UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	**)**	**Docket No. 52-011-ESP**
	)	
Southern Nuclear Operating Company	**)**	**ASLBP No. 07-850-01-ESP-BD01**
	)	
(Early Site Permit for Vogtle ESP Site)	**)**	**April 24, 2009**

SOUTHERN NUCLEAR OPERATING COMPANY'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW REGARDING ENVIRONMENTAL CONTENTIONS

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Pursuant to 10 C.F.R. § 2.712(a)(1) and the Atomic Safety and Licensing Board's ("ASLB" or "Board") Nov. 13, 2008 scheduling order,[1] Southern Nuclear Operating Company ("SNC") submits its Proposed Findings of Fact and Conclusions of Law Regarding Environmental Contentions ("Proposed Findings and Conclusions"). The Proposed Findings and Conclusions address Environmental Contentions ("EC") 1.2, 1.3, and 6.0, and conclude all involved contested issues.

The Proposed Findings and Conclusions are based on the evidentiary record in this proceeding; pursuant to 10 C.F.R. § 2.712(c), the proposed findings of fact and conclusions of law are set out in numbered paragraphs, with corresponding citations to the Transcript of Southern Nuclear Operating Company Early Site Permit Hearing that occurred March 16-19, 2009, in Augusta, Georgia ("Transcript" or "Tr.").

I. Procedural Background

1. On August 14, 2006, SNC submitted an Early Site Permit ("ESP") application in accordance with 10 C.F.R. Part 52 requesting approval for siting one or more new

[1] *Southern Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), Docket No. 52-011-ESP, Memorandum and Order (Revised General Schedule) (Nov. 13, 2008), , ("Nov. 13, 2008 Order").

nuclear reactors at the existing Vogtle Electric Generating Plant ("VEGP" or "Vogtle") site. The application, which was accepted on September 19, 2006, included an Environmental Report ("ER"). The ER was prepared pursuant to 10 C.F.R. § 51.50(b).[2] *See* Exhibit SNC000001.

2. On October 12, 2006, pursuant to 10 C.F.R. § 2.104, the Nuclear Regulatory Commission ("Commission" or "NRC") issued a "Notice of Hearing and Opportunity to Petition for Leave to Intervene," which notified interested parties that a hearing would be held to consider SNC's application for an ESP. *See* Southern Nuclear Operating Company, Notice of Hearing and Opportunity to Petition for Leave to Intervene on An Early Site Permit for the Vogtle ESP Site, 71 Fed. Reg. 60,195 (Oct. 12, 2006).

3. In response, on December 11, 2006, Joint Intervenors (then Joint Petitioners) filed a Petition for Intervention seeking to have admitted seven contentions challenging the ER, arising under the National Environmental Policy Act ("NEPA"), designated Environmental Contentions 1.1, 1.2, 1.3, 2, 3, 4, and 5.

4. The Commission appointed this Board pursuant to delegation by the Commission and the Commission's regulations. Authority of Atomic Safety and Licensing Board to Rule on Certain Petitions, 37 Fed. Reg. 28,710 (Dec. 29, 1972), *see* 10 C.F.R. §§ 2.104, 2.300, 2.303, 2.309, 2.311, 2.318, and 2.321. *See* Order (Establishment of Atomic Safety and Licensing Board) (Dec. 15, 2006).

5. Following a pre-hearing conference, the Board heard oral argument, and on March 12, 2007, the Board admitted two contentions, EC 1.2 and EC 1.3. *See In re Southern Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), 65 NRC 237, 257 (2007) ("Vogtle ESP March 12, 2007 Order").

[2] In November 2006, SNC submitted a revised ER.

6. As originally admitted and set forth in Appendix A of the Vogtle ESP March 12, 2007 Order, EC 1.2 read: 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.

7. EC 1.3, as originally proposed, claimed that the ER's discussion of "cooling technologies fails to consider environmental and economic benefits of avoiding construction of the proposed cooling system." Vogtle ESP March 12, 2007 Order at 259. In admitting EC 1.3, the Board narrowed its scope, rejecting the contention to the extent it was based on an asserted failure of the ER to address the "no-action alternative." *Id.* at 259-60.

8. As admitted, and as set out in Appendix A of the Vogtle ESP March 12, 2007 Order, EC 1.3 reads: "The ER fails to satisfy 10 C.F.R. § 51.45(b)(3) because its analysis of the dry cooling alternative is inadequate to address the appropriateness of a dry cooling system given the presence of extremely sensitive biological resources."

9. On September 10, 2007, as part of its obligations under NEPA, the NRC Staff released its Draft Environmental Impact Statement ("DEIS"), which incorporates data from the original and subsequently revised ER, SNC's responses to the RAIs[3] and information the Staff compiled from other sources. *See* Office of New Reactors, U.S. Nuclear Regulatory Commission, [DEIS] for an [ESP] at the [VEGP] Site, NUREG-1872 (Sept. 2007). .

10. Following publication of the DEIS, SNC moved for summary disposition as to EC 1.2, on the grounds that the DEIS answered the complaints of the Joint Intervenors by identifying and considering the impacts to aquatic organisms from impingement, entrainment, and thermal and chemical discharges from the operation of Vogtle Units 3 and 4. *See* [SNC's]

[3] After EC 1.2 and 1.3 were admitted, the NRC Staff issued and SNC responded to certain Requests for Additional Information ("RAIs"). In addition, SNC further revised its ER to supplement its earlier analysis.

Motion for Summary Disposition of Intervenors' [EC] 1.2 (Cooling System Impacts on Aquatic Resources), October 17, 2007. The Board granted SNC's motion as to the portion of the contention regarding chemical impacts. In so doing, the Board revised EC 1.2 to read: The ER fails to identify and adequately consider direct, indirect, and cumulative impingement/entrainment and thermal effluent discharge impacts of the proposed cooling system intake and discharge structures on aquatic resources. Memorandum and Order (Ruling on Dispositive Motion and Associated Motions to Strike Regarding [EC] 1.2) (Jan. 15, 2008) at 34 ("January 15, 2008 Order").

11. On August 14, 2008, the NRC Staff issued the Final Environmental Impact Statement. NUREG-1872, "Final Environmental Impact Statement for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site" (August 2008) ("FEIS") (Exhibit NRC000001). Following publication of the FEIS, Joint Intervenors filed a motion to admit a new contention, EC 6.0. *See* Joint Intervenors' Motion to Admit New Contention, September 22, 2008 ("Joint Intervenors' Motion").

12. On October 24, 2008, the Board admitted EC 6.0 – "[FEIS] Fails to Provide Adequate Discussion of Impacts Associated with Dredging the Savannah River Federal Navigation Channel." *See Southern Nuclear Operating Co*. (Early Site Permit for Vogtle ESP Site), Docket No. 52-011-ESP, Memorandum and Order (Ruling on Motion to Admit New Contention) (October 24, 2008). As admitted, EC 6.0 reads: Because Army Corps of Engineers (Corps) dredging of the Savannah River Federal navigation channel has potentially significant impacts on the environment, the NRC staff's conclusion, as set forth in the "Cumulative Impacts" chapter of the FEIS, that such impacts would be moderate is inadequately supported.

Additionally, the FEIS fails to address adequately the impacts of the Corps' upstream reservoir operations as they support navigation, an important aspect of the problem. *Id.* at App,

13. Beginning in January, 2009, the Board accepted pre-filed direct and rebuttal testimony on the contested issues.

14. Pursuant to the Board's scheduling order, on March 16, 2009, the Board commenced an evidentiary hearing regarding all three contentions ("Contested Hearing"), which concluded on March 19, 2009.

II. Applicable Legal Standards

1. Contentions challenging the content or adequacy of the NRC Staff's EIS arise under NEPA. *See* 10 C.F.R. § 2.309(f)(2). All three admitted contentions in this proceeding arise under NEPA, and the NRC's general NEPA obligation applies to each.

A. NRC's NEPA Obligation

2. Section 102(2) of NEPA requires all federal agencies to prepare detailed statements assessing the environmental impact of and alternatives to major federal actions significantly affecting the environment. *See* 42 U.S.C. § 4322. "NEPA generally requires that federal agencies consider the environmental impacts of their proposed actions, and take these considerations into account in their decisionmaking process." *See In re La. Energy Servs., L.P.* (Claiborne Enrichment Center), LBP-97-8, 45 NRC 367, 399 (1997), *aff'd in part, rev'd in part on other grounds* CLI-98-3, 47 NRC 77 (1998) (cited by *In re La. Energy Servs., L.P.* (Nat'l Enrichment Facility), LBP-05-13, 61 NRC 385, 403 (2005), *aff'd in part, rev'd in part on other grounds* CLI-05-20, 62 NRC 523, 536 (2005)).

3. The Council on Environmental Quality ("CEQ") has promulgated regulations to guide agencies in complying with NEPA. *See* 40 C.F.R. Part 1500. While the CEQ's regulations are entitled to deference, they are not binding on the NRC unless expressly

adopted. *See Limerick Ecology Action, Inc. v. NRC*, 869 F.2d 719, 725 (3rd Cir. 1989). The NRC has promulgated its own regulations implementing NEPA, which are found in 10 C.F.R. Part 51. "Together, [NEPA] and the corresponding regulations require an applicant and the Staff to consider the potential environmental effects of the proposed action." *In re La. Energy Servs., L.P.* (Nat'l Enrichment Facility), LBP-05-13, 61 NRC at 403.

4. Subpart A of 10 C.F.R. Part 51 implements Section 102(2) of NEPA for NRC's domestic licensing and related regulatory functions. Section 51.45 requires the applicant to submit an ER which "shall contain a description of the proposed action, a statement of its purposes, a description of the environment affected, and discuss," *inter alia* "[t]he impact[s] of the proposed action on the environment . . . in proportion to their significance."

5. In accordance with Sections 51.70 – 51.75, the NRC Staff is responsible for reviewing the ER and preparing a DEIS. The DEIS:

> will be concise, clear and analytic, will be written in plain language with appropriate graphics, will state how alternatives considered in it and decisions based on it will or will not achieve the requirements of [NEPA] . . . will identify any methodologies used and sources relied upon, and will be supported by evidence that the necessary environmental analyses have been made.

10 C.F.R. § 51.70.

6. Finally, following distribution of the DEIS for public comment, the Staff is required to review any comments it receives, along with the information submitted by the applicant and any supplemental information, and to prepare an FEIS. *See* 10 C.F.R. § 51.90; *see also In re La. Energy Servs., L.P.* (Nat'l Enrichment Facility), LBP-05-13, 61 NRC at 404-05.

7. An EIS is sufficient and satisfies NEPA if it contains "an adequate compilation of relevant information, has analyzed it reasonably, has not ignored pertinent information, and has made disclosures to the public." *Vt. Public Interest Research Group v. U.S. Fish & Wildlife Serv.*, 247 F. Supp. 2d 495, 517 (D. Vt. 2002) (internal quotations omitted).

NEPA does not require agencies to "elevate environmental concerns over other appropriate considerations. Rather it require[s] only that the agency take a 'hard look' at the environmental consequences before taking a major action." *Balt. Gas & Elec. Co. v. Natural Res. Def. Council*, 462 U.S. 87, 97 (1983) (internal citation omitted); *In re La. Energy Servs., L.P.*, (Nat'l Enrichment Facility), LBP-05-13, 61 NRC at 403 ("NEPA imposes procedural restraints, calling for an agency to take a 'hard look' at the environmental impacts of a proposed action . . .").

8. "[O]nce environmental concerns are adequately identified and evaluated by the agency, NEPA places no further constraint on agency actions." *Citizens' Comm. to Save Our Canyons v. Krueger*, 513 F.3d 1169, 1179 (10th Cir. 2008). As the Supreme Court has held, Congress authorized agencies to adopt "an appropriate method of conducting the hard look" required by NEPA. *Balt. Gas & Elec. Co.*, 462 U.S. at 100-101.

9. Importantly,

> [t]hat the Intervenors would have preferred that the FEIS contain additional details on any particular issue is not, standing alone, probative of the FEIS' adequacy. One can always flyspeck an FEIS to come up with more specifics and more areas of discussion that conceivably could have been included. The salient question is whether the FEIS took the required "hard look" at the relevant environmental consequences.

In re Hydro Res., Inc., LBP-06-19, 64 NRC 53, 80 n.27 (2006), *review denied by* CLI-06-29, 64 N.R.C. 417 (2006) (internal citation omitted). An FEIS "shall be kept concise and shall be no longer than absolutely necessary to comply with NEPA." *Piedmont Envtl. Council v. U.S. Dept. of Transp.*, 159 F. Supp. 2d 260, 275 (W.D. Va. 2001) ("Piedmont").

10. NEPA does not require an EIS to "be exhaustive to the point of discussing all possible details bearing on the proposed action," as there is "undoubtedly always room for additional consideration of most potential environmental impacts." *Vt. Pub. Interest Research Group v. U.S. Fish & Wildlife Serv.*, 247 F. Supp. 2d at 518, 524 . The fact that an FEIS "may

not go into great detail on every impact" does not mean that an agency failed to take a hard look. *See Piedmont*, 159 F. Supp. 2d at 275-76 (holding that forty page discussion in the FEIS of all environmental consequences and studies satisfied the requisite hard look); *Anson v. Eastburn*, 582 F. Supp. 18, 21 (S.D. Ind. 1983) (ruling that agency is not required "to review all possible impacts or all possible alternatives to the proposed action," and that "there is no requirement that every conceivable study be performed and that each problem be documented from every angle"). The NRC's guidance provides that "[t]he degree of detail should be modified according to the anticipated magnitude of the potential impacts." "Standard Review Plans for Environmental Reviews for Nuclear Power Plants" NUREG-1555 (July, 2007) at 2.4.2-2.

11. In other words, the "hard look" requirement is tempered by a "rule of reason." *See In re La. Energy Servs., L.P.*, (Claiborne Enrichment Center), LBP-97-8, 45 NRC at 399. "That standard is not one of perfection; rather, it is a question of reasonableness." *Id.* The Supreme Court has characterized the "rule of reason" as such:

> [A]n EIS is required to furnish only such information as appears to be reasonably necessary under the circumstances for evaluation of the project rather than to be so all-encompassing in scope that the task of preparing it would become either fruitless or well nigh impossible.

New York v. Kleppe, 429 U.S. 1307, 1311 (1976), *citing Natural Res. Def. Council v. Callaway*, 524 F.2d 79, 88 (2d Cir. 1975). More generally, the CEQ has described the "rule of reason" as "a judicial device to ensure that common sense and reason are not lost in the rubric of regulation." 51 Fed. Reg. 15,618, 15,621 (April 25, 1986).

12. Agencies are given "broad discretion" in establishing how thoroughly an issue should be analyzed "and may decline to examine issues the agency in good faith considers 'remote and speculative' or 'inconsequentially small[.]'" *See In re La. Energy Servs., L.P.* (Claiborne Enrichment Center), CLI-98-3, 47 NRC at 103; *In re La. Energy Servs.*, LBP-05-13,

61 NRC at 403. Similarly, agencies are entitled to "wide discretion" in assessing scientific evidence, "so long as it takes a hard look at the issues and responds to reasonable opposing viewpoints." *Navajo Nation v. U.S. Forest Serv.*, 408 F. Supp. 2d 866, 877 (D. Ariz. 2006), *citing Earth Island Inst. v. U.S. Forest Serv.*, 351 F.3d 1291 (9th Cir. 2003).

13. In conducting its NEPA analysis, an agency "may, in its discretion, rely on data, analyses, or reports prepared by persons or entities other than agency staff . . . provided, however, that the staff independently evaluates and takes responsibility for the pertinent information before relying on it in an EIS." *In re La. Energy Servs., L.P.* (Nat'l Enrichment Facility), LBP-06-08, 63 NRC 241, 259 (2006), *aff'd as supplemented* CLI-06-15, 63 N.R.C. 687 (2006) (citing 10 C.F.R. § 51.70(b).

14. An agency is not required to generate new data in order to satisfy its obligation to take a "hard look" at the environmental consequences of a proposed action. Rather, the NRC has held that the Staff may base its findings "upon the 'available technical information.'" *In re Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-03-17, 58 NRC 419, 431 (2003).

> NRC adjudicatory hearings are not EIS editing sessions. [Atomic Safety and Licensing Boards] do not sit to parse and fine-tune EISs. To litigate a NEPA claim, an intervenor must allege, with adequate support, that the NRC Staff has failed to take a "hard look" at significant environmental questions – i.e., the Staff has unduly ignored or minimized pertinent environmental effects.

Id.

15. Courts have routinely held that reliance on available data which reflect conditions at the site, even if the information originated from assessments of surrounding areas or from sources other than field studies conducted by the agency or applicant, constitutes an appropriate method for complying with NEPA. *See Edwardsen v. U.S. Dep't of the Interior*, 268 F.3d 781, 785 (9th Cir. 2000) (In using the data from a nearby area as a "valid estimate" of site

specific information, the Interior Department "made a reasoned judgment that the data was relevant and yielded a useful analysis of the extent to which spilled oil would spread. . . . The fact that the FWS would have preferred a site-specific analysis is not sufficient, however, to require a conclusion that the [Interior Department] acted unreasonably or in contravention of NEPA" by using data that the agency concluded reflected wind and water conditions in the areas under study reflected those at the site of the proposed development.); *Okanogan Highlands Alliance v. Williams*, 236 F.3d 468, 473 (9th Cir. 2000).

16. Similarly, in *Oregon National Desert Association v. Shuford,* an environmental organization challenged a resource management plan for a wilderness area, on grounds that the government used outdated baseline data for the area in question, in violation of NEPA. *Oregon National Desert Association v. Shuford,* 2007 WL 1695162, *3 (D. Or. 2007). The district court held that "NEPA does not contain an explicit requirement that an agency [conduct an] inventory [of] wilderness characteristics on the affected land for each proposed action." *Id.* at *4. Further, NEPA does not establish a strict "quantum of information" for the needed data; the law requires only that the agency rely on accurate data. The court stated that: "NEPA [does not] require that [an agency] perform a new wilderness inventory each time [it] develops [a plan], so long as [the agency] utilizes an adequate environmental baseline of resources in its NEPA analysis . . . ." *Id.* at *6.

17. "[T]he appropriate scope of the baseline [scientific data] for a project is a functional concept: an applicant must provide enough information and in sufficient detail to allow for an evaluation of important impacts." Vogtle ESP March 12, 2007 Order at 257 (citing NUREG-1555 and "General Site Suitability Criteria for Nuclear Power Stations," Reg. Guide 4.7 (April 1, 1998)). Applying the "rule of reason," the Ninth Circuit has held that reliance on

existing studies is sufficient. *See Stop H-3 Ass'n v. Dole*, 740 F.2d 1442, 1462-63 (9th Cir. 1984), *cert. denied sub nom. Yamasaki v. Stop H-3 Ass'n*, 471 U.S. 1108 (1985), *see also Nat'l Indian Youth Council v. Andrus*, 501 F. Supp. 649, 669 (D. N.M. 1980).

B. Consideration of Environmental Impacts

18. Agencies have "considerable discretion" in determining the scope of their EISs. *Earth* Island *Inst. v. U.S. Forest Serv.*, 351 F.3d at 1305; *see also Thomas v. Peterson*, 753 F.2d 754, 758 (9th Cir. 1985). Section 1508.25 of the CEQ's regulations guides agencies to consider three types of actions and three types of impacts to determine the scope of an environmental impact statement. 40 C.F.R. § 1508.25. The types of actions include:

> (1) Connected actions, which means that they are closely related and therefore should be discussed in the same impact statement. Actions are connected if they:
>
> (i) Automatically trigger other actions which may require environmental impact statements.
>
> (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously.
>
> (iii) Are interdependent parts of a larger action and depend on the larger action for their justification.
>
> (2) Cumulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement.

40 C.F.R. § 1508.25(a).

19. The purpose of part (1) of this provision is to stop a single agency from "segmenting" its actions. *Cf. Stewart Park and Reserve Coalition, Inc. (SPARC) v. Slater*, 352 F.3d 545, 559-60 (2d Cir. 2003). "Put simply, projects that have independent utility are not connected actions . . . ." *Citizens Comm. to Save our Canyons v. U.S. Forest Serv.*, 297 F.3d

1012, 1029 (10th Cir. 2002); *see also Wetlands Action Network v. U.S. Army Corps of Eng'rs*, 222 F.3d 1105 (9th Cir. 2000).

20. Cumulative impacts must be "reasonably foreseeable." "[I]f effects are remote or speculative, the EIS need not discuss them." *In re La. Energy Servs.*, LBP-05-13, 61 NRC at 404 (citing *Vt. Yankee Nuclear Power Corp. v. Nat. Res. Def. Council, Inc.*, 435 U.S. 519, 551 (1978)). Importantly, impacts are only considered "reasonably foreseeable" in the context of NEPA if sufficiently concrete detail is known. *See City of Oxford, GA v. Fed'l Aviation Admin.*, 428 F.3d 1346, 1353 (11th Cir. 2005). As the Eleventh Circuit has recognized, "[t]he inquiry into whether a future action is foreseeable should be conducted with an eye toward the purposes underlying NEPA." *Id.* "An agency must consider the cumulative impacts of future actions only if doing so would further the informational purposes of NEPA. Restricting cumulative impact analysis to foreseeable future actions ensures that the details of these actions are sufficiently concrete for the agency to gather information useful to itself and the public." *Id.* at 1353-54. The NRC must "make an informed judgment, and [] estimate future impacts . . . if trends are ascertainable," but it is "not required to engage in speculation or contemplation about [] future plans." Forty Most Asked Questions Concerning CEQ's [NEPA] Regulations, CEQ, 46 Fed. Reg. 18,026, 18,031 (Mar. 23, 1981). Reasonable foreseeability is not the same as "possible" and "does not include 'highly speculative harms.'" *City of Shoreacres v. Waterworth*, 420 F.3d 440, 453 (5th Cir. 2005).

21. Agencies must also analyze three types of impacts to determine the scope of an EIS: direct, indirect and cumulative impacts. 40 C.F.R. § 1508.25(c). A cumulative impact is defined as:

> the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable

> future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

40 C.F.R. § 1508.7.

22. As the United States Supreme Court has ruled, the requirement to include a cumulative impacts analysis does not enlarge the scope of analysis. *See U.S. Dept. of Transp. v. Public Citizen*, 541 U.S. 752, 769-70 (2004).

23. Furthermore, NRC has no duty under NEPA to consider the environmental impacts of a not-yet-proposed action by another federal agency, when it has no control over that agency's action and, importantly, no ability to prevent the other action's environmental effects. *See U.S. Dept. of Transp. v. Public Citizen*, 541 U.S. at 756, 768. *Quechan Indian Tribe of the Fort Yuma Indian Reservation v. U.S. Dep't of the Interior*, 547 F. Supp. 2d 1033, 1043 ("D. Ariz. 2008").

24. Again, because NRC has not specifically adopted these provisions, these definitions are not binding on the NRC. *See Limerick Ecology Action, Inc. v. NRC*, 869 F.2d at 725; *In re La. Energy Servs.*, LBP-05-13, 61 NRC at 403. However, they do, together with the rule of reason, provide guidance on the scope of the cumulative impacts analysis.

25. "NEPA does not call for certainty or precision, but an *estimate* of anticipated (but not unduly speculative) impacts." *In re La. Energy Servs., L.P.* (Nat'l Enrichment Facility), CLI-05-20, 62 NRC at 536. *See, e.g., City of Oxford*, 428 F.3d at 1353-54 (FAA not required under NEPA to analyze cumulative impact of revisions to airport runway plan and relocation of a road where the agency "would have no basis upon which to asses the environmental impacts of such a project, other than pure speculation.")

26. Impacts from the proposed action will also not be assumed based only on geographic proximity to it. *See, e.g., Heartwood Inc. v. U.S. Forest Service*, 380 F.3d 428, 431-32 (8th Cir. 2004) (finding endangered species even in close geographic proximity are not automatically deemed to be significantly impacted, but rather the analysis turns on actual impacts); *Little Lagoon Pres. Soc'y. Inc. v. United States*, No. 06-0587-WS-C, 2008 U.S. Dist. LEXIS 66557, at *99-100 (S.D. Ala. Aug. 29, 2008) (supporting a finding of no significant impact with endangered Alabama Beach Mouse critical habitat being nearby and their migration into project construction area having been predicted).

27. In those instances "when the nature of the effect is reasonably foreseeable, but its extent is not . . . [t]he CEQ has devised a specific procedure for 'evaluating reasonably foreseeable significant adverse effects on the human environment' when 'there is incomplete or unavailable information.'" *Mid States Coal. for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 549-550 (8th Cir. 2004). Section 1502.22 of the CEQ regulations states that:

> When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.

40 C.F.R. § 1502.22. Unavailable information is that "which cannot be obtained because the means to obtain it are not known." 51 Fed. Reg. at 15,621.

28. The agency should state that the information is incomplete or unavailable, state the relevance of the missing information, summarize the existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts and evaluate such impacts based on theoretical approaches or scientific methods generally accepted in the scientific community. 40 C.F.R. § 1502.22(b). An agency's analysis made "in the face of unavailable information" is "grounded in the 'rule of reason.'" 51 Fed. Reg. at

15,621; *see also Scientists' Inst. for Public Info., Inc., v. Atomic Energy Comm'n*, 481 F.2d 1079, 1092 (D.C. Cir. 1973) ("The statute must be construed in the light of reason if it is not to demand what is, fairly speaking, not meaningfully possible . . . .").

29. "Situations often arise when information that would be considered important for the preparation of an environmental impact statement is unavailable. If [NEPA] barred agency action until this information became available, it is unlikely that any project requiring an environmental impact statement would ever be completed." *Village of False Pass v. Watt*, 565 F. Supp. 1123, 1149 (D. Alaska 1983); *Jicarilla Apache Tribe of Indians v. Morton*, 471 F.2d 1275, 1280 n.11 (9th Cir. 1973). "[T]he unavailability of information should not be permitted to halt all government action." *Village of False Pass*, 565 F. Supp. at 1144. As the Fifth Circuit has recognized, "[t]his is particularly true when information may become available at a later time and can still be used to influence [agency] decision." *Sierra Club v. Sigler*, 695 F.2d 957, 970 (5th Cir. 1983).

30. Moreover, for information subject to 40 C.F.R. § 1502.22, an agency's obligation only applies when the information is "essential to a reasoned choice among alternatives." The purpose of NEPA is to "ensure[] that important effects will not be overlooked or underestimated." *In re Hydro Resources, Inc.* 53 NRC 31, 44 (citing *Robertson v. Methow Valley Citizens Council* ("*Robertson*"), 490 U.S. 332, 349 (1989)).

C. Analysis of Alternatives

31. NEPA requires an analysis of alternatives to the proposed action. NRC promulgated 10 C.F.R. § 51.45(b)(3) to implement this requirement; the regulation states:

> Alternatives to the proposed action. The discussion of alternatives shall be sufficiently complete to aid the Commission in developing and exploring, pursuant to section 102(2)(E) of NEPA, "appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." To the extent practicable, the

> environmental impacts of the proposal and the alternatives should be presented in comparative form[.]

10 C.F.R. § 51.45(b)(3).

32. "[W]hen reviewing a license application filed by a private applicant . . . an agency may give substantial weight to the stated preferences of the applicant with regard to issues such as site selection and facility design." *In re La. Energy Servs.*, LBP-05-13, 61 NRC at 403.

33. The discussion of alternatives required by Section 51.45(b)(3) need not include "every possible alternative, but every reasonable alternative." *In re Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation) ("*Private Fuel Storage*"), LBP-03-30, 58 NRC 454, 479 (2003) (quoting *Long Island Lighting Co.* (Shoreham Nuclear Power Station, Unit 1), CLI-91-2, 33 NRC 61, 71 (1991)). This is consistent with well-established NEPA jurisprudence that "Section 102 of NEPA (42 U.S.C. § 4332(2)(E)) (2006)) requires analysis only of reasonable alternatives." *Midcoast Interstate Transmission, Inc. v. FERC* ("*Midcoast*"), 198 F.3d 960, 967 (D. C. Cir. 2000); *Vermont Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519, 551 (1978) ("[T]he concept of alternatives [under NEPA] must be bounded by some notion of feasibility."); *In re La. Energy Servs.*, LBP-05-13, 61 NRC at 403 (citing *In re Long Island Lighting Co.* (Shoreham Nuclear Plant) ("*Shoreham*"), CLI-90-8, 32 NRC 201, 206 (1990) ("[T]here is no need to consider alternatives of speculative feasibility[.]")); *see also Envtl. Law and Policy Center v. NRC* ("*Center*"), 470 F.3d 676, 682-83 (7th Cir. 2006). As the United States Court of Appeals for the District of Columbia Circuit explained, "The statute must be construed in the light of reason if it is not to demand what is, fairly speaking, not meaningfully possible, given the obvious, that the resources of energy and research -- and time --

available to meet the Nation's needs are not infinite." *Nat. Res. Def. Council, Inc. v. Morton*, 458 F.2d 827, 837 (D.C. Cir. 1972).

34. Accordingly, environmental documents need not discuss alternatives which depend on unproven or non-existent technology, or which would prove impractical for the project. *See Kelley v. Selin*, 42 F.3d 1501, 1521 (6th Cir. 1995) (finding the NRC properly held that alternatives to dry casks for storing nuclear fuel, neither proven nor practical, did not belong in an environmental document); *City of Grapevine, Tex. v. Dep't of Transp.* ("*Grapevine*"), 17 F.3d 1502, 1506 (D.C. Cir. 1994) (finding a "wayport," which was never built and would hamper certain types of air traffic, does not merit discussion in a DEIS as an alternative to expanding runways); *see also, Citizens Against Burlington, Inc. v. Busey* ("*Burlington*"), 938 F.2d 190, 195 (D.C. Cir. 1991) (requiring discussion of every conceivable alternative would turn environmental documents into "frivolous boilerplate"). Similarly, environmental documents may exclude alternatives in situations in which the applicant would be "in no position to implement [the] measures." *Center*, 470 F.3d at 684.

35. The NRC applies the same legal standards described above. As the Commission held: "NEPA does not require the consideration of alternatives that are impractical, that present unique problems; or that cause extraordinary costs. . . . An agency's consideration of alternatives is sufficient if it considers an appropriate range of alternatives, even if it does not consider every available alternative." *Private Fuel Storage*, LBP-03-30, 58 NRC at 479 (citations and quotation marks omitted). Furthermore, the courts have held that the "Rule of Reason" limits not just the "range of alternatives" the agency's environmental documents must discuss, but also "the extent to which [the agency] must discuss them." *Grapevine*, 17 F.3d at 1506 (citing *Burlington*, 938 F.2d at 195) (emphasis added). Finally, NEPA "does not require

the selection of the most environmentally benign alternative." *Private Fuel Storage*, LBP-03-30, 58 NRC at 479.

36. An agency is not constrained by NEPA from deciding that other values (such as economic considerations) outweigh environmental issues. *Robertson*, 490 U.S. at 350. "[W]hether it is "reasonable" to bear a particular cost may well depend on the resulting benefits[.]" *Entergy Corp. v. Riverkeeper, Inc.*, 129 S. Ct. 1498, 1509-10 (2009) (finding that the EPA reasonably employed a cost-benefit analysis in determining the best technology available for minimizing cooling water intake structures adverse environmental impact).

D. The Board's Consideration of the Staff's NEPA Analysis

37. When the adequacy of the Staff's analysis is challenged, "[i]n connection with any admitted NEPA contentions, the [Board's] role in the NEPA analysis is similar to that of a federal court, in that the Board's job is 'to ensure that the agency has adequately considered and disclosed the environmental impacts of its actions.'" *Coalition on Sensible Transp., Inc. v. Dole*, 826 F.2d 60, 66 (D.C. Cir. 1987); *see also In re La. Energy Servs.*, LBP-05-13, 61 NRC at 403. The baseline NEPA issues require the Board to independently (a) decide whether NEPA §§ 102(2)(A), (C), and (E) have been complied with, (b) consider the final balance among conflicting factors contained in the record with a view to determining the appropriate action to be taken, and (c) determine whether the ESP should be issued, denied, or appropriately conditioned to protect environmental issues. *In re Dominion Nuclear North Anna, LLC*, LBP-07-09, 65 NRC 539, 559 n. 32, 560 (2007), *aff'd* CLI-07-27, 2007 WL 4129154 (Nov. 20, 2007) ("These issues are called 'baseline' issues, because these decisions must be made 'regardless of whether the proceeding is contested or uncontested.'" (quoting 10 C.F.R. § 2.104(b)(3)).

38. The Board reviews contested issues *de novo*, which means it must apply for itself the same substantive standard applicable to the Staff's NEPA review, i.e., the "hard

look" standard, subject to the "rule of reason." *See Ka Makani 'O Kohala Ohana Inc. v. Dep't of Water Supply*, 295 F.3d 955, 959 (9th Cir. 2002). Thus, while the Board must "bring [its] own 'de novo' judgment to bear," it must also apply the same standards applicable to the Staff for assessing impacts under NEPA. *See In re Exelon Generation Co., LLC* (Early Site Permit for Clinton ESP Site), CLI-05-17, 62 NRC 134, *9 (2005); *Westlands Water Dist. v. U.S. Dep't of Interior*, 376 F.3d 853, 865 (9th Cir. 2004). In this case, therefore, the Board must simply decide whether the analysis and conclusions in the EIS contain "an adequate compilation of relevant information, has analyzed it reasonably, has not ignored pertinent information, and has made disclosures to the public." *Vt. Public Interest Group*, 247 F. Supp. 2d at 518.

39. According to the NRC's rules of practice, the Applicant generally has the burden of proof, unless the presiding officer orders otherwise. 10 C.F.R. § 2.325. However, the NRC has the burden of complying with NEPA. "[W]hen the Applicant becomes a proponent of a particular challenged position set forth in the EIS, the Applicant, as such a proponent, also has the burden on that matter." *In re La. Energy Servs.*, LBP-97-8, 45 NRC at 373. Thus, SNC and the Staff share the burden of demonstrating that the EIS complies with NEPA.

40. If the Board finds that the FEIS should have contained additional information, then it may consider the record as a whole. The Commission has consistently held that the adjudicatory record and the ASLB decision become part of the FEIS. *See, e.g., In re Louisiana Energy Services, L.P.* (National Enrichment Facility), CLI-06-15, 63 NRC 687, 707 n.91 (2006) ("Adjudicatory findings on NEPA issues, including our own in this decision, become part of the environmental 'record of decision' and in effect supplement the FEIS."); *Louisiana Energy Servs., L.P.* (Claiborne Enrichment Center), CLI-98-3, 47 NRC at 89 (In "NRC licensing adjudications . . . it is the Licensing Board that compiles the final environmental 'record of

decision' . . . . The adjudicatory record and Board decision . . . become, in effect, part of the FEIS."); *In re Louisiana Energy Servs.*, LBP-05-13, 61 NRC at 404.

41. Therefore, in the context of an NRC adjudicatory proceeding, when faced with a contention regarding the adequacy or sufficiency of an Applicant's ER or the NRC Staff's EIS, "the ultimate NEPA judgments regarding a facility can be made on the basis of the entire record before a presiding officer, such that the EIS can be deemed to be amended *pro tanto*." *In re Louisiana Energy Servs., L.P.* (National Enrichment Facility), LBP-05-13, 61 NRC at 404. Thus, the Board may consider the full record before it, including the admitted and the testimony presented, to conclude that "the aggregate is sufficient to satisfy the agency's obligation under NEPA" to take a "hard look" at the environmental consequences of issuing an ESP. *In re Louisiana Energy Servs., L.P.* (National Enrichment Facility), LBP-06-08, 63 NRC at 286; *see also* Vogtle ESP, LBP-07-3, 65 NRC at 277.

E. New and Significant Information

42. An ESP and Limited Work Authorization ("LWA") application initiated this proceeding. An ESP and LWA proceeding extends to approval of site suitability and are partial construction permits. They do not authorize the construction of a nuclear power plant. 10 C.F.R. § 52.10 ("[ESP] means a Commission approval, issued under Subpart A of this part, for a site or sites for one or more nuclear power facilities. An early site permit is a partial construction permit."); 10 C.F.R. § 52.25 ("[I]f …the [ESP] site is not referenced in an application for a construction permit or a combined license … while the permit remains valid, then the early site permit remains in effect solely for the purpose of site redress").

43. Agency action is not limited by the potential for future information to arise. *In re Louisiana Energy Servs., L.P.* (Nat'l Enrichment Facility), LBP-06-08, 63 NRC at 286; Vogtle ESP, LBP-07-3, 65 NRC at 277; 10 C.F.R. § 52.39; *see also* 40 C.F.R. § 1502.22.

44. If information arises after issuance of an ESP, then it will be subject to the new and significant information standard. *See* 10 C.F.R. § 52.39(c). If the information is determined to be new and significant, then it would be addressed in the Combined Operating License NEPA analysis. *Id.*

III. Findings of Fact

A. Environmental Contention 1.2

i. Contention and Evidence Presented

1. As admitted, EC 1.2 reads: The ER fails to identify and adequately consider direct, indirect, and cumulative impingement/entrainment and thermal effluent discharge impacts of the proposed cooling system intake and discharge structures on aquatic resources.

2. SNC presented a panel of the following four qualified witnesses on EC 1.2: (1) Dr. Charles C. Coutant, a scientist with a Ph.D. in Biology and nearly fifty years' experience studying impacts to aquatic resources; (2) Mr. Thomas Moorer, SNC's Project Manager for Environmental Support; (3) Mr. Anthony Dodd, an Environmental Specialist for Georgia Power Company, focusing on Fisheries Biology and Aquatic Ecology; and (4) Mr. Matt Montz, an Environmental Specialist for SNC. The extensive, relevant experience of these experts is demonstrated by their pre-filed direct and rebuttal testimony and statements of professional qualification provided therewith. *See* Exhibits SNC000002, SNC000003, SNC000012 and SNC000014 (witness CVs).

3. SNC submitted pre-filed direct testimony of Dr. Coutant on January 9, 2009 and rebuttal testimony on February 6, 2009. SNC submitted pre-filed direct joint testimony of Mr. Montz and Mr. Dodd on January 9, 2009, submitted a revised version on March 16, 2009, and pre-filed rebuttal joint testimony on February 6, 2009. SNC submitted pre-filed direct

testimony of Mr. Moorer on January 9, 2009, and pre-filed rebuttal testimony on February 6, 2009 and revisions to both on March 11, 2009. These testimonies were admitted and entered into the record as if read. Tr. 587, 589, 604, 605, 610, and 611.

4. SNC's witnesses demonstrated their extensive experience and involvement with the NEPA process. Dr. Coutant was involved in the preparation of the initial EISs for the Atomic Energy Commission Division of Regulation (predecessor to NRC). Tr. 604 (Coutant 1.2 Direct at A.2); *see also* Exhibit SNC000012. He has participated in preparation of NEPA EISs for nuclear power plants for the U.S. Atomic Energy Commission, later the NRC, including the Palisades, Shoreham and Indian Point Plants. *Id.* Mr. Moorer also has extensive NEPA experience, including work with the NRC on the development of the Generic Environmental Impact Statement ("GEIS") for license renewal. Tr. 610 (Moorer 1.2 Direct at A.3); *see also* Exhibit SNC000014. He also managed the environmental support for the Plant Farley and Plant Hatch license renewals, and has been involved with EPRI and NEI work associated with development of the NEI License Renewal Guideline. *Id.*

5. The NRC Staff also presented a panel of five witnesses on EC 1.2. These witnesses included: Dr. Michael T. Masnik, Ms. Anne R. Kuntzleman, Ms. Rebekah H. Krieg, Ms. Jill S. Caverly, and Mr. Lance W. Vail.

6. The NRC Staff submitted pre-filed direct joint testimony on January 6, 2009 and revised versions on February 2, 2009, and February 26, 2009. Rebuttal testimony was submitted on February 6, 2009, and a revised version was submitted on February 26, 2009.

7. Joint Intervenors presented a panel of two witnesses on EC 1.2. These witnesses included: Dr. Shawn Young and Mr. Barry Sulkin.

8. Joint Intervenors filed pre-filed direct testimony of Dr. Young and Mr. Sulkin on January 9, 2009, submitted revised versions on February 2, 2009, and pre-filed rebuttal testimony for each on February 6, 2009.

9. Joint Intervenors' principal witness regarding impacts, Dr. Young, testified that he was "relatively inexperienced" when asked about the standards used for nuclear power plant EISs. Tr. 855.

ii. Staff's Analysis of Baseline Aquatic Data was Adequate.

10. Joint Intervenors contend that the FEIS does not contain an adequate analysis of the impacts of the cooling system intake and discharge structures from impingement and entrainment to support its conclusion that impacts will be SMALL. Specifically, Joint Intervenors argue that the species' and habitat descriptions were inadequate. Joint Intervenors argued that site-specific field studies are needed to adequately assess the species likely to inhabit the Savannah River in the vicinity of the Vogtle site.

a. Preparation of EIS was Proper.

11. The Staff's EIS was prepared in accordance with 10 C.F.R. §§ 51.70, 51.71, 51.90 and 51.91, following submission of SNC's ER. The Staff used the NRC's Standard Review Plans for Environmental Reviews for Nuclear Power Plants (1999, NUREG-1555) ("ESRPs") as guidance on how to write the EIS. Tr. 768-69; Exhibits NRC000009 and NRC000010. Ms. Kuntzelman explained that "[t]he Staff followed the guidance in Regulatory Guide 4.2 and in the ESRP in several ways. The Staff characterized the kinds of aquatic ecological resources in the vicinity of the VEGP site and other areas likely to be impacted by the construction, operation, or maintenance of the proposed VEGP Units 3 and 4. In doing so, the Staff emphasized the aquatic communities of the VEGP site (e.g., onsite ponds and streams as

well as the reach of the Savannah River adjacent to the VEGP site) that will be potentially affected by project . . . and . . . consistent with the definitions in the ESRP and Regulatory Guide 4.2, the Staff identified the "important" aquatic species . . . ." Tr. 742-43 (Staff 1.2 Direct at A.7)

12. As SNC's expert witness, Dr. Coutant, explained the NRC guidelines for preparation of EISs are "clear that the amount of detail is to be commensurate with the anticipated level of impacts." Tr. 712. The anticipated level of impacts is determined with a "screening study" which is a "standard practice" of making simplifying but conservative assumptions about the resource and then performing a straightforward analysis without excessive detail. *Id.* When the screening study indicates that impacts are small, additional, detailed study is not necessary. Tr. 713; *see also* Tr. 659 (Mr. Moorer for SNC: "[I]f you can with existing information, available studies, arrive at a conclusion that an impact is small, then there really would be no reason to go do exhaustive additional studies.").

13. NRC Staff's witness Dr. Masnik confirmed this was the approach used and testified that the Staff tries to "tailor the impact assessment to the potential impact." Tr. 793.

14. The level of detail presented in the FEIS is appropriate. Dr. Coutant testified that the Staff, in its FEIS, did "a good job . . . of doing the analysis with the level of detail that's commensurate with the anticipated impacts based on their screening initial analysis." Tr. 714.

b. The Level of Detail of Discussion of Baseline Aquatic Data in the FEIS was Appropriate.

15. The FEIS's discussion of baseline aquatic data, including the habitats and life history stages of species in the vicinity of the Vogtle site, is sufficient to allow evaluation of important impacts and adequate to support the Staff's conclusion that impacts to aquatic resources would be SMALL.

16. Section 2.7.2 of the FEIS contains over twenty (20) pages describing the aquatic environment and biota in the vicinity of the Vogtle site. Exhibit NRC000001a at 2-72 through 2-93; *see also* Tr. 744 (Staff 1.2 Rebuttal at A.13).

17. Table 2-7 of the FEIS, entitled "Native, Resident, Diadromous, Marine, and Upland Fish Species of the Middle Savannah River" (as taken from Marcy et al. 2005 and presented in phylogenetic order) lists the species present in the middle Savannah River. Exhibit NRC000001a at 2-77 through 2-79. The life cycles of "important species" are described in 2-81 through 2-89, and "threatened and endangered aquatic species" are described in 2-89 through 2-93.

18. Specifically, details of local life history, population sizes and relevance to occurrences at the Vogtle site are given for American shad, Exhibit NRC000001a at 2-8, striped bass, *id.* at 2-84, robust redhorse, *id.* at 2-88, and shortnose sturgeon, *id.* at 2-89. *See also* Tr. 604 (Coutant 1.2 Direct at A.31). The Staff explained that "the Staff's data collection and analysis followed the appropriate ESRP guidelines for the description of aquatic resources and assessment of impacts . . . [and that] it followed the ESRP guidance regarding information needs, analysis, and the amount of information to be presented in the FEIS." Tr. 744 (Staff 1.2 Rebuttal at A.7).

19. The level of detail of the aquatic environment and biota is sufficient for a reasonable assessment of likely impacts. Tr. 604 (Coutant 1.2 Direct at A.31). This is the kind and detail of species information that should be in an EIS. SNC's expert witness, Dr. Coutant, explained that "[t]he NRC in its guidance summarizes the [CEQ's] guidance that an EIS should 'emphasize the issues that are significant and reduce emphasis on other issues and background material' (NUREG-1555 at 4)" and that providing encyclopedic detail of every local fish species

"would be burdensome for a reader of a decision document like an EIS and would not be helpful." *Id*.

c. NRC Staff's Reliance on and Reference to Existing Studies was Consistent with NEPA Practice.

20. As Dr. Coutant explained, "[r]eliance on data collection performed by reputable agencies and organizations, whose methods can be assessed with the results, is just as valid an approach to a NEPA analysis as an applicant performing its own studies." Tr. 604 (Coutant 1.2 Direct at A.15).

21. Dr. Coutant also explained that "the information in the EIS provides an adequate basis for estimating impacts on the NRC scale of SMALL, MODERATE or LARGE." *Id.* at A.53.

22. Consistent with the guidance set forth in NUREG-1555 at 2.4.2-3, the FEIS references literature and studies by others to provide the general life-history information of the most relevant species of fish. *Id*. at A.31; *see also* Exhibit SNC000015 (list of over 100 references provided by SNC in response to the Staff's RAIs). Ms. Krieg confirmed that the analysis was performed consistent with applicable guidance. Tr. 742-43 (Staff 1.2 Direct at A.8) ("[T]he documentation and characterization of the potentially affected biota should be aimed at those activities and life-stages that make the biota vulnerable to the operations at the site and . . . [the analysis] did refer to studies that were systematic and spanned multiple years and multiple periods within years and that occurred in the vicinity of the site, even though these studies were not conducted by the applicant.").

23. The Staff considered "numerous studies [that] have been performed on the fish located in the middle Savannah River." Exhibit NRC000001a at 2-76. These included studies by Bennett and McFarlane (1983), written to supply background information for

biologists initiating ichtyofaunal studies on the Savannah River Site, Specht (1987), initiated to evaluate the effects of the intake structure at the Savannah River Plant, Marcy et al. (2005) and a series of studies performed by the Academy of Natural Sciences, Philadelphia ("ANSP"). *Id.* at 2-76. Specifically, the Staff considered ANSP studies conducted in 2001 and 2003. *Id.* at 2-80. The Staff's consideration of the dominance of the river ichthyoplankton by American shad eggs and larvae and gizzard shad and threadfin shad from the oxbow spawning areas is indicated by reference to studies by Specht (1987) and Paller et al. (1986) on 2-81. The Staff also considered a 1986 study by Paller regarding the vertical distribution of larvae. *Id.*

24. Joint Intervenors criticized the Staff's consideration of the ANSP studies, arguing that while they "provide some useful data," the studies "do not *by themselves* support a conclusion that the addition of two new units will have only small impacts on aquatic resources." Exhibit JTI000003 (Affidavit of Shawn Paul Young, Ph.D. (November 13, 2007)) at A.17 (emphasis added). However, as Dr. Coutant explained, the ANSP studies "should be taken in the context of the Academy's overall philosophy," which is that "if you go into an area at the end of the summer season, you see what survived, what has reproduced, what has survived. . . .[Y]ou can go in a few day period with focused surveys on the various biotic categories." Tr. 685-86. Joint Intervenors' criticism is resolved by Dr. Coutant's explanation that "out of those three days of survey they're accumulating the kinds of information that they feel are very important to evaluating ecosystem health." *Id.*

25. The Savannah River Site ("SRS") studies are also relevant to an analysis of "site-specific" conditions at the Vogtle site due to the close proximity of the two sites. As Mr. Moorer explained, the SRS is "right across the river from the Vogtle site." Tr. 664.

26. Moreover, the ANSP studies were just several of many studies considered by the Staff to reach its conclusions regarding impacts to aquatic species. Mr. Moorer explains that there are "over 200 sites on the aquatic ecology" in the FEIS and that "taken in the aggregate" this information is more than adequate to provide an appropriate analysis of the Savannah River in the vicinity of Vogtle. Tr. 684; *see also* Tr. 685 ("[W]e're not suggesting, and in nowhere did we conclude [an individual study] should stand alone."). Ms. Krieg further confirmed that the FEIS properly relied on the ANSP studies:

> the Staff used the ANSP studies to provide an understanding of the river ecology and the current species of fish and molluscs present in the vicinity of the VEGP site, as well as to demonstrate that the Savannah River has been studied extensively upstream and downstream of the VEGP site . . . . The ANSP studies were not the source of information for life history, migration timing or population numbers. The sources used for life history, migration timing and population numbers are clearly referenced in the appropriate sections of the FEIS. As a result, Dr. Young's testimony inaccurately characterizes the contents of the ANSP studies and how the Staff considered those studies in the FEIS.

Tr. 744 (Staff 1.2 Rebuttal at A.13).

27. As Mr. Moorer testified for SNC, "[t]here is no question that the use of ANSP data was appropriate. In fact, it would not have been credible . . . to ignore it." Tr. 610 (Moorer 1.2 Direct at A.9).

28. Pages 2-124 through 2-145 of the FEIS, contain references to the studies and reports considered by the Staff in its description of the "affected environment." Exhibit NRC000001a. Joint Intervenors' witness, Dr. Young, acknowledged that the list of references in the FEIS, in fact, includes "reports that address the species" in the vicinity of the plant. Tr. 946.

d. No Requirement to Conduct Additional Site-Specific Studies

29. Joint Intervenors contend that the Staff should have conducted site-specific studies of the species in the vicinity of the Vogtle site.

30. The SRS studies are effectively "site-specific" studies of the Savannah River conditions near the Vogtle site due to the close proximity of the two sites. As Mr. Moorer explained, "[m]any of the [SRS] studies monitor the same physical areas that we would monitor for Vogtle." Tr. 665; Tr.743 (Staff 1.2 Direct at A.8). Other studies included data collection "within a mile or so" of the Vogtle site and would also have to be considered to have assessed conditions within the vicinity of Plant Vogtle. Tr. 666.

31. As Dr. Coutant testified, NEPA does not require an applicant to conduct additional site-specific studies when there is an "abundance of information" on the general life history of the species known to be in the vicinity of Vogtle, as was analyzed by the Staff in the FEIS. Tr. 677. Staff witness, Ms. Krieg, also concluded that "given [the] available information, . . .data from further site-specific assessments are not necessary to obtain an impact determination of SMALL." Tr. 744 (Staff 1.2 Rebuttal at A.13).

32. Joint Intervenors' criticism of the Staff's baseline data is based on a different standard than that required by NEPA. Dr. Young, for the Joint Intervenors, agreed with the Board's suggestion that his viewpoint that the Staff should have performed or considered more data is "more of a scientific analytical viewpoint, the studies you would do to write scholarly papers, perhaps, and not necessarily tied to the guidance that the staff needs to follow in preparing an EIS." Tr. 882.

iii. Adequacy of Staff's Analysis of Impacts from Impingement, Entrainment and Thermal Discharges

33. Joint Intervenors contend that the Staff's conclusion that impacts from impingement, entrainment and thermal discharges will be SMALL is not adequately supported. However, Section 5.4.2.2 of the FEIS discusses potential impacts to aquatic organisms from entrainment and reflects the Staff's evaluation of a number of factors to support its finding that impacts from entrainment would be minor. Exhibit NRC00001b at 5-29 through 5.33.

34. The Staff appropriately considered SNC's use of a closed-cycle wet cooling system, the design and location of the intake structure and the amount of water withdrawn from the source waterbody. *See* NRC000001b at 5.4.2.2. The Staff also explained that its analysis includes a review of the 1985 Final Environmental Statement ("1985 FES") for the construction of Units 1 and 2. *Id.* Due to the similarity in design of the cooling water intake structure for Units 1 and 2 and the proposed structure for Units 3 and 4, the Staff evaluated impacts using the same uniform drift distribution assumption used in the 1985 FES. *Id.* The Staff confirmed this assumption by evaluating a study by Paller *et al.* (1986) and determined that it was a conservative assumption. *Id.* The Staff also analyzed an assessment prepared for the SRS, compared the intake structure at the SRS with that proposed for Units 3 and 4 and concluded that impacts would be minor. The Staff's finding is also based on calculations that are, in turn, based on conservative river flows as low as 2000 cfs. *Id*; *see also* Tr. 694. These analyses are proper and comply with the requirements of NEPA.

35. The Staff also considered observations during its site visit and the lack of unreported "Unusual or Important Environmental Events" for Units 1 and 2. Exhibit NRC000001b at 5-32, 5-33.

36. As explained by Dr. Coutant, several proposed designed features of the new units' cooling system obviate the need for additional site-specific studies. For instance, use of closed-cycle cooling reduces potential mortality by 95 to 98 percent, Tr. 698; construction of a weir wall at the bottom of the intake provides a vertical barrier to prevent organisms that are bottom-oriented, *i.e.*, sturgeons, from entering the intake, Tr. 700; construction of an upper weir prevents organisms that are surface-oriented from entering the intake, Tr. 700; and very low intake and through-screen velocities further reduces the potential number of organisms impinged or entrained. Tr. 701.

37. As Dr. Coutant testified, the design features of the proposed Vogtle cooling system include most biological design criteria recommended by biologists to minimize impacts of power plants of any type on aquatic biota. These type of features greatly reduce the impacts of other systems, such as open cycle, or once through, systems. Tr. 698-702. Similarly, Mr. Masnik confirmed that a comprehensive review by NRC of closed-cycle cooling systems, such as the one proposed in this situation, demonstrated that such systems have not impacted riverine aquatic populations. Tr. 794-795.

38. Joint Intervenors' witness, Dr. Young, agrees that the design of the intake canal with a skimmer wall and a weir wall "may aid in . . . preventing entrainment of some species." Tr. 838.

39. To assess impacts from the thermal discharge, the Staff used the EPA-approved CORMIX model to estimate the size and temperature of the thermal plume and assumed conservative river conditions to analyze potential impacts from thermal discharge. Exhibit NRC000001b at 5-18, 5-33.

40. The CORMIX model "is a U.S. EPA-supported mixing zone decision support system for environmental impact assessment of regulatory mixing zones resulting from continuous point source discharges . . . . CORMIX is an industry standard for such assessments and is commonly employed by the U.S. EPA." Tr. 742-743 (Staff 1.2 Direct at A.57).

41. The assumptions used by the NRC Staff in its analysis are very conservative. As Mr. Montz testified, "[t]hey combined the intake and the discharge – the discharge structures from both Units 1 through 4 in their analysis. And they also looked at extreme water conditions; in other words the highest possible discharge temperature from the plant and the highest possible water [temperature] conditions . . . . And so there were some very extreme, very conservative assumptions that were made in the [CORMIX] analysis." Tr. 640.

42. As described in the FEIS, the thermal plume associated with the proposed effluent discharge "is small in comparison to the width of the Savannah River at the VEGP site." Exhibit NRC00001b at 5-33. Using the CORMIX model, and assuming conservative conditions (minimum river temperatures, maximum discharge temperatures) the Staff projected a plume that was approximately 15 feet wide by 97 feet for the five degree isotherm. *Id.*; Tr. 640. The maximum distance that the plume was estimated to occur was 29.6m downstream of the outfall pipe. *Id.* "Under average flow conditions, the plume is significantly smaller." *Id.* The NRC's analysis was "reasonable and appropriate." Tr. 604 (Coutant 1.2 Direct at A.57).

43. Joint Intervenors offered no evidence to contradict the use or results of the CORMIX model.

44. Joint Intervenors argued that the Staff did not consider that moderately high temperatures can be injurious or fatal to certain organisms. However, Joint Intervenors' witness, Dr. Young, did not consider the duration of exposure to such temperatures. Unrefuted

testimony from Dr. Coutant explains that the "the lethal effects of high temperature are caused by a combination of exposure temperature and the duration of that exposure." Tr. 605 (Coutant 1.2 Rebuttal at A.17). Dr. Coutant explains that "the duration of exposure to any potentially lethal temperatures in all likelihood would be too brief to cause mortality, even assuming that temperatures in the plume were above the long-term lethal level at some points." *Id*. at A.18. The evidence cited by Joint Intervenors, Exhibits JTI000011 and JTI000012 refer to holding temperatures, rather than brief exposure. *Id*. at A.17. Dr. Coutant testified that "it would take 30 min exposure of striped bass larvae to temperature elevations of 15°F above ambient of 65°F (18.3°C) to cause mortality," whereas "water and drifting organisms would pass through the entire surveyed plume in about 8 minutes." Tr. 604 (Coutant 1.2 Direct at A.59). Nor does the evidence suggest that the plume from VEGP 3 and 4 would approach temperatures as high as 15 F above ambient. *See* Exhibit SNC000011 (showing an increase of only 1°F above ambient).

45. The drift community would not be concentrated during the periods of high temperatures (80-90°F) cited by Joint Intervenors as temperatures lethal to various fish species. Tr. 605 (Coutant 1.2 Rebuttal at A.16).

a. Use of the Uniform Drift Distribution Assumption was Proper.

46. The evidence shows that the Staff's use of the uniform drift distribution was proper in its analysis of the impacts to aquatic species.

47. The uniform drift distribution assumption is a common, conservative assumption. Tr. 604 (Coutant 1.2 Direct at A.79). "Rather than using spatially – and temporally – variable numbers of several entrainable species and life stages, such as one would find in most river surveys, an analyst usually takes a high-end estimate of numbers, assumes them to be the same for all entrained water, and makes an evaluation of the scale of likely impact. The details

of distribution would generally come into play only if a moderate to large impact appears to occur and further, more detailed, analyses are warranted." *Id*. at A.78.

48. The uniform drift distribution assumption is especially conservative with respect to species that nest, *e.g.*, sunfish and sturgeon. Dr. Coutant explained that these species "spawn in ways that simply don't make their eggs and larvae available to be entrained." Tr. 668. Rather, they deposit their eggs in nests. Sturgeon spawn in the Savannah River Shoals and their eggs attach to the substrate. When hatched, the larvae "tend to go right down into the bottom substrate and don't drift willy-nilly through the water column." *Id.*

49. Dr. Young testified that the distribution is variable and cites two studies by Wiltz and Nichols. Dr. Coutant explained that these studies do not invalidate the Staff's use of the uniform drift distribution. Tr. 604 (Coutant 1.2 Direct at A.81). Rather, while SNC agrees that the distribution is most likely *not* uniform, due to the design features of the proposed intake structure and the additional assumption that species entrained are directly proportional to the percentage of water withdrawn, assumption of uniformity "is almost certainly an overestimate rather than an underestimate of true entrainment . . . . " *Id.* Dr. Maznik also explained that the Staff "does not dispute the results of the [Wiltz and Nichols] field studies; however, due to the temporal and spatial variation in densities and the generally higher concentrations of drift near the surface or the bottom of rivers, the Staff finds the use of a uniform-distribution model is conservative for the assessment of entrainment impact at this facility." Tr. 744 (Staff 1.2 Rebuttal at A.12).

50. Joint Intervenors offered no evidence to support their argument that the Staff should have completed a detailed distribution analysis, rather than assuming a uniform drift distribution to assess impacts. Rather, Joint Intervenors' witness, Dr. Young, testified that he is

"relatively inexperienced" and knew of no analyses performed at other nuclear power plants to that degree of detail. Tr. 855. In fact, Dr. Young testified that he did not know if the uniform drift distribution is an accepted assumption for a NEPA analysis, but even if the uniform drift distribution is common and accepted, "it should be changed," without offering any evidence to refute this accepted method. Tr. 843.

51. Joint Intervenors' witness, Dr. Young, seemed to agree with the uniform drift distribution in theory, if not in terminology. He testified, "[I]n any case, if you're modeling and using mean location or mean distribution, then it should be based on an entirely different terminology. The mean location of an organism at any given time or over hours or days, that's not – that does not mean – you would not use the term, 'uniform distribution.'" Tr. 850.

b. Range of River Flows Considered by the Staff was Proper.

52. The Staff appropriately considered reasonably foreseeable river flows to assess impacts. The conclusions in the FEIS are based on the Staff's consideration of average daily flow conditions (8830 cfs) and Drought Level 3 conditions (3800 cfs). *See* Exhibit NRC000001b at 5-30; Tr. 742-743 (Staff 1.2 Direct at A.41); Tr. 771. To be conservative, however, the Staff also considered flows as low as 2000 cfs to assess impacts. Exhibit NRC000001b at 5-38; Tr. 742-743 (Staff 1.2 Direct at A.41).

53. The flows considered by the Staff are conservative for several reasons. First, the river flows cited in the FEIS are flows at the Thurmond Gauge, ninety miles upstream of Vogtle. *See* Tr. 535, 774. As Dr. Cook explained, the river is a "gaining river," meaning that the flows at the Vogtle site are higher (usually in excess of 500 cfs) than the flows at the Thurmond gauge. Tr. 800-801; *see also* Tr. 694; Exhibit SNCR00054.

54. The flow of the Savannah River in the vicinity of the Vogtle site is regulated by the U.S. Army Corps of Engineers through discharges from the J. Strom Thurmond Dam. Exhibit NRC000001b at 5-7. These discharges are determined by the Corps' Drought Contingency Plan. *Id.* The Staff assessed impacts *at the site* using the Corps' Drought Level 3 release level, which is 3800 cfs *at the Thurmond Dam*. Tr. 771. Thus, consideration of flow levels at the Thurmond Dam to assess impacts at the Vogtle site is a conservative approach

55. Consideration of 3800 cfs is also conservative because, as Dr. Masnik and Mr. Vail explained, there were only two days over the entire record, from October 2004 through January 2009, where the flow ever went below 3800 at the Waynesboro gauge, which is most representative of the conditions at the Vogtle site. Tr. 772. Mr. Vail also testified that even when the Corps temporarily decreased releases at Thurmond Dam to 3100 cfs, the flow at the Waynesboro gauge at the Vogtle site still remained above 3800 cfs. Tr. 774.

56. For additional conservatism, the Staff also evaluated impacts at flow rates of 3,000 and 2,000 cfs, *see* Exhibit NRC000001b at 5-38, although it "expects that the occurrence of these flows would be extremely rare and of temporary duration." Tr. 742-743 (Staff 1.2 Direct at A.35); *see also* Tr. 778. Mr. Vail testified that he would not expect the river to reach such low flows "in the next 50 years." Tr. 780.

57. Mr. Sulkin's affidavit offered by the Joint Intervenors asserts that the 3220 cfs flow observed at the Jackson gauge near the Thurmond dam "is indicative of the likely future minimum discharge." Exhibit JTI000031 at A.19. The analysis in the FEIS included assessment of flows as low as 3000 cfs and 2000 cfs at the Vogtle site, which would experience flows in excess of the flows at the Jackson gauge. Accordingly, this evidence supports the NRC Staff's

and SNC's position that the flows analyzed in the FEIS are conservative, as it bounds the "likely future minimum flow at the site."

58. Even during the recent record drought, the Waynesboro gauge has never recorded flows as low as 3,000 cfs. Tr. 742-743 (Staff's 1.2 Direct at A.40); Exhibit NRC000041.

59. Joint Intervenors' argument that the FEIS should have considered "worst case" river flows is based on a different standard than that required by NEPA. As Dr. Young testified, he was not aware of any requirement for an EIS to consider all possible river conditions: "I am not aware whether it is or is not a requirement, just again, as a scientist typically, I'm required to do a more exhaustive, you know, analysis to insure that I'm thorough and if you're going to evaluate the impacts of activities, to me it makes common sense and usually in the scientific community it's required that you cover your bases and you try to cover the range of, you know, potential conditions that could be out there in nature." Tr. 879. He also agreed with the Board that one would need to use "some good sense" in looking at what ranges are probable. Tr. 880.

60. As shown by Exhibit SNC000053, flows in the Savannah River at Plant Vogtle during 2008 were plainly higher during the spring than during the late summer and fall. This is true despite the fact that releases from Thurmond Dam did not vary significantly during that period. Exhibit NRC000026. As Mr. Vail explained, local inflows over the 90 river miles between the Thurmond dam and the Vogtle site increased the flows at the site. Tr. 780. Mr. Sulkin also noted that this cycle of higher spring flows is typical of all rivers in the Eastern United States. Tr. 929.

61. Mr. Sulkin criticized use of the Waynesboro gauge data due to its relatively recent installation. However, testimony from Mr. Vail of the NRC Staff explained that this choice was made in order to assure a consistent source of historical data. Tr. 773-74. No questions concerning the accuracy of the flow data measured by the Waynesboro gauge were raised.

62. Mr. Sulkin determined that the average discharge from the Thurmond dam for the year 2008 was approximately 3300 cfs. However, the average flow at the Vogtle site, as measured by the Waynesboro gauge, was much higher in 2008. Exhibit SNC000053. Mr. Sulkin testified that this average was nearly 5700 cfs during the 2008 drought. Tr. 817 (Sulkin 1.2 Rebuttal at A.4). The average annual flow at Thurmond Dam over the period of record (October 1971 to September 2002) was determined to be 8,830 cfs. Exhibit NRC000001a at 218.

c. Consideration of Population Declines was Sufficient.

63. The Staff's analysis adequately demonstrates its consideration that impingement and entrainment may contribute to the decline in population on the Savannah River.

64. The FEIS at 2-82 through 2-89, Exhibit NRC000001a, does discuss the overall decline in the population of several species. For instance, the FEIS notes that the number American shad has "dropped significantly from the early 1980s," Exhibit NRC000001a at 2-82, that possible factors contributing to the decline in American eel include overfishing at various life stages, loss of spawning habitat or eggs because of seaweed harvesting, loss of adult habitat from dams, dredging and wetland destruction, impingement and entrainment. *Id.* at 2-83.

65. As Dr. Coutant testified, additional discussion of population declines is not necessary and would only be required "if the estimated impacts of the proposed facility would contribute a significant added source of mortality. For many species in decline, the causes are more speculative and power plant entrainment and impingement are mentioned only among many other possible contributors." Tr. 604 (Coutant 1.2 Direct at A.7). Joint Intervenors' witness, Dr. Young, agreed that "it is very difficult to tease out which [possible contributor] is causing which impact . . . ." Tr. 874.

66. NRC Staff's Exhibit NRC000006 at page 16 also confirms Dr. Coutant's assessment that entrainment and impingement are not regarded as major contributors to population decline on the Savannah River. *See also* Tr. 898-902 (Dr. Young agrees that the study does not explicitly state that entrainment and impingement negatively impacted the fisheries).

d. Discussion of Larval Fish Mobility was Proper.

67. Joint Intervenors failed to demonstrate the relevancy of their argument that larval fish have limited mobility.

68. The FEIS clearly states that the Staff conservatively assumed 100% mortality of entrained biota. Exhibit NRC000001b at 5-32. The Staff's assumption that percentage of eggs or larvae entrained equals percentage of mortality is conservative. Tr. 604 (Coutant 1.2 Direct at A.18); Tr. 842. The Staff did not condition its analysis or conclusion on the presumption of *any* mobility. As Mr. Moorer explained, "the ability, or lack thereof, of an organism to avoid being entrained in irrelevant." Tr. 612 (Moorer 1.2 Rebuttal A.7). Dr. Young agreed that this 100% mortality assumption in the FEIS "would be a conservative assumption." Tr. 842.

69. Dr. Young's criticism is based on the discussion of generic larval fish mobility in the FEIS that was provided as background information. *See* Exhibit NRC000001b at 5-30. Even the limited mobility example highlighted by Dr. Young regarding the Robust Redhorse still exceeds the velocity of the canal, identified as 0.1 foot per second. Tr. 612 (Moorer 1.2 Rebuttal at A.8); Exhibit NRC000001b at 5-31. Accordingly, species with "limited mobility" of 3-5 inches per second are capable of avoiding the intake canal. Tr. 612 (Moorer 1.2 Rebuttal at A.8).

e. Further Consideration of Impact on Flow Variability was Not Necessary.

70. The evidence presented by Joint Intervenors in support of their claim that the new intakes will create flow variability actually focused on the effects of large-scale river management projects, such as dams. *See e.g.,* JTI000016 (addressing impacts of dams in Oklahoma). None of these studies address power plant water withdrawals.

71. The variability induced by the consumption rates at Plant Vogtle are not comparable to the evidence cited by Dr. Young. Rather, Dr. Coutant explained that each of these references "deal primarily with biological impacts to mussels and fish from flow changes from impoundments and with other species declines due to human activities unrelated to flow." Coutant 1.2 Rebuttal at A.13; Exhibit JTI000016 (Vaughan and Taylor 1999) observed loss of mussel species downstream of mainstream and tributary reservoirs in Oklahoma. Exhibit JTI000017 (Ricciardi and Rasmussen 1999) deals with general extinction rates of North American freshwater fauna, and relates them to many sources of habitat change including pollution, land-use changes and flow regulation by dams. Exhibit JTI000018 (Cosgrove and Hastie 2001) relates to the loss of a particular mussel species to 'river engineering' in Scotland, particularly channel and bank modification. Exhibit JTI000019 (Layzer and Scott 2006) deals

with major changes in river mussels and fish in the Holston River, Tennessee, downstream of Douglas Dam affected by flow changes due to hydroelectric plant discharges and low dissolved oxygen content . . . . For those studies that did concern human-induced flows, discontinuous dam discharges are not relevant to evaluating impacts of the nearly continuous withdrawal of Savannah River water by the proposed Vogtle 3 & 4 cooling-tower facility." Tr. 605 (Coutant 1.2 Rebuttal at A.13).

f. Proper Withdrawal Rates were Evaluated.

72. The Staff's method of relating entrainment impacts to withdrawal percentages is appropriate. The Staff's comparison of withdrawal percentages with a 5% mean annual flow threshold is also appropriate.

73. Joint Intervenors assert the method of relating entrainment impacts to withdrawal percentages in the FEIS is flawed. A principal reason for this assertion is the treatment of EPA's 5% threshold. Mr. Moorer provided a helpful explanation of discussion of EPA's 5% standard. Tr. 610 (Moorer 1.2 Direct at A.12). Regarding the use of withdrawal percentages in assessing impacts, Mr. Moorer explained that it is scientific method. Tr. 612 (Moorer 1.2 Rebuttal at A.19). Indeed, EPA uses it. Exhibit SNC000055. Mr. Sulkin, Joint Intervenors expert witness, even uses this very method to make his own assessments. Exhibits JTI000021. The Staff's Mr. Maznik agreed that "[t]he assumption that entrainment is proportional to the percent of river flow withdrawn is not only intuitive but is also consistent with EPA analysis as presented in its Phase I regulations for cooling water intake structures." Tr. 744 (Staff 1.2 Rebuttal at A.12).

74. The 5% threshold was not viewed in isolation in the FEIS and was referenced appropriately. *See Id.* at A.26. Notably, there was no need to amend tables in the

FEIS to present withdrawal percentage data added to the text. As Mr. Moorer explains, this is no obstacle to understanding the analysis. Tr. 612 (Moorer 1.2 Rebuttal at A.16). Accordingly the method as applied in the FEIS was appropriate.

75. The Staff explains in its FEIS that it considered maximum withdrawal rates and maximum consumptive use to evaluate expected impacts from Units 3 and 4. Exhibit NRC000001b at 5-31. In its cumulative impacts analysis, the Staff used the normal withdrawal rate, considered at the lower flows of 3000 cfs and 2000 cfs, rather than maximum withdrawal rate, because of the nature of the analysis – a cumulative impacts analysis is a longer-term, integrated assessment, and there was no reason to assume that maximum withdrawal would occur at all four units simultaneously. Tr. 784; *see* Tr. 744 (Staff 1.2 Rebuttal at A.29). This is a consistent practice in preparing EISs for nuclear power plants and was appropriate. Tr. 791.

iv. The Totality of Information Considered by Staff was Sufficient to Support the Conclusion Regarding Aquatic Impacts.

76. The totality of the information considered by the Staff supports its conclusion that impacts to aquatic species from impingement, entrainment and thermal discharges will be SMALL.

77. The FEIS demonstrates that the Staff's findings that impacts from entrainment and impingement would be minor are based on ample information. Joint Intervenors criticize discrete aspects of the Staff's analysis, but fail to demonstrate how, when the totality of the information reviewed by the Staff is considered, the purported deficiencies would have any impact on informed decision making or informed public participation. In any event, Joint Intervenors' offered no evidence to support their criticisms.

v. Post-FEIS Studies Confirm the Staff's Conclusions Reached in the FEIS that Impacts to Aquatic Resources Will Be SMALL.

78. To confirm the conclusions reported in the FEIS, SNC has performed site-specific field studies of the intake structure for Units 1 and 2. The preliminary results of these studies are considered by the Staff in its FEIS (*See* Exhibits NRC000001a at 2-94; NRC000001b at 5-32). However, to the extent the Board finds it necessary, the Board may supplement the Staff's analysis with the results of these studies as admitted in this proceeding to support the Staff's conclusion that impacts from impingement and entrainment will be minor and, therefore, overall impacts to aquatic resources will be SMALL.

79. SNC presented evidence of 2008 Impingement and Entrainment studies performed at the intake structure for Units 1 and 2: "Interim Report of Fish Impingement at the [VEGP]," Georgia Power Company, December 2008 ("Impingement Report") and "Entrainment Assessment at the [VEGP]," Georgia Power Company, October 2008 ("Entrainment Report"). *See* SNCR00004 and SNCR00005.

80. The impingement sampling was conducted from March 2008 through December 2008. Monitoring events were conducted twice per month, with two 12-hour sample periods, representing "day" and "night" samples. Tr. 587 (Montz/Dodd 1.2 Direct at A.9).

81. Mr. Dodd testified that if the results of the Final Impingement Report were extrapolated to 365 days of the year, then the result would be an expected impingement rate of 2,421 fish per year at an approximate weight of 3.1 pounds. Tr. 633.

82. The entrainment sampling was performed once every two weeks from March through July of 2008, representing the most biologically productive time period of the year for fish. Tr. 587 (Montz/Dodd 1.2 Direct at A.8).

83. Joint Intervenors questioned the change of sampling location in the study. Mr. Dodd testified that while the first samples were taken at the mouth of inlet canal, however, due to the conditions of the river at that site (presence of an eddy where currents stall and are roiled, Tr. 624), the sampling location was moved farther into the intake structure to provide a better representation of the entrained community. Tr. 627; Exhibits SNC000007, SNC000008, and SNC000009 (indicating location of sampling apparatus and physical characteristics of intake canal); *see also* Tr. 625: (Mr. Dodd: "[B]y definition an entrainment sample is material that not only goes into the canal, but it's subject to the plant's cooling system.").

84. The sampling indicated that "the entrained community was approximately 37.4 times less than the source community" indicating that "it's a very, very small percentage of source water community that gets entrained." Tr. 630.

85. The number of organisms impinged was "extremely small." Tr. 638. Tr. 728-729 (Coutant testified: "I also would note that in power plants that I've dealt with recently, personally sampled impingement, we were dealing with numbers that on one three-hour sampling would amount to more shad than was collected in or is estimated from the sampling at Vogtle").

86. Mr. Dodd testified that because the 2008 impingement and entrainment studies were conducted in the same manner as earlier studies in the same area, he was confident of the results of his sampling in the flow of the river and the density of the organisms and drift population. Tr. 629.

87. No robust redhorse or sturgeon egg or larvae were identified during the entrainment study, using the available, state-of-the-art analysis to identify eggs and larvae to

their lowest practical taxon. Tr. 630; Exhibit SNC00005 at Table C-1. In addition, no protected species were collected during the impingement study. Exhibit SNC00004 at 13.

88. The results of SNC's 2008 impingement and entrainment studies are applicable to all modes of planned operation. Tr. 644. While the studies were conducted at very low flows, Mr. Montz testified that impingement rates are not linearly proportional to intake flow rates. Tr. 643. Thus, a higher flow would not necessarily result in greater impingement. Rather, as Mr. Montz testified, as the through-screen velocities increase, SNC uses additional screen bays to increase screen area and offset increased velocity. Tr. 644. Mr. Montz stated that he would expect a river that had a more normal flow pattern to result in less impingement. Tr. 692. Because the study was completed during very low flows it yielded very conservative results. As Coutant explained, "I think this was a good time to do the study, if you will, because the flows were low and probably the – the numbers entrained and impinged too perhaps, would be at the high side of what you might have over a historical record, if you had it." Tr. 693.

89. Additionally, Mr. Dodd confirmed that even if the flow rate were reduced beyond that at the time of the study, and even if the number of organisms entrained or impinged were two to three times as many as the rate determined in the 2008 study, "it would still be a small impact." Tr. 695; *see also* Tr. 632: (Mr. Dodd testified: "I'm confident what we sampled is representative of the conditions that were afforded that community.").

90. Mr. Montz testified that he compared the results of the 2008 studies with previous studies and found that composition of species was very similar. Tr. 689.

91. Joint Intervenors' own witness, Dr. Young, characterized the entrainment study as a "proper ichthyoplankton study . . . ." Tr. 850-851. Dr. Young described the sampling

at the current intake as "elaborate," Tr. 853, and also conceded that "for the most part, the study was conducted in a proper manner with the appropriate results." Tr. 867.

92. Joint Intervenors do not dispute the ultimate results of SNC's impingement and entrainment studies.

93. As Dr. Coutant concluded, that the results of the entrainment study "fully support the EIS conclusion that the impacts of entrainment at the proposed intake for Units 3 and 4, designed similarly to that for Units 1 and 2, will be SMALL. Likewise, the study results, if doubled to represent both intakes operating, would show a cumulative impact that [he believes] is still SMALL." Tr. 604 (Coutant 1.2 Direct at A.45).

94. Joint Intervenors mistakenly asserted that the Hydraulic Zone of Influence determination conducted at Plant Vogtle was performed while the units operated at 56% capacity. Mr. Montz and Mr. Dodd testified for SNC that, to the contrary, "Unit 1 was operating at 100% of its generating capacity, Unit 2 was operating at 98.1% of its generating capacity, and the cooling water intake structure was operating in its normal pumping configuration." Tr. 589 (Montz/Dodd 1.2 Rebuttal at A.5).

95. SNC also performed a Thermal Study in August of 2008. The Thermal Study conducted by SNC supports the conservative CORMIX model used by the Staff in assessing impacts from thermal discharge. Tr. 641.

96. Dr. Coutant also confirmed that the thermal study "confirms the conclusions reached from the CORMIX modeling, from which the NRC determined the impacts would be SMALL." Tr. 604 (Coutant 1.2 Direct at A.59).

97. SNC collected high resolution temperature data from 40 vertical profiles along seven established transects. Tr. 587 (Montz/Dodd 1.2 Direct at A.27). Acoustic Doppler

Current Profiler ("ADCP") data was collected continuously from 24 cross-sectional transects. *Id.* This information was entered and processed in SURFER software which created color-coded contour maps. *Id.* at A.28; *see also* Exhibit SNC000011.

98. SNC's Thermal Study indicated "that the thermal discharge plume occupies a small zone (approximately 100 feet long by 75 feet wide) located immediately downstream of the discharge pipe/outfall." Tr. 587 (Montz/Dodd 1.2 Direct at A.29); *see also* Exhibit SNC000011.

99. SNC's Impingement and Entrainment studies also confirmed that the drift community would not be concentrated during periods of high temperatures. Tr. 605 (Coutant 1.2 Rebuttal at A.16); *see also* SNC000005 at Table C-1 (indicating that river temperatures reached the 80-90°F range only in mid-June when most of the ichthyoplankton drift had passed the Vogtle site).

100. The Thermal Study indicated that "exposure to elevated temperatures in the plume would be no greater in midsummer than organisms already receive from natural warming of the ambient surroundings." Tr. 604 (Coutant 1.2 Direct at A.59).

B. Environmental Contention 1.3

i. Contention and Evidence Submitted

101. As admitted by the Board, EC 1.3 states:

> The ER fails to satisfy 10 C.F.R. § 51.45(b)(3) because its analysis of the dry cooling alternative is inadequate to address the appropriateness of a dry cooling system given the presence of extremely sensitive biological resources.

102. SNC presented a panel of four experts on EC 1.3: Dr. Charles C. Coutant, James W. Cuchens, Thomas C. Moorer, and Charles R. Pierce. The extensive, relevant experience of these experts is demonstrated by their pre-filed direct and rebuttal testimony and

statements of professional qualification provided therewith. Exhibits SNC000012, SNC000014, SNC000023 and SNC000058.

103. SNC submitted the pre-filed direct testimony of Dr. Coutant, Mr. Cuchens and Mr. Moorer on January 9, 2009. *See* "Testimony of Dr. Charles C. Coutant on behalf of Southern Nuclear Operating Company Concerning Environmental Contention 1.3" (Tr. 950) ("Coutant 1.3 Direct"); "Testimony of James W. Cuchens on behalf of Southern Nuclear Operating Company Concerning Environmental Contention 1.3" (Tr. 955) ("Cuchens Direct"); and "Testimony of Thomas C. Moorer on behalf of Southern Nuclear Operating Company Concerning Environmental Contention 1.3" (Tr. 967) ("Moorer 1.3 Direct").

104. SNC submitted the rebuttal testimony of Mr. Cuchens and Mr. Pierce on February 6, 2009. *See* "Rebuttal Testimony of James W. Cuchens on behalf of Southern Nuclear Operating Company Concerning Environmental Contention 1.3" (Tr. 957) ("Cuchens Rebuttal"); and "Testimony of Charles R. Pierce on behalf of Southern Nuclear Operating Company Concerning Environmental Contention 1.3" (Tr. 971) ("Pierce Rebuttal").

105. NRC Staff submitted direct testimony on EC 1.3 from Dr. Michael T. Maznik, Rebekah H. Krieg, Dr. Christopher B. Cook, and Lance Vail. *See* "Staff's Testimony of Dr. Michael T. Masnik, Rebekah H. Krieg, Dr. Christopher B. Cook, and Lance W. Vail Concerning Environmental Contention EC 1.3" dated January 6, 2009 (as revised on February 26, 2009) (Tr. 1061) ("Staff 1.3 Direct"). NRC Staff also submitted rebuttal testimony on EC 1.3 from Mr. Lance Vail. *See* "NRC Staff Rebuttal Testimony of Lance W. Vail Concerning Environmental Contention 1.3" dated February 6th, 2009 (Tr. 1064) ("Staff 1.3 Rebuttal").

106. Joint Intervenors submitted direct testimony for Mr. William Powers and Mr. Barry Sulkin. *See* "Revised Pre-filed Direct Testimony of William Powers in Support of EC

1.3" (Tr. 1088, 1098) ("Powers Direct"); and "Pre-filed Direct Testimony of Barry W. Sulkin in Support of EC 1.3" dated January 9, 2009 (Tr. 1100). Joint Intervenors also submitted rebuttal testimony for Mr. Williams Powers and Dr. Shawn R. Young. *See* "Pre-filed Rebuttal Testimony of William Powers Concerning Contention EC 1.3" dated February 6, 2009 (Tr. 1089) ("Powers Rebuttal"); and "Pre-filed Rebuttal Testimony of Dr. Shawn P. Young Concerning Contention EC 1.3" dated February 6, 2009 (Tr. 1102) ("Young 1.3 Rebuttal").

ii. Staff's Analysis of Dry Cooling as an Alternative Was Adequate

107. Joint Intervenors contend that the analyses of dry cooling as an alternative contained in the ER and FEIS are inadequate given the presence of extremely sensitive biological resources in the Savannah River near the Vogtle site. Specifically, Joint Intervenors claim that the shortnose sturgeon and the robust redhorse qualify as extremely sensitive biological resources and that their mere presence in the Savannah River watershed requires additional review of dry cooling at the proposed Vogtle 3 and 4 Units. *See* Tr. 1102 (Young 1.3 Rebuttal at A.2 and A.6); Tr. 1180.

108. The FEIS presents a detailed analysis of dry cooling, and concludes, as did the ER, that dry cooling is not a preferable alternative to the closed cycle cooling system proposed for the proposed additional Vogtle Units. Specifically, the FEIS states:

> [A]s described in Sections 5.3 [Water-Related Impacts], 5.4.2 [Aquatic Impacts], 5.4.3 [Federally Listed Species] and Chapter 7 [Cumulative Impacts], the staff found that the impacts of the proposed natural draft, wet tower system on water use, water quality, and aquatic resources would be SMALL. Therefore, the staff concludes that . . . a dry . . . cooling system would [not] be preferable to the proposed wet tower system for VEGP Units 3 and 4.

Exhibit NRC000001b at Section 9.3.2.

109. The FEIS discusses the adverse environmental and land use impacts of dry cooling, the power demand and spent fuel impacts of dry cooling, and the impacts of dry cooling

on aquatic resources as compared to closed-cycle wet cooling at the proposed site. Section 9.3.2 states:

> [A] dry cooling tower also has some disadvantages. In comparing dry cooling and wet cooling, EPA (66 FR 65256) found there are additional expenses associated with dry cooling, making this technology less cost effective. In addition, to achieve the necessary cooling, dry systems must move a large amount of air through a heat exchanger, and the fans that move the air consume a significant amount of power. This, in turn, would increase the environmental impacts of fuel use and spent fuel transport and storage relative to the net electrical power production. The fans and the large volume of air required for cooling also result in elevated noise levels. The dry cooling system would also occupy more land than a mechanical or natural draft wet-cooling tower system, affecting site land use and increasing terrestrial impacts.

Exhibit NRC000001b at Section 9.3.2

110. The EPA New Facilities Rule, cited in the FEIS and ER, contains a very detailed analysis of dry cooling based on a nearly zero intake flow and rejects dry cooling as the option because: (1) dry cooling costs are sufficient to pose a barrier to entry into the marketplace for some facilities; (2) dry cooling has a detrimental effect on energy production by reducing energy efficiency of steam turbines; (3) dry cooling may pose unfair competitive disadvantages by region and climate; and (4) dry cooling technologies pose significant engineering feasibility problems. Exhibit SNC000001b at Section 9.3.2. Finally, the cost is conservatively estimated at more than three times the cost of wet cooling. *See* Why EPA is not Adopting Dry Cooling as Best Technology Available for Minimizing Adverse Environmental Impact, EPA New Facilities Rule, 66 Fed. Reg. 65,256, at 65,282-65,285 (Dec. 18, 2001) (codified at 40 C.F.R. § 125).

111. Joint Intervenors' expert, Mr. Powers, testified that the EPA study of dry cooling cited in the FEIS is the most recognized study in the industry. Tr. 1133.

iii. Extremely Sensitive Biological Resources

112. EC 1.3 is based on Joint Intervenors' assertion that there are "extremely sensitive biological resources" present in the Savannah River in the vicinity of the Vogtle site.

Specifically, Joint Intervenors claim that the shortnose sturgeon, a federally protected species, and the robust redhorse, a state protected species, are extremely sensitive biological resources. *See* Tr. 1102 (Young 1.3 Rebuttal at A.2 and A.6); Tr. 1180.

113. The term "extremely sensitive biological resources" is drawn from the preamble of the final rule for Section 316(b) of the Clean Water Act, which governs cooling water intake structures at new electricity generation facilities. *See* National Pollutant Discharge Elimination System: Regulations Addressing Coding Water Intake Structures for New Facilities; Final Rule, 66 Fed. Reg. 65,255 (Dec. 18, 2001), at 65,282; Tr. 1042-1048. In the preamble, the EPA rejected dry cooling as the best available technology for power generation cooling systems, finding that the environmental benefits of dry cooling are not so great as to offset its costs, regional disparities, and losses in energy efficiency. *Id.*

> EPA rejects dry cooling as best technology available for a national requirement . . . because the technology of dry cooling carries costs that are sufficient to pose a barrier to entry to the marketplace for some projected new facilities. Dry cooling technology also has some detrimental effect on electricity production by reducing energy efficiency of steam turbines and is not technically feasible for all manufacturing applications. Finally, dry cooling technology may pose unfair competitive disadvantages by region and climate.

Id.

114. EPA stated, however, that it "does not intend to restrict the use of dry cooling or to dispute that dry cooling may be the appropriate cooling technology for some facilities . . . in areas with limited water available for cooling[4] or waterbodies with *extremely sensitive biological resources* (*e.g.*, endangered species, specially protected areas)." *Id.* (emphasis added).

[4] There are no issues involved in EC 1.3 that relate to "limited water available for cooling" and, therefore, this phrase from the preamble has no application in this context. In fact, water from the Savannah River is "consumed by the cooling water system only; all other plant operation system demands are satisfied from groundwater. . . . Even under lower flow conditions, which would likely be only temporary, maximum consumptive use . . . would not destabilize the resource. Therefore, the staff concludes the impacts would be SMALL, and mitigation not warranted." Exhibit NRC000001b at Section 5.3.2.1.

115. The term "extremely sensitive biological resources" is not formally defined by EPA's regulation and EPA's guidance is limited to the quoted example above (*i.e.*, "waterbodies with extremely sensitive biological resources (*e.g.*, endangered species, specially protected areas)"). 66 Fed. Reg. 65,255, at 65,282; Tr. 1042-1048, 1067.

116. SNC expert witness, Dr. Charles Coutant, testified that a finding of "extremely sensitive biological resources" requires more than the mere *presence* of an endangered or protected species in the Savannah River watershed. Dr. Coutant testified that the term requires that there be significant risks to these species caused by the proposed cooling system. Tr. 950 (Coutant 1.3 Direct at A.6); Tr. 1042-1048.

117. Based on the literature on these species, including scientific studies, agency status reports, and management plans, Dr. Coutant testified that there are no critical habitats or sensitive areas for the shortnose sturgeon or robust redhorse in the vicinity of the proposed Vogtle 3 and 4 intake and discharge structures. Tr. 950 (Coutant 1.3 Direct at A.7); Tr. 1042-1048. Moreover, to the extent that individual specimens from these species have been found in the Savannah River near the Vogtle site, Dr. Coutant explained that they were located in the river channel which is the deepest portion of the river and will not be impacted by the proposed intake and discharge structures. Tr. 950 (Coutant 1.3 Direct at A.9).

118. Dr. Coutant also explained that successful spawning occurs consistently many miles upstream of the existing Vogtle Units 1 and 2 intake and discharge facilities, which indicates that there is an effective zone of passage for pre-spawning adults moving upstream, spawned adults moving downstream, and juveniles moving downstream. Tr. 950 (Coutant 1.3 Direct at A.9); Tr. 1042-1048. Therefore, Dr. Coutant's testimony established that the Vogtle 1 and 2 intake and discharge structures are not located in critical zones of passage or critical

habitats for spawning or rearing and, thus, do not compromise any extremely sensitive biological resources. Tr. 950 (Coutant 1.3 Direct at A.9, A.16); Tr. 1047.

119. Given that the proposed Vogtle 3 and 4 intake and discharge structures are similarly designed and would be closely located to that of Vogtle Units 1 and 2, Dr. Coutant concluded that the Vogtle Units 3 and 4 intake and discharge structures would likewise not be located in and would not compromise any extremely sensitive biological resources. In support of this testimony, Dr. Coutant relied upon the entrainment and impingement study conducted by SNC, which reported that none of these species had been collected. Tr. 950 (Coutant 1.3 Direct at A.9); Tr. 1042-1048; Exhibits SNCR00004 and SNCR00005.

120. Dr. Coutant's testimony is supported by the findings in the FEIS, which demonstrates the lack of significant impacts on the shortnose sturgeon and the robust redhorse. In the FEIS, the NRC Staff analyzed SNC's proposed closed-cycle wet cooling system and determined that the impact of such system on the shortnose sturgeon and robust redhorse would be SMALL. Exhibit NRC000001a at Sections 5.4.2.6 and 5.4.3.7 and Exhibit NRC000001b at Section 9.3.2. Dr. Coutant and NRC Staff also testified that the same finding are applicable to the other sturgeon species in the region, including the Atlantic Sturgeon. Tr. 1061 (Staff 1.3 Direct at A.20, A.21, and A.25); Tr. 1042-1048; Exhibits NRC000024 and NRC000025.

121. With regard to the shortnose sturgeon, the FEIS found that (i) there is no designated "critical habitat" in or near the Vogtle site; (ii) there are no spawning areas for the shortnose sturgeon or robust redhorse in the vicinity of the Vogtle site; and (iii) the design of the intake structure inhibits entrainment and impingement. Exhibit NRC000001a at Sections 2.7.2.1-2 and 5.4.2.2 and Exhibit NRC000001b at Section 9.3.2. The FEIS concluded that the "overall impact on aquatic resources of operating the proposed VEGP Units 3 and 4 . . . would

be SMALL[.]" Exhibit NRC000001a at Section 5.4.2.9. In addition, the NRC Staff determined that design and operation of the proposed cooling water intake system are not likely to adversely impact shortnose sturgeon because the area affected by thermal discharge is small in comparison to the width of the Savannah River at the Vogtle site. Exhibit NRC000001a at Section 5.4.3.2.

122. The potential impacts of the closed-cycle cooling system on the robust redhorse also are addressed in the FEIS. Exhibit NRC000001a at Section 5.4.2.6. NRC Staff found that the robust redhorse spawning areas are 25 miles upstream of the Vogtle site and the adults stay primarily within the main channel as they move up and down the river. *Id.* As a result, the FEIS stated that "the potential for impact to the State Listed robust redhorse from entrainment, impingement, and thermal or chemical discharges would be minor." *Id.*

123. The conclusions in the FEIS regarding the shortnose sturgeon were confirmed by the National Marine Fisheries Service ("NMFS"), which is the designated authority for this species. Pursuant to Section 7 of the Endangered Species Act ("ESA"), the NRC Staff prepared a Biological Assessment and submitted it to the National Oceanic and Atmospheric Administration ("NOAA") in January 2008. In doing so, NRC Staff requested a concurrence from NMFS on its findings in the DEIS with regard to the shortnose sturgeon. Tr. 950 (Coutant 1.3 Direct at A.18); Tr. 1042-1048; Exhibit SNC000022.

124. By letter dated August 11, 2008, the NMFS, commenting on the impact of the proposed new Vogtle units on endangered species, stated that the "proposed action is not likely to adversely affect shortnose sturgeon" and that there is no designated "critical habitat" in or near the project area. Exhibit SNC000022 at pp. 3-4. The NMFS letter states: "Shortnose sturgeon generally do not inhabit this section of the Savannah River at this time of year; sturgeon are generally found upstream from the site during the proposed construction months and no

spawning studies have observed them in the river adjacent to the Vogtle site." Exhibit SNC000022 at p. 3. In addition, "the potential effect from thermal discharge will be insignificant as it is expected that fish and other organisms would avoid the elevated temperatures, as they can move through this part of the river unencumbered by any structures or physical features that would retain them in the plume[.]" Exhibit SNC000022 at p. 4. "The risk of sturgeon impingement within the intake structures will be discountable due to the very small chance of sturgeon being trapped[.]" *Id.*

125. Based on the foregoing evidence, we find that the area of the Savannah River near the Vogtle site does not contain extremely sensitive biological resources necessary for the maintenance of the shortnose sturgeon or robust redhorse. *See* Tr. 950 (Coutant 1.3 Direct at A.7, A.16); Tr. 1042-1048.

iv. Feasibility of Dry Cooling

126. SNC argued that, under NEPA, the extent to which an alternative must be evaluated depends on whether such alternative is feasible. Joint Intervenors claimed that dry cooling is a feasible technology for use with the proposed Vogtle 3 and 4 units. SNC argued that dry cooling is not feasible.

127. SNC stated the position that dry cooling is not a feasible alternative because of the limitations of current state-of-the-art dry cooling technology with respect to its implementation on large nuclear power plants, including the AP1000. SNC also argued that dry cooling is not a feasible alternative because it is an unproven technology in the context of a large generating plant such as the AP1000 and, even if possible to install, would raise unit reliability concerns, result in lower unit output and prohibitive costs, and cause harm to the environment. Tr. 1012, 1026, 1029, 1032, 1034. Based on the foregoing, SNC argued that NEPA does not

require an evaluation of dry cooling at the Vogtle site, certainly not beyond the discussion already included in the FEIS.

128. Joint Intervenors argued that dry cooling is a feasible alternative and, in support of their position, cited various examples of smaller fossil generation facilities that utilize dry cooling. Based on the operating experience of these smaller units, Joint Intervenors claimed that dry cooling does not cause reliability concerns. Joint Intervenors acknowledged that application of dry cooling with the proposed Vogtle Units would result in some loss of unit output due to parasitic load and that dry cooling would be more expensive than wet cooling. Tr. 1121. However, Joint Intervenors argued that these negative factors are minor and acceptable.

129. SNC's witness, Mr. James Cuchens, prepared a detailed study of the feasibility of a dry cooling system for the AP1000 standard plant design. *See* Exhibit SNCR00024, "Feasibility of Air-Cooled Condenser Cooling System for the Standardized AP1000 Nuclear Plant"; Tr. 964. The study reviews the design of the current AP1000 Nuclear Plant proposed for the Vogtle 3 and 4 Units and investigates the feasibility and impacts of replacing the wet cooling system with an Air Cooled Condenser ("ACC") (*i.e.,* dry cooling system). *Id.*

130. The SNC study examines capital cost differentials and operation and maintenance cost differentials between the wet and dry systems over the life of the plant. The study also addressed impacts on the performance of an AP1000 unit, differences in consumptive power (station service) requirements, and changes to the plant design and layout that would be required to replace the wet cooling system with an ACC. *See* Exhibit SNCR00024 at p. 3.

131. Because a dry cooling system has never been used with a nuclear power plant or any plant the size of the AP1000, SNC's study is based on a theoretical application of an

ACC to the AP1000 standard design. Tr. 1000, 1218. The SNC study modeled two hypothetical ACC systems – a 204 module system and a 324 module system. The hypothetical 204 module system is based on the current state-of-the-art ACC technology and modeled for use with the standard AP1000 turbine. The hypothetical 324 module system is a theoretical dry cooling system that was sized to remove the backpressure limitations of the 204 module system. The hypothetical 324 module system was also modeled with the standard AP1000 turbine. Exhibit SNCR00024; Tr. 997.

132. The SNC study was conducted by Mr. James Cuchens. Mr. Cuchens is Principal Engineer for Southern Company Generation Engineering and Construction Services and has over 35 years experience related to all phases of power plant design and construction, including conceptual design studies, equipment design specifications, and equipment bid evaluations. As described in his qualifications materials, he has designed the thermal cycle equipment, boiler and draft system equipment, and plant cooling system equipment for various types of units, including nuclear, fossil, and cogeneration. Moreover, specifically with regard to cooling, Mr. Cuchens has extensive expertise in the design of various types of cooling cycles, including closed loop, once-through, and/or cooling ponds, serving nuclear units, fossil units, and cogeneration units. Cuchens Direct at A.2. Mr. Cuchens has also served on the ASME committee and cooling technology committee that wrote the test codes for the current state-of-the-art ACC technology, Tr. 1269

133. Joint Intervenors' expert, Mr. Powers, fundamentally agreed with portions of the SNC study regarding the cost of the 204 module system and acknowledged that it was "reasonably accurate". Tr. 1152.

a. Overview of Cooling Systems

134. In the process of generating electricity, water is heated in the steam generator and turned into steam. The steam is passed across a steam turbine, which turns a generator, creating electricity, and is then cooled back into liquid form to allow the process to repeat. Tr. 955 (Cuchens Direct at A.4); Exhibit SNCR00024 at p. 3.

135. The AP1000 Design Certification Document ("DCD") specifies a closed-cycle wet cooling system. In this system, the steam leaves the turbine and goes to a steam surface condenser, which is a large heat exchanger filled with tubes that have cold water flowing through them. The cold water in the tubes absorbs the heat from the steam, causing the steam to condense back into liquid form, and then the condensed liquid is pumped back to the steam generator and the process begins again. Tr. 955 (Cuchens Direct at A.4); Exhibit SNCR00024 at pp. 3-4; Exhibit SNC000065.

136. The water circulating through the condenser tubes is then pumped out to a wet cooling tower where it is cooled by discharging its heat largely by evaporation to the air that is flowing through the tower under motive force and ultimately in the surrounding atmosphere. Once cool, the water is collected in a basin below the tower and pumped back through the condenser tubes. Tr. 955 (Cuchens Direct at A.4); Exhibit SNCR00024 at pp. 3-4.

137. In contrast to a closed-cycle wet cooling system, which relies on the cooling property of water (*i.e.*, evaporation), a dry cooling system is based on an ACC (*i.e.*, direct heat transfer). In such a system, the steam leaving the turbine is piped through large ducts outside of the turbine building to an ACC where it is cooled by air flowing over large metal-finned tubes. As the steam loses its heat, it condenses to water and is drained to a large tank from which it is pumped back to the nuclear steam supply system. Tr. 955 (Cuchens Direct at A.4); Exhibit SNCR00024 at pp. 3-4.

138. During both cooling processes described above, when steam is condensed back to liquid form, it requires a significantly less amount of space and/or volume. When this occurs, it creates a vacuum inside a steam condenser and/or turbine exhaust, which is often referred to as "backpressure". Typically, the lower the backpressure (or vacuum), the better turbine performance will be because less restriction is being placed on the turbine exhaust flow. Tr. 955 (Cuchens Direct at A.6); Exhibit SNCR00024 at p. 6.

b. The Standard AP1000 Turbine v. High Backpressure Turbine Technology.

139. The AP1000 DCD specifies a triple exhaust, six flow low-pressure turbine generator designed to pass 8,400,000 lbs. of steam with design backpressures ranging from 2.37 to 3.57 inches of mercury absolute ("HgA") in each section with an average backpressure of 2.92" HgA at the design inlet cold water temperature of 91º F. Tr. 955 (Cuchens Direct at A.9); Exhibits SNCR00024 at p. 6 and SNC000028 at 10.2.1; Tr. 1210-1213. In order to achieve its designed megawatt output, the cooling system must allow the AP1000 to operate at the average 2.92" HgA backpressure. Tr. 955 (Cuchens Direct at A.9); Tr. 957 (Cuchens Rebuttal at A.6); Tr. 971 (Pierce Rebuttal at A.7); Exhibits SNCR00024 at p. 6, SNC000027, and SNC000028. The closed-cycle wet cooling system specified in the DCD allows the AP1000 to operate in such a manner. Exhibit SNC000065.

140. During normal operations, the AP1000 standard turbine generator could experience backpressure in the range of ~ 1.0" HgA to a maximum of less than 5.0" HgA. The higher the backpressure on the turbine, the less electricity the generator is able to produce, while the lower the backpressure is on the turbine, the more electricity the generator is able to produce. Backpressure in excess of 5.0" HgA would exceed the functional operational limit of the

standard AP1000 turbine. Tr. 955 (Cuchens Direct at A.9); Tr. 957 (Cuchens Rebuttal at A.6); Tr. 971 (Pierce Rebuttal at A.7); Exhibits SNC000027 and SNC000028; Tr. 983-985.

141. High backpressure turbines operate with an average backpressure of 8" HgA or greater, which would exceed the functional limitations of the AP1000 standard design. Tr. 957 (Cuchens Rebuttal at A.6); Tr. 983-985. Mr. Cuchens and Mr. Powers both testified that there is not a high backpressure turbine in existence today that can pass the steam flows of the AP1000 (*i.e.*, 8,400,000 lbs.) and, furthermore, there is no high backpressure turbine currently in use with a nuclear power plant. Tr. 955 (Cuchens Direct at A.13); Tr. 1170-1172, 1210-1213, 1218.

c. Limitations of Current State-of-the-Art ACC Technology

142. The current "state-of-the art" ACC technology operates at a high steam saturation point and, therefore, creates high backpressure on the turbine. This is due to the technological limits of the ACC with regard to the lowest achievable Initial Temperature Difference or "ITD." ITD is the chief governing design characteristic of an air cooled condenser used in a dry cooling system. The ITD is the difference between the temperature of the outside air and the temperature of the steam condensing within the tube bundles. At a given ITD, the higher the ambient temperature in which an air-cooled turbine operates, the higher the steam saturation temperature and, therefore, the higher the backpressures on the turbine will be. Tr. 955 (Cuchens Direct at A.10); Exhibit SNCR00024.

143. Mr. Cuchens explained that state-of-the-art ACC technology is designed with an ITD of around 40° F, but that there have been a few ACCs built in the United States with an ITD of 35° F. Tr. 955 (Cuchens Direct at A.10). Moreover, Mr. Cuchens testified that no manufacturer of ACCs has successfully designed or built an ACC with an ITD lower than 35°F. Tr. 955 (Cuchens Direct at A.10). Based on this current technological limit of a 35º F ITD, at the

design ambient air temperature of 95º F, the lowest steam saturation temperature achievable in an ACC would be 130º F, which would produce turbine backpressure of approximately 4.5" HgA. Tr. 955 (Cuchens Direct at A.10). This is much higher than the average backpressure specified by the AP1000 design (*i.e.*, 2.92" HgA) and only 0.5" HgA below the alarm point for the AP1000 turbine (*i.e.*, 5.0" HgA). Tr. 955 (Cuchens Direct at A.10); Tr. 983-987; Exhibit SNCR00024 at p. 6.

144. Mr. Cuchens further explained that any rise above 4.5" HgA would put the turbine near or above its alarm point and at risk of tripping. Tr. 995, 1272. Factors commonly experienced in the operation of ACCs such as wind influence, recirculation and fouling would cause an increase by as much as 1.5" HgA, which would push the turbine to its trip point. *Id*. Given this risk, an AP1000 unit at Vogtle could not operate reliably at full rated power any time the inlet air temperature to the ACC approached 95º F. Tr. 955 (Cuchens Direct at A.10, 23-24); Tr. 995, 1272.

145. Joint Intervenors claimed that the AP1000 could use smaller high backpressure turbines (rated to 8.0" HgA) to resolve the backpressure issue and, thus, accommodate dry cooling. Tr. 1089 (Powers Rebuttal at A.6); Tr. 1171. However, both Mr. Cuchens and Mr. Powers testified that no high backpressure turbine currently available is capable of passing the 8,400,000 lbs. of steam flow specified in the AP1000 thermal cycle. Tr. 1170-1172, 1210-1213. Moreover, Mr. Cuchens and Mr. Powers both testified that a large, multi-exhaust turbine (such as the AP1000 standard turbine) that is capable of safely operating at elevated backpressures has never been designed or manufactured anywhere in the world. Tr. 955 (Cuchens Direct at A.13); Tr. 1210-1213.

146. Mr. Powers referred to the Midlothian power plant in Texas, the Wyodak plant in Wyoming and the Matimba plant in South Africa as evidence that dry cooling is feasible with an AP1000 unit at the Vogtle site. Tr. 1088, 1098 (Powers Direct at A.18 and A.26); Tr. 1167. None of these plants, however, has a comparable capacity and steam flow to the AP1000. Tr. 957 (Cuchens Rebuttal at A.9); Tr. 1210-1211, 1212-1213. Moreover, none of these plants utilize the triple exhaust, six-flow turbine-generator package specified in the AP1000 standard design (or comparable turbine package). *Id*. Accordingly, not only are these references inconclusive as to the feasibility of dry cooling at the Vogtle site, but they are also misleading as to their comparability to an AP1000 unit.

147. As the evidence demonstrates, the Midlothian plant consists of six units of 275 MW each for a total of 1,650 MW. *See* Exhibit SNC000033. The Wyodak power plant consists of one 330 MW unit and the Matimba power plant consists of six 665 MW units for a total of 4,000 MW. Tr. 957 (Cuchens Rebuttal at A.9); Exhibit SNC000032. In addition, the dry cooling systems at these plants do not comprise one large, common system, but instead are divided into independent units, one for each turbine on the site. *Id*. Accordingly, these plants do not demonstrate comparable examples of dry cooling facilities (size and capability) that would be required for the capacity of the Vogtle units, which are 1,117 MW each. A valid comparison would necessarily include dry cooled units of equal size with similar turbine cycles to the AP1000 rather than a group of small units compared to a large unit. No evidence was submitted that proves the existence of such a dry cooling unit.

148. Mr. Cuchens also presented evidence of the many problems with dry cooling experienced by the Matimba power plant. Tr. 979-986; Exhibit SNC000098. Mr. Cuchens explained that the Matimba facility located in South Africa experienced significant

problems associated with load swings, weather shifts, wind patterns and foiling of its dry cooling units. *Id*. Mr. Cuchens also submitted evidence that the Matimba dry cooling facility was subjected to operational difficulties due to nesting birds, which ultimately had to be exterminated to resolve the issue. Exhibit SNC000098. Over the course of years, the Matimba plant was able to resolve these operation issues with the construction of substantial and costly wind skirts, changes in operational protocols and wildlife mitigation measures. Tr. 1054; Exhibit SNC000098. However, as Mr. Cuchens explained, the construction of a dry cooling facility for the AP1000 at the Vogtle site would have its own set of unique issues to address. Tr. 1283-1284.

149. Joint Intervenors presented evidence regarding the cooling systems proposed for the North Anna 3 and 4 nuclear units as support for their contention that dry cooling can be implemented with a nuclear power plant. *See* Exhibits JTIR00050 and JTI000051; Tr. 1212, 1215-1220. Joint Intervenors argued that the commitment given by Dominion in the North Anna 3 and 4 ESP that unit 4 will be a 100% dry cooled facility is evidence that it can be done. *See* Tr. 1089 (Powers Rebuttal at A.6); Exhibits JTIR00050 and JTI000051; Tr. 1212, 1215-1220. However, Joint Intervenors failed to submit any technical documentation that demonstrates that North Anna 4 can be 100% dry cooled. Moreover, Dominion has not submitted a combined license application for North Anna 4. Tr. 1216.

150. Joint Intervenors also presented evidence regarding the dry portion of the North Anna 3 combination wet/dry cooling system as support for their argument that the implementation of dry cooling on a nuclear plant is possible. Exhibit JTIR00050. Specifically, Joint Intervenors argued that the North Anna 3 and 4 ESP establishes that North Anna 3 will be able to operate in a "dry only" mode. However, as the North Anna 3 and 4 ESP and the North Anna 3 Combined License application ("COLA") demonstrate, the North Anna 3 combination

wet/dry cooling system will only be run as "dry only" in very limited circumstances and only under "favorable meteorological conditions." Exhibit JTIR00050 at p. 3-10. Moreover, the North Anna 3 and 4 ESP states that the dry tower will be sized "so that under the worst-case conditions (*i.e.*, full power operation and a hot and humid atmosphere at tower level), a minimum of one-third of excess heat from Unit 3 would be dissipated via the dry tower system." *Id*.

151. The North Anna 3 COLA further states that Dominion plans to run North Anna Unit 3 with the wet portion of its cooling system the majority of the time, and will only run the unit in "dry only" mode when Lake Anna falls below a certain level. Exhibit SNC000096 at pp. 2-173, 2-174, and 2-194; Tr. 989-992. The North Anna 3 COLA also states that the unit will only be able to run in "dry only" mode "during cold weather" and for "relatively short durations". Exhibit SNC000096 at p. 2-194; Tr. 989-992. In sum, Dominion plans to operate North Anna 3 only when Lake Anna drops below a threshold level during cold weather for short periods and, to the extent the unit is run "dry only" during hot and humid weather, the dry cooling portion will only be able to dissipate one third of the heat.

152. Based on the foregoing, Joint Intervenors' reliance on the North Anna 3 and 4 cooling systems is not convincing. Joint Intervenors provide only a conceptual basis for such a comparison and do not provide any technical evidence to support their position. If anything, the evidence regarding the limited conditions under which North Anna 3 would operate in dry only mode tends to support SNC's argument that dry cooling alone is not a feasible cooling alternative for Vogtle 3 and 4. Exhibits SNC000095 and SNC000096; Tr. 1212, 1215-1220.

153. Accordingly, given that SNC's and Joint Intervenors' experts agree that there is not a commercial nuclear reactor in existence today that utilizes dry cooling (Tr.1212-1216), the implementation of dry cooling on a nuclear baseload facility such as the AP1000 (or North Anna) would constitute a first-of-a-kind and unproven application.

d. Design Changes to the AP1000 Necessary to Accommodate Dry Cooling

154. SNC submitted extensive evidence to show that the Nuclear Regulatory Commission has adopted a policy of developing and utilizing standard plant designs. *See* Exhibits SNC000059 through SNC000064. As Mr. Pierce explained, the Commission has repeatedly expressed its desire that not only the nuclear island, but also the "balance of plant" systems, be standardized in order to enhance safety by making reactors safer and to reform the licensing process by making it more predictable. *Id.;* Tr. 971 (Pierce Rebuttal at A.4); Exhibit SNC000060.

155. Mr. Pierce testified that the modifications necessary to implement dry cooling and/or a high backpressure turbine with an AP1000 unit would preclude the benefits of standardization, such as standardized licensing, procurement, construction, and operation, between Vogtle 3 and 4 and other AP1000 units. Tr. 971 (Pierce Rebuttal at A.6).

156. Mr. Cuchens and Mr. Pierce testified that the implementation of dry cooling would have a substantial impact on the AP1000 standard design. Tr. 955 (Cuchens Direct at A.31); Tr. 971 (Pierce Rebuttal at A.9); Tr. 1004-1007, 1013, 1016-1019, 1263-1267. Specifically, SNC presented evidence that substantial modifications would be required with regard to the turbine building, turbine pedestal, feed water heaters and associated piping and steam surface condensers. *Id*. Moreover, Mr. Pierce stated that a new site safety analysis report would be required. Tr. 971 (Pierce Rebuttal at A.9); Tr. 1263-1267.

157. Redesign of the turbine pedestal alone would affect many other aspects of the plant. Section 10.2.2.1 of the DCD states that the turbine-generator foundation forms "an integral part of the turbine building structural system…[t]he lateral bracing under the turbine-generator deck also serves to brace the building frame." Modifying the turbine pedestal in any way, whether to accommodate steam ducts or a theoretical "high backpressure" turbine, would impact the structural framework of the entire turbine building and may require literal redesign of the entire building itself. Tr. 955 (Cuchens Direct at A.31); Exhibit SNC000028, Tr. 1004-1006, 1013, 1016-1019, 1263-1267.

158. The removal of the steam surface condensers and creation of multiple 30-foot diameter holes in the turbine building wall would be substantial changes to the standard design. Tr. 971 (Pierce Rebuttal at A.8-A.9); Tr. 957 (Cuchens Rebuttal at A.8). These modifications would require changes not only to the wall of the turbine building, but also to the turbine building structural steel cross bracing, and the main turbine deck support system. *Id*. These modifications would cause layout changes to other equipment in order to provide a path for the steam ducts and will require the design of a support system for the steam ducts. *Id*. Finally, the massive size of an ACC system may dictate a change in the entire plant layout given the acreage necessary for a dry cooling system. Tr. 967 (Moorer 1.3 Direct at A.9, and A.10); Exhibit SNC000040.

159. Similar to the implementation of dry cooling, the use of high backpressure turbines with the proposed Vogtle Units would require substantial modifications to the AP1000 standard design. Mr. Cuchens and Mr. Pierce testified that such modifications would include the redesign of the turbine building, the turbine building structural steel cross bracing, and the main turbine deck support system. Tr. 955 (Cuchens Direct at A.22-A.25, A.31-A.33); Tr. 971 (Pierce

Rebuttal at A.9); Tr. 957 (Cuchens Rebuttal at A.8); Tr. 1004-1006, 1263-1267. These modifications would result in increased costs and a substantial reduction in the output of the AP1000 units. Tr. 957 (Cuchens Rebuttal at A.10).

e. Harm to the Environment Caused by Dry Cooling

160. As described above, SNC presented evidence of two theoretical ACC designs – one with 324 modules and one with 204 modules. Exhibit SNCR00024. For either design, a significant amount of additional land would be required to ensure unencumbered wind approaches, adequate spacing between ACC sections, piping needs, access roads and spacing between the Unit 3 and Unit 4 cooling systems. The estimated acreage for the 324 module system is approximately 250 acres. The estimated acreage for the 204 module system is approximately 170 acres. *See* Exhibit SNCR00024, p. 19; Tr. 967 (Moorer 1.3 Direct at A.9, Exhibit SNC000040; Tr. 1024-1025, 1057.

161. Mr. Moorer testified that the size and configuration of the ACC units would require the clearing and grubbing of wooded areas, including removal of a large number of trees, cut and fill for the construction pad, and rerouting and reconstruction of site drainage features. *See* Tr. 967 (Moorer 1.3 Direct at A.9, A.10, and A.20, A.21); Exhibit SNC000040. Moreover, Mr. Moorer explained that the ACCs may require the filling of existing bodies of water on the site, including Mallard Pond. In addition, Mr. Moorer testified that the installation of dry cooling at the Vogtle site would have substantial adverse aesthetic impacts. *Id*.

f. Prohibitive Expenditures

162. SNC presented evidence that the estimated cost of construction of the 324 module ACC would be approximately $445 million for each of the Vogtle 3 and 4 units, for a total of $890 million for the entire plant (which is more than six times the cost of the wet cooling system). Tr. 955 (Cuchens Direct at A.22, A.27); Exhibit SNCR00024. The estimated cost of

the 204 module ACC system is approximately $400,000,000 (or $200,000,000 per unit), more than the wet cooling system. *Id.* Joint Intervenors' expert, Mr. Powers, agreed with Mr. Cuchens' cost estimate for the 204 module system. Tr. 1152.

163. SNC's estimates do not include the cost of the large steam ducts, condensate tanks/pumps, foundations, and associated vacuum systems. The estimates also exclude the costs of additional engineering and construction costs associated with design changes to the turbine island and the value of the lost of electrical output. Additionally, Mr. Cuchens testified that an ACC would cost significantly more to maintain and operate over the life of the plant than a wet system. Tr. 955 (Cuchens Direct at A.36); Exhibit SNCR00024; Tr. 1247-1250, 1262.

164. SNC's estimates do not include costs associated with the use of a high backpressure turbine, including turbine costs, re-design and engineering costs, and loss in value from capacity degradation. Tr. 955 (Cuchens Direct at A.32); Tr. 971 (Pierce Rebuttal at A.10); Tr. 1247-1248.

165. These costs estimates also do not include the expenses that would be incurred by SNC in the preparation of the necessary licensing review and documentation related to the implementation of a dry cooling system and/or a high backpressure turbine. Tr. 1244-1245, 1279-1280.

166. In sum, the total cost of a dry cooling system for use at the proposed Vogtle 3 and 4 Units would be substantially more than the estimates provided above. Tr. 1244-1245, 1279-1280.

g. Decreased Efficiency and Capacity

167. Mr. Cuchens testified that utilizing a current state of the art ACC (204 module system) with the AP1000 standard turbine would result in significant decreases in capacity and efficiency. Specifically, Mr. Cuchens stated that the increase in backpressure associated with using the current state-of-the-art ACC with the AP1000 turbine would result in a loss of output of approximately 55 MW per unit and an additional consumptive power demand of approximately 30 MW per unit, which would be a net loss of approximately 85 MW per unit (compared to the standard AP1000 plant wet cooling tower which uses 13 MW). Tr. 955 (Cuchens Direct at A. 28); Exhibit SNCR00024 at App. A.; Tr. 1029-1030; 1230-1232.

168. Mr. Cuchens testified that the 324 module ACC system would not cause the capacity degradation of the 204 module system, but the consumptive power demand would be approximately 45 MW per unit. Tr. 955 (Cuchens Direct at A.24); Exhibit SNCR00024, at App. A.

169. The North Anna 3 and 4 ESP and the North Anna 3 COLA also support SNC's position that dry cooling systems are more expensive to build and are not as efficient as wet cooling systems. Exhibit JTIR00050 at p 3-12 and Exhibit SNC000095 at p. 8-4. Citing the EPA studies, Dominion noted that the efficiency penalty of dry cooling towers can exceed 12 percent. Exhibit JTIR00050 at p. 3-12. Moreover, Dominion estimated that the power needed to operate dry towers would be 8.5 to 11% (or 150 MW for North Anna 3). Exhibit SNC000095 at p. 8-4.

170. Joint Intervenors' evidence also demonstrated that dry cooling requires more land area, is more expensive, less efficient and less productive than wet cooling. *See* Tr.

1088, 1098 (Powers Direct at A.23 and A.28 and Powers Rebuttal at A.2 and A.3); Tr. 1152, 1162 , 1247.

171. Although Mr. Powers contended that a natural draft dry cooling system should have been the basis of Mr. Cuchens comparison rather than an ACC, because of the lower parasitic load requirements of a natural draft dry tower, the evidence demonstrates that that the capital cost of a natural draft dry system would be two to three times higher than an ACC. Exhibits SNCR00024 at p. 27 and SNC000098 at p. 10. These extremely high capital costs make Mr. Cuchens' comparison of an ACC to a natural draft closed cycle wet system reasonable, notwithstanding the lower operating costs of a natural draft dry cooling system.

172. While not taking a position on the issue, NRC Staff aptly observed that "SNC and the Joint Intervenors appear to agree that compared to the proposed wet-tower design, dry cooling would A) require more land, B) cost more to implement, and C) decrease the operating efficiency of the plants." Tr. 1061 (Staff 1.3 Direct at A.14). The Staff concluded that SNC and Joint Intervenors' dispute is over the magnitude of these impacts, but not their existence. *Id*.

C. Environmental Contention 6.0

i. Contention and Evidence Presented

173. As admitted, EC 6.0 reads: "Because Army Corps of Engineers (Corps) dredging of the Savannah River Federal navigation channel has potentially significant impacts on the environment, the NRC staff's conclusion, as set forth in the "Cumulative Impacts" chapter of the FEIS, that such impacts would be moderate is inadequately supported. Additionally, the FEIS fails to address adequately the impacts of the Corps' upstream reservoir operations as they support navigation, an important aspect of the problem."

174. SNC presented a panel of five qualified witnesses on EC 6.0. These witnesses included: (1) Dr. Charles C. Coutant, a scientist with a Ph.D. in Biology and nearly fifty years' experience studying impacts to aquatic resources; (2) Mr. Tom Moorer, SNC's Project Manager for Environmental Support; (3) Mr. Jeffrey Neubert, Director of Logistics for Nuclear Power for Westinghouse Electric Company; (4) Mr. Benjamin Smith, Operations Manager for Stevens Towing Company; and (5) Captain H. David Scott, Owner, President and Principal Surveyor of Southeastern Marine Surveying Company. The extensive, relevant experience of these experts is demonstrated by their pre-filed direct and rebuttal testimony and statements of provisions qualification provided therewith. Exhibits SNC000012, SNC000043, SNC000044, SNC000045 and SNC000014.

175. SNC's submitted pre-filed direct testimony of Dr. Coutant on January 9, 2009 and rebuttal testimony on February 6, 2009. SNC submitted pre-filed direct joint testimony of Mr. Neubert, Mr. Smith and Capt. Scott on January 9, 2009 and submitted a revised version on March 6, 2009. SNC submitted pre-filed direct testimony of Mr. Moorer on January 9, 2009. These testimonies were admitted into the record as if read. Tr. 1294, 1295, 1291, 1292.

176. The NRC Staff also presented a panel of five witnesses on EC 6.0. These witnesses included: Mr. Mark D. Notich, Ms. Anne R. Kuntzleman, Ms. Rebekah H. Krieg, Dr. Christopher B. Cook, and Mr. Lance W. Vail.

177. The NRC Staff submitted pre-filed direct joint testimony on January 9, 2009 and revised versions on February 2, 2009, and February 26, 2009. Rebuttal testimony of Ms. Anne R. Kuntzleman was submitted on February 6, 2009.

178. Joint Intervenors presented a panel of two witnesses on EC 6.0. These witnesses included: Dr. Shawn Young and Dr. Donald Hayes.

179. Joint Intervenors filed pre-filed direct testimony of Dr. Shawn Young and Dr. Donald Hayes on January 9, 2009, submitted revised versions on February 2, 2009, and pre-filed rebuttal testimony on February 6, 2009.

ii. Staff's Cumulative Impacts Analysis was Adequate.

180. Joint Intervenors contend that the Staff's conclusion in the Cumulative Impacts chapter of the FEIS regarding impacts from dredging the Savannah River Federal navigation channel is inadequately supported. Joint Intervenors' contention is based on the *assumption* that "[u]sing the Federal navigation channel to barge components to the VEGP site is necessary for construction of Units 3 and 4." Joint Intervenors' Motion to Admit New Contention (Sept. 22, 2008) at 3. *Accord* Tr. 1574 (Hayes 6.0 Rebuttal at A.3).

181. Joint Intervenors' contention is also based on the *assumption* that dredging would require removal of 2 million cubic yards of material per foot of depth. Tr. 1573 (Hayes 6.0 Direct at A.14).

182. Joint Intervenors' calculation of 2 million cubic yards of material per foot of depth was based on Dr. Hayes' *assumption* that every linear foot of river for 120 miles would need to be dredged to the channel's authorized depth of 9 feet by 90 feet wide. Tr. 1574 (Hayes 6.0 Rebuttal at A.4).

183. The FEIS at 7-21 (Exhibit NRC000001b) contains the Staff's discussion of the cumulative impacts of dredging the Savannah River Federal navigation channel.

184. The Staff's conclusion that cumulative impacts from dredging "could be MODERATE" was based on its *assumption* that "depending on the level of water flow, most areas of the Federal navigation channel above rkm56 (RM35) would likely need to be dredged to allow barge traffic during normal river flow . . . ." Exhibit NRC000001a, b at 4-27, 7-21.

185. As demonstrated by Ms. Kunzleman's rebuttal testimony, the environmental impacts of any potential dredging of the Savannah River for this project depends on the evaluation of a "multitude of parameters" that cannot be determined with any reasonable degree of certainty until the Army Corps of Engineers determines the scope of the dredging project and the dredging and disposal methods that will be utilized. Tr. 1480 (Kuntzelman 6.0 Rebuttal at A.4).

186. The only information the Staff had at the time of the FEIS, and indeed at the time of the hearing, was that although Southern was depending on the Army Corps of Engineers to maintain the navigability of the channel pursuant to its existing legislative authority, the Corps of Engineers informed the Staff that dredging was unlikely, for a number of reasons. Tr.1478 (Staff 6.0 Direct at A.13)

187. The Staff's discussion concludes that "[a] detailed assessment of impacts to river biota by the NRC staff" was not possible at the time the FEIS was published. Exhibit NRC000001a at 4-27. Rather, the Staff notes that "the dredging project, if it should occur, is incompletely defined, the amount of material to be removed is unknown, and the location of the spoils dredge areas has not been identified." *Id.*

188. The Staff's addition in the FEIS of a discussion regarding dredging impacts was in response to several comments and was not necessary for its cumulative impacts analysis. At the time DEIS was published, it was the Staff's understanding that no dredging would be required. Tr. 1484. Following publication of the DEIS, the Staff received comments from several regulatory agencies and environmental organizations raising the issue that if barging would be used, dredging would be required. Tr. 1486; *see also* Tr. 1560: ("Because we thought it was only fair that dredging should be mentioned because of these agencies providing

these comments, and it was from a wide range of agencies. And then based on the fact that we had no details, you couldn't say small, but moderate, moderate was a conservative approach.").

a. Dredging of Savannah River Navigation Channel was Not Reasonably Foreseeable.

189. Dredging of the Savannah River Federal navigation channel is not "reasonably foreseeable" within the context of NEPA absent a more concrete indication than exists now that the Corps will perform such dredging.

190. At the time the Corps' witnesses appeared at the hearing, the Corps had not received a formal request to maintain the Savannah River Federal navigation channel through its authority under the Rivers and Harbors Act. *See* Tr. 1292 (Moorer 6.0 Direct at A.12); *see also* Exhibit SNC0000049 (December 15, 2008 Email from Matt Montz to Tom Moorer). Although it is foreseeable that SNC will submit such a request, several conditions, over which neither SNC, NRC nor the Corps has control, must be satisfied in order for dredging to actually occur. Tr. 1411, 1458-1462.

191. The Corps does not have funding to maintain the Savannah River Federal navigation channel. *Id.* Moreover, as testimony from Corps witnesses explained, obtaining funding can be competitive within the Corps. Tr. 1411-12.

192. The Corps cannot proceed with any dredging without specific funding. *Id.*

193. SNC is not planning to apply for its own permit to dredge the Federal navigation channel. *See* Tr. 1318; *see also* Tr. 1292 (Moorer 6.0 Direct at A.12).

194. The foreseeability of dredging did not change following receipt of the comments on the DEIS urging the consideration of dredging. As Mr. Vail explained, "we still think it's unlikely that dredging the navigation channel would happen . . . . [A]s long as they don't have money to do it, it's not going to happen." Tr. 1492.

195. The Corps of Engineers witnesses explained how many steps would be involved before dredging could commence, none of which has occurred, including obtaining money to study the issue (Tr. 1456), resolving real estate issues (Tr. 1457-8), and obtaining funding (Tr. 1462). The Corps also pointed out that they have requested funding for dredging more than once since the last maintenance of the channel in 1979 and have not received it. Tr. 1464-5.

196. Dr. Cook testified for the Staff that "Southern stated to us . . .that they had no intentions to dredge the navigation channel. When we met with the Corps, the Corps told us . . . that they had no intention to dredge the channel themselves, nor had they received an application from Southern to dredge the navigation channel." Tr. 1493. He also testified that it was the Staff's understanding that "barging was possible without dredging" and that they never heard SNC say they were going to apply for an application to dredge. Tr. 1504.

197. While barging is the preferred method for delivery of the heavy components for Units 3 and 4, *see* Tr. 1291 (Neubert/Scott/Smith 6.0 Direct at A.9), Westinghouse would still be able to deliver all of the components to the site. "Westinghouse has built nuclear power plants around this country and around the world. Many of those plants are in locations that are not accessible by water, and [they] have not had a situation where [they] weren't able to deliver the components." Tr. 1323.

198. Although barging is the preferred method of delivering certain components to the site, there is no connection between work proposed under the Limited Work Authorization and any potential dredging. SNC witness, Mr. Moorer, confirmed there was no relationship: "[t]he work that's going to be done under the limited work authorization involves basically the placement of backfill, the mud mat and waterproof membrane in the excavation and

some mechanically stabilized earth walls and there's no impact --dredging has no impact on that. So the channel has no impact. Tr. 1372.

199. And while, Dr. Hayes testified that dredging was essential for construction, *see* Tr. 1574 (Hayes 6.0 Rebuttal at A.3), there is no evidence to support this view. To the contrary, Mr. Neubert made clear that "[w]e are absolutely certain that we will be able to deliver all the components to the site even without the barge delivery for Vogtle." Tr. 1323. "I was challenged in my position at Westinghouse to come up with at least two viable delivery methods for every component that goes into the AP-1000." Tr. 1322.

b. Incomplete Nature of Information Regarding Scope of Dredging

200. The Staff made clear that its analysis of impacts from dredging was based on incomplete information. Exhibit NRC000001b at 7-21. The Staff notes that "the dredging project, if it should occur, is incompletely defined, the amount of material to be removed is unknown, and the location of the spoils dredge areas has not been identified. Specifics of the project including any time-of-year restrictions or mitigation to protect aquatic resources would be provided in the Corps' assessment to fulfill the NEPA requirement." Exhibit NRC000001b at 7-21. Joint Intervenors' witness agreed that the specifics of any potential dredging were not known. Tr. 1573 (Hayes 6.0 Direct at A.13)

c. Spoil Disposal and Sediment Contamination

201. Joint Intervenors assert that the Staff did not consider impacts of spoil disposal and possible sediment contamination. However, the Staff disclosed in the cumulative impacts analysis in the FEIS that impacts from dredging "could include . . . resuspension of sediments that may be contaminated, and would also require the disposal of dredged materials,"

but that a detailed assessment had not been conducted due to the unknown nature of any dredging. Exhibit NRC000001b at 7-20.

202. The Staff explained that the dredge material quantity, quality, and disposal locations were and remain unknown. Tr. 1480 (Kuntzelman 6.0 Rebuttal at A.4).

203. Joint Intervenors offered no evidence that sediments in the river are contaminated. Rather, SNC's witness, Dr. Coutant testified that he is "quite confident" they are not. Tr. 1359. Dr. Coutant explained in his report that "it is reasonable to conclude that the spread of contaminated materials in Savannah River sediments from the proposed dredging is a very low risk." Exhibit SNCR20051 at 9.

204. Dr. Hayes testified that Joint Intervenors' "evidence" of contaminants – the Chlor-alkali paper, Exhibit JTI000040 "was not to claim that there is contamination," but just to suggest that this issue be addressed in the FEIS. Tr. 1590.

205. Dr. Young did not attempt to determine whether any contamination was present. He explained that he did not "scour the contaminant studies to find out which ones were there or weren't there. I just posed the fact that if there are highly contaminated areas with any type of toxic chemicals, the dredging or the disturbance of those sediments likely will resuspend them and thus mussels being filter feeders will be subject to those resuspended toxicants;" Tr. 1599 (emphasis added). Dr. Young testified: "Again, I'm not an expert, and I haven't reviewed any reports to say there is or is not any type of contamination from nuclear facilities." Tr. 1610. Dr. Young's conditional testimony is not evidence of contamination.

d. Conservatism of MODERATE Conclusion

206. The Staff's conclusion that impacts from dredging could be MODERATE was conservative. *See* Tr. 1527.

207. The Staff's conclusion in the FEIS that impacts "could be MODERATE" "meant that [they] did not have adequate information to do a quantitative analysis." Tr. 1526. It meant that impacts could be SMALL or MODERATE, but not LARGE. *Id.*

208. Ms. Kuntzleman selected MODERATE as a conservative estimate in part because of the Corps' Section 404 process, in which "the least environmentally damaging practicable alternative must be selected." Tr. 1526-27. Regardless of whether the Corps dredged as a result of their authorization to do so or issued a permit for a private applicant to dredge, the substantive requirements would be the same. Tr. 1564.

209. The FEIS's determination that the impact could be moderate was appropriate given the level of information available to the Staff. Dr. Hayes asserted in his pre-filed testimony that this conclusion is not sufficiently supported. Tr. 1573 (Hayes 6.0 Direct at A.18). However, Ms. Kuntzleman explained that the Corps of Engineers' permitting and 404(b)(1) obligations would avoid impacts exceeding moderate. Tr. 1480 (Kuntzleman 6.0 Rebuttal at A.9); Tr. 1563-66. In fact, she agreed that "could be MODERATE" was a conservative designation. Tr. 1527. Dr. Hayes also confirmed that he could not dispute the conclusions in the FEIS on this point. Tr. 1574 (Hayes 6.0 Rebuttal at A.8).

210. It was not necessary for the Staff to provide a quantitative evaluation of the Federal navigation channel dredging when no details concerning dredging were before the Staff. *See* Tr. 1480 (Kuntzleman 6.0 Rebuttal at A.4). The impacts of dredging the navigation channel are not precisely known, because the actual details of any future dredging are not known; however, the Staff was able to conclude in the FEIS that impacts would only be SMALL or possibly MODERATE. Dr. Hayes' and Dr. Young's testimony that impacts could be significant did not account for the Captain Scott's River Survey, SNC000046, which showed that

actual dredging would likely be "minimal." Tr. 1291 (Neubert/Smith/Scott 6.0 Direct at A.24). The Joint Intervenors' witnesses agreed that reduced dredging reduces impacts accordingly. *E.g.*, Tr. 1573 (Hayes 6.0 Direct at A.15).

e. Consideration of Corps Changes of Upstream Reservoir Releases

211. Joint Intervenors assert that the Staff's cumulative impacts analysis was deficient because it did not include a discussion of impacts from upstream reservoir release to support navigation of barge traffic.

212. The flow passing the Vogtle site is highly regulated by the Corps' upstream reservoir releases, which the Corps currently operates in accordance with the Drought Contingency Plan rule curves. *See* Exhibit NRC00001a at 2-19; Exhibit SNC000048 ("J. Strom Thurmond Dam and Lake Water Control Plan and Guide Curves").

213. The Staff's analysis was based on their belief that barging would occur under high water conditions, as was done in the past, and would not require special upstream reservoir releases by the Corps. Tr. 1538. The Staff's analysis did not include consideration of any "purposeful releases" by the Corps to support barging. Tr. 1540. The Staff's conversations with the Corps indicated that as part of their drought management plan, the Corps would not release water specifically to facilitate barging. Tr. 1539.

214. Any reservoir releases made by the Corps for purposes of navigation will be in accordance with the Corps' reservoir management plans which were subject to their own environmental analyses. Mr. Simpson testified for the Corps that anytime the Corps is operating under its Drought Contingency Plan, they will not make releases for barge shipments. Tr. 1442. If the Corps were not in a drought control situation, the Corps would determine how much flow

was needed to release additional water. Tr. 1446. The Corps has already completed an environmental analysis of releasing water and any releases associated with barging would "fall within the parameters" of that environmental analysis. Tr. 1453-56.

215. Mr. Moorer confirmed that SNC was not intending to request any additional or special releases. Tr. 1339.

iii. Post-FEIS Analysis of Dredging Impacts

a. Adequacy of Southeastern Marine Survey

216. SNC presented evidence that the extent of any potential dredging would be much smaller than that assumed by the Staff in its FEIS and by Dr. Hayes. SNC employed Captain David Scott and Mr. Benjamin Smith to survey the Savannah River stretching from the Savannah harbor to the Vogtle site. Tr. 1291 (Neubert/Scott/Smith 6.0 Direct at A.16); *see also* Exhibit SNC000046. They reviewed the survey and noted the locations where the depth of the practical navigational channel was less than six feet. Tr. 1291 (Neubert/Scott/Smith 6.0 Direct at A. 18). They identified eight locations that would need to be dredged. *Id.* at A.20. Based on their analysis, "a total of roughly 36,500 cubic yards of dredged material would need to be removed from the entire 110 mile stretch of river . . . ." *Id.* This information is the only credible evidence in the record concerning the locations and quantities of dredging that would be necessary to enable SNC to barge components to the Vogtle site.

217. The evidence is compelling and undisputed that the scope of any dredging necessary to support barge deliveries to Vogtle would be much less than the 2 million cubic yards removed per foot of depth suggested by Dr. Hayes. *See* Tr. 1573 (Hayes 6.0 Direct at A.14). Dr. Hayes acknowledged that this was simply a desktop calculation based on an assumption that every linear foot of river would need to be dredged to a width of 90 feet. Tr.

1574 (Hayes 6.0 Rebuttal at A.4). He did not dispute the testimony of Captain Scott, who testified that the dredging necessary would be small, on the order of only 36,000 cubic yards, based on the River Survey (Exhibit SNC000046). *Id.* at A.14.

218. Ensuring that at least a depth of six feet is attained would be sufficient for the barging needs of SNC. Tr. 1301-02. Dr. Hayes expressed concern that this would not provide sufficient clearance, see Tr. 1584, but Mr. Smith and Capt. Scott confirmed that they had no concerns navigating the specified barges with the depths identified in the River Survey. Tr. 1291 (Neubert/Smith/Scott 6.0 Direct at A.24). Captain Scott explained that the concern about a "minimum clearance under keel . . . for barge traffic up the Savannah River, it's a non-issue." Tr. 1374. Dr. Hayes agreed that this depth was likely acceptable for at least a few shipments, Tr. 1584, and Mr. Neubert confirmed that only a few barges would require the maximum draft. Tr. 1326.

219. SNC's witnesses concluded that 36,500 cubic yards of sediment was a "conservative estimate" that was "far less than the 2 million cubic yards" indicated by Joint Intervenors' witness, Dr. Hayes. Tr. 1291 (Neubert/Smith/Scott 6.0 Direct at A.26).

220. As explained by Captain Scott, "[t]o move 37,000 . . . roughly cubic yards of sand is not a big endeavor . . . . Just to be clear what 37,000 cubic yards of sand is, for 130 miles of river it's peanuts." Tr. 1332; *see also* Tr. 1345: ("[O]n the lower harbor where dredging is done all the time constantly, it's 37,000. It's a small event, nothing.").

221. Mr. Smith testified for SNC that, because the Corps is challenged with funding for dredging, when it does have the funding to dredge, "they concentrate on shoal areas only," and "are minimally dredging waterways so that traffic can still operate without risk." Tr. 1320.

222. Joint Intervenors do not dispute the dredging survey performed by SNC. Rather, Dr. Hayes testified that he believes the navigation study conducted by SNC in which Captain Scott estimated that 36,000 cubic yards would need to be dredged, "would be acceptable in the planning and projection of an estimated yardage." Tr. 1597. Dr. Hayes agreed that this could certainly be considered a small dredging project. Tr. 1574 (Hayes 6.0 Rebuttal at A.10). During cross-examination, Dr. Hayes agreed that, at the 36,000 cubic yards of material estimated by SNC as requiring removal, the dredging project should be considered to be a "small to modest sized project." Tr. 1587. On cross-examination, Dr. Hayes further indicated that this small amount could be removed by barge and hauled to a permitted disposal facility. Tr. 1587. Accordingly, it is not at all certain that multiple new confined disposal facilities would be required, as initially suggested by Dr. Hayes. Tr. 1573 (Hayes 6.0 Direct at A.21).

223. As explained by Captain Scott, the survey is "good to determine where trouble spots may be and a fairly accurate determination of the quantity of spoil. It's an estimate of spoil removal." Tr. 1313.

b. Impacts of Limited Dredging Would Likely be SMALL

224. Joint Intervenors' witness, Dr. Hayes, agreed that "a 36,000 cubic yard project is a very small to modest sized dredging project," and that he is not "particularly concerned whether it's 36,000 or 40,000 or 30,000." Tr. 1587.

225. Joint Intervenors' witness, Dr. Young, testified that "the scale of activities would determine the scale of the impacts. And the larger the scale of the activity the larger the surveys or . . . sampling activities that might be required to ensure the distribution of different organisms, would also increase in scale." Tr. 1626.

226. The proposed dredge locations are not likely hotspots for benthic organisms. Dr. Coutant explained that "the habitat or the environmental characteristics of the material that would be dredged, as Captain Scott characterized it, is the sand bars that encroach on the channel. This is very poor habitat for mussels, and . . . they're either rare or not there at all." Tr. 1354. Dr. Coutant concluded based on the evidence that the dredging "probably would have a very small impact on any mussels in this kind of a bottom substrate." Tr. 1356.

227. Dr. Young speculates that without conducting new surveys, it is possible mussels could be present. Tr. 1570 (Young 6.0 Direct at A.12). However Exhibit NRC000005, on which Dr. Young relies, concludes that the sand bars subject to dredging impacts are not good habitat for mussels. *See* Tr. at 1351-1353. In assessing the possible impact on mussels, Dr. Coutant reviewed studies on both the Savannah River and the Pee Dee Rivers. He explained that the Pee Dee study was on a very similar river and was, in his expert judgment, more complete and focused more on habitat issues and was therefore featured more prominently in his analysis. Tr. 1351-1354. His analysis of those reports led him to conclude that "the specific sites to be dredged contain some mussels but are not those habitats where mussels are particularly abundant." Exhibit SNCR20051 at 9.

228. Dr. Coutant explained that the dredging of shallow sandbars would not be expected to affect the robust redhorse, which prefers deep channel habitats where dredging would not occur. Tr. 1364.

229. Relocation of snags and trees on the order suggested by the River Survey would not present significant impacts. Dr. Coutant testified that removing a tree from a navigation channel would not disrupt the habitat of mussels which exist in the deeper portions of the channel. Tr. 1378. Dr. Coutant also explained that the number of trees to be relocated was

not a concern. Tr. 1361-62. Dr. Coutant concluded in his report that "the proposed dredging and snag removal is unlikely to have any major impact on population size of freshwater mussels." Exhibit SNCR20051.

230. Dr. Young urged the Staff to undertake perhaps hundreds of additional "experimental design studies," Tr. 1571 (Young 6.0 Rebuttal at A.10), but there is no basis in the record for requiring such extensive additional studies for purposes of the Staff's analysis.

231. Ms. Kreig testified for the Staff that, based on SNC's testimony and evidence regarding the extent of any potential dredging, she felt confident about her conservative approach of estimating impacts as could be MODERATE, because her conclusion was based on the channel being dredged to nine feet and the testimony indicated that the amount of dredging would be less. Tr. 1547. Dr. Coutant provided a report which concluded impacts from dredging on this scale would be insignificant. "Overall, the impacts of dredging and snag removal operations on the scale suggested in the survey are expected to be localized and not biologically significant on a broad scale of geography or animal populations of the 110 miles of the Savannah River, and should be considered small on the scale of impacts used by the NRC." Exhibit SNCR20051 at 13.

iv. Corps' NEPA Analysis

232. Any impacts of the Corps' dredging will be analyzed in a Corps' NEPA review before dredging takes place.

233. Mr. Bailey testified for the Corps that if the Corps decided to dredge under its authority, it would do its own independent EA according to the Corps' regulations and make its own determination. Tr. 1438.

234. Ms. Kuntzleman testified for the Staff that the Corps prepared an FEIS in 1979 for dredging the Savannah River Federal navigation channel. When considering whether to dredge the channel, either under its own authority or by granting a permit to a private applicant, the Corps will conduct its own NEPA analysis. Tr. 1518.

235. When considering a permit application, the Corps' goal will be to ensure that impacts of dredging are small. Tr. 1520. Ms. Kuntzleman testified that an applicant "may submit an application wanting to do X, but . . . may end up with Y, in order to mitigate impacts." *Id.*

236. Dr. Young testified for Joint Intervenors that he anticipates that "if a particular stretch of river is identified for large scale removal, [the Corps] will probably conduct fish surveys to determine if there is an abundance of robust redhorse or any presence of robust redhorse in that area." Tr. 1615-16.

237. If SNC were to apply for a permit from the Corps to dredge, the Corps would require "a number of items," including sediment testing, and would do their own environmental assessment or impact statement." Tr. 1396.

v. Corps Maintenance of the Savannah River Navigation Channel is Not Connected to the ESP Issuance.

238. The issuance of an ESP by the NRC and the Corps of Engineers' possible efforts to dredge or maintain the Savannah River Federal navigation channel (under either its authority to maintain the channel or through issuance of a permit to a private applicant) are independent actions by separate federal agencies. Each agency has its own NEPA obligations. Tr. 1479 (Staff 6.0 Direct at A.33); Tr. 1438, 1518.

239. The issuance of the ESP by the NRC and activities authorized by that action and the possible maintenance of the Federal navigation channel by the Corps are not

automatically triggered by each other. They can proceed independently and are not mutually dependent on one another for their justification. Tr. 1479 (Staff 6.0 Direct at A.22); Tr. 1291 (Neubert/Scott/Smith 6.0 Direct at A.9); Tr. 1323.

vi. Supplementation Based on New and Significant Information

240. The Staff would address new and significant information regarding cumulative impacts in the COL EIS.

241. Ms. Kuntzleman testified for the Staff that if new and significant information became available after issuance of the ESP, it would be included in the COL EIS. Tr. 1521; *see also* Tr. 1548.

IV. Conclusions of Law

A. Environmental Contention 1.2

1. The FEIS identifies and adequately analyzes impacts of the proposed cooling system on aquatic resources from impingement, entrainment and thermal discharges and satisfies the Staff's NEPA obligation to consider such impacts. The Staff's conclusion that impacts will be SMALL is supported by the analysis and demonstrates that the Staff took the required "hard look" at the impacts to aquatic resources. *See Balt. Gas. & Elec. Co. v. Natural Res. Def. Council*, 462 U.S. 87, 97; *In re La. Energy Servs., L.P.*, (Nat'l Enrichment Facility), LBP-05-13, 61 NRC 385, 403 (2005).

2. The FEIS contains a sufficient amount of information regarding the baseline aquatic species in the vicinity of the Vogtle site, and supports the Staff's conclusion that impacts will be SMALL. The Staff, following the NRC's guidelines in preparing the FEIS (NUREG-1555), appropriately relied on existing studies and data to analyze the baseline aquatic species in the vicinity of the Vogtle site. This is an accepted approach that is consistent with NEPA law and guidelines. *See Edwardsen v. U.S. Dep't of the Interior*, 268 F.3d 781, 785 (9th

Cir. 2000)*; see also Stop H-3 Ass'n v. Dole*, 740 F.2d 1442, 1462-1463. (9th Cir. 1984). The FEIS reflects the Staff's consideration of "an abundance of information" on the general life history of these species. Tr. at 677. SNC's and Staff's witnesses established that the level of detail considered by the Staff was sufficient for a reasonable assessment of likely impacts. The FEIS provided enough information and in sufficient detail "to allow for an evaluation of important impacts." Vogtle ESP March 12, 2007 Order at 257. The FEIS's discussion of baseline aquatic data and conclusions based upon such data are therefore proper. *See In re La. Energy Servs., L.P.* (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 103 (1998).

3. The FEIS contains a thorough discussion of the factors considered by the Staff to assess impacts from impingement, entrainment and thermal discharges. That Joint Intervenors would have preferred the Staff to include additional details "is not, standing alone, probative of the FEIS's adequacy." *In re Hydro Res., Inc.*, LBP-06-19, 64 NRC 53, 80 n.27 (2006).

4. Regarding certain specific elements of the analysis challenged by the Joint Intervenors, the Staff's use of the uniform drift distribution was proper to support its conclusion that impacts to aquatic resources would be SMALL. Simplifying assumptions are appropriate in order to ensure the FEIS focuses on important impacts. Due to the conservative nature of the uniform drift distribution and the added consideration of the plant design, the Staff appropriately relied on available information to support its conclusions. *See In re Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-03-17, 58 NRC 419, 431 (2003).

5. Further, NEPA does not require a site-specific scientific investigation when existing data is available. Rather, because the Staff's initial assessment indicated that

impacts would be SMALL, a more detailed analysis was not warranted and would not have been useful. *See* NUREG-1555 at 2.4.2-2; *Vt. Pub. Interest Research Group v. U.S. Fish & Wildlife Serv.,* 247 F. Supp. 2d 495, 518, 524 (D. Vt. 2002).

6. The range of flows considered by the Staff was proper to support its conclusion that impacts to aquatic resources would be SMALL. NEPA does not require a worst-case analysis. *See Robertson v. Methow Valley Citizens,* 490 U.S. 332 (1989). The Staff's consideration of flows as low as 2000 cfs was more than reasonable, given that the flow at the Vogtle site has only gone slightly below 3800 cfs two days during the entire period of record.

7. The Staff's analysis with respect to consideration of contributions to population decline was adequate to support the conclusion that impacts will be SMALL. Joint Intervenors offered no evidence to support their claim that impingement and entrainment were major contributors of population decline on the Savannah River and that the Staff should have considered this issue more thoroughly. The Staff considered the possible reasons for population decline and found that impingement and entrainment would not contribute a significant added source of mortality. Therefore, the level of detail of the Staff's analysis was consistent with NRC guidelines on preparation of EISs. *See* NUREG-1555 at 2.4.2-2; *Vt. Pub. Interest Research Group v. U.S. Fish & Wildlife Serv.,* 247 F. Supp. 2d 495, 518, 524 (D. Vt. 2002).

8. Additionally, the Staff's assumption of 100 percent mortality of entrained biota was conservative and rendered moot any analysis of larval fish mobility. The Staff reasonably relied on this assumption to analyze impacts to aquatic species. Joint Intervenors offered no credible evidence to support their claim that the cooling system would have an impact on flow variability or that the Staff should have considered such impacts. The Staff was not required to consider such impacts. *See Balt. Gas & Elec. Co.,* 462 U.S. at 100-101. The Staff

reasonably analyzed entrainment impacts by relating them to withdrawal percentages. Moreover, the nature of a cumulative impacts analysis supports the Staff's use of normal withdrawal rate, rather than maximum withdrawal rate, to assess impacts. Because it is not reasonable to assume that maximum withdrawal would occur at all four units simultaneously, the Staff's analysis was proper.

9. In sum, the totality of the information considered by the Staff in assessing impacts to aquatic resources from impingement, entrainment and thermal discharges provides an adequate basis to support the conclusion that impacts will be SMALL, and constitutes the requisite "hard look" required by NEPA.

10. The Board may supplement the record as needed with SNC's post-FEIS studies which confirm the Staff's conclusion that impacts will be SMALL. *Louisiana Energy Servs., L.P.* (Claiborne Enrichment Center), CLI-98-3, 47 NRC at 89.

11. Considering the totality of the information considered by the Staff, as well as the additional information provided by SNC, including the post-FEIS studies, the results of which were not disputed, the analysis of impacts of impingement, entrainment and thermal discharge clearly supports the Staff's conclusion that impacts will be SMALL. The evidence establishes satisfied that the Staff took a "hard look" at these impacts. Applicant has met its burden of persuasion as to Contention 1.2 and the Contention is rejected.

B. Environmental Contention 1.3

13. The mere presence of the shortnose sturgeon and robust redhorse in the Savannah River is not equivalent to their presence at the "Vogtle site" nor does it mean that the area that would be impacted by the operation of the proposed new units contains sensitive areas for these species or that extremely sensitive biological resources are impacted by the proposed

project. *See, e.g.*, *Heartwood*, 380 F.3d 428, 431-32; *Little Lagoon*, 2008 U.S. Dist. LEXIS 66557, at *99-100.

14. Extremely sensitive biological resources means more than that endangered species such as the shortnose sturgeon or non-listed, sensitive species such as the robust redhorse are present in the Savannah River watershed, but instead requires that such species be impacted by alterations of the environment in the vicinity of the proposed cooling system. *See* 66 Fed. Reg. 65,256, at 65,280 and 65,282.

15. The evidence established that there are no "extremely sensitive biological resources," as that term is used in EC 1.3, present in the area of the Savannah River that will be impacted by the proposed Vogtle 3 and 4 intake or discharge facilities. Therefore, 10 C.F.R. § 51.45(b)(3) does not require a more detailed analysis of dry cooling as an alternative to closed-cycle wet cooling than is described in the FEIS. *See* 66 Fed. Reg. at 65,282; *see also Grapevine*, 17 F.3d at 1506 (*citing Burlington*, 938 F.2d at 195)*; Private Fuel Storage*, LBP-03-30, 58 NRC at 479.

16. Dry cooling in the context of proposed AP1000 units at the Vogtle site is not a feasible alternative because (i) it is an unproven, non-existent technology, (ii) would prove impractical for the proposed Vogtle units, (iii) would present unique problems, and (iv) would cause extraordinary costs. Accordingly, discussion of dry cooling beyond that in the FEIS is not required by NEPA or Commission regulations. *See Kelley*, 42 F.3d at 1521 (no need to discuss alternatives which depend on unproven or non-existent technology); *Private Fuel Storage*, LBP-03-30, 58 NRC at 479 ("NEPA does not require the consideration of alternatives that are impractical; that present unique problems; or that cause extraordinary costs."); *see also Entergy*

Corp., 129 S. Ct. 1509-10 (which affirmed the EPA's use of economic considerations in assessing the feasibility of best available cooling technology).

17. The ER and FEIS adequately analyzed dry cooling as an alternative and satisfies the requirements of 10 C.F.R. § 51.45(b)(3). *Vermont Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519, 551 (1978).

18. The evidence presented herein and the portions of the administrative record regarding (i) the presence of and impact on extremely sensitive biological resources, and (ii) the feasibility of an ACC as an alternative cooling system for an AP1000 at the Vogtle site can be used to supplement FEIS through the Board's decision and, in doing so, satisfy the requirements of 10 C.F.R. § 51.45(b)(3). *See In re La. Energy Servs., L.P.* (Nat'l Enrichment Facility), CLI-06-15, 63 NRC 687 (2006), 707 n.91 (adjudicatory findings on NEPA issues, including the related ALSB decision, become part of the environmental 'record of decision' and in effect supplement the FEIS.).

19. Applicant's preferences regarding design issues are entitled to deference in proceedings such as this ESP proceeding. *See In re La. Energy Servs., L.P.* (Nat'l Enrichment Facility), LBP-05-13, 61 NRC 385, 403 (2005); *In re La. Energy Servs., L.P.* (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 103 (1998). Taking into consideration all of the evidence submitted in this proceeding, the finding in the EIS that dry cooling is inferior to closed cycle wet cooling is reasonable. Applicant has met its burden of proof as to EC 1.3 and the contention is rejected.

C. Environmental Contention 6.0

20. The NRC's issuance of an ESP and the Corps' potential dredging of the Savannah River Federal navigation channel are not connected actions. The evidence demonstrated that neither action would "automatically trigger" the other, both actions could

proceed without the other, and both actions are not "together interdependent parts of a larger action" 40 C.F.R. § 1508.25. Further, testimony offered by the Corps' and Staff's witnesses established that neither agency was attempting to "improperly segment" its actions. *Stewart Park and Reserve Coalition, Inc. (SPARC) v. Slater*, 352 F.3d 545, 559-60 (2d Cir. 2003).

21. The Staff's cumulative impacts analysis with respect to dredging the Savannah River Federal navigation channel is adequate. NEPA requires an agency to consider only those impacts that are "reasonably foreseeable." As a legal matter, just because the possibility of dredging can be imagined, or is desired by the Applicant, does not mean that such an activity is more than speculative. "Reasonably foreseeable" does not include impacts that are speculative. *See City of Oxford*, 428 F. 3d at 1353-54. Because any potential dredging project is unknown and undefined, impacts from such dredging are speculative. *Id.*

22. Given that the Staff did not have available information upon which to perform a quantitative analysis of impacts from dredging, the Staff's conclusion that impacts could be MODERATE was conservative. *See* Forty Most Asked Questions Concerning CEQ's [NEPA] Regulations, CEQ, 46 Fed. Reg. 18,026, 18,031 (Mar. 23, 1981); *see also In re La. Energy Servs., L.P.* (Nat'l Enrichment Facility), CLI-05-20, 62 NRC 523, 536 (2005).

23. The Staff was not required to analyze the impacts of additional upstream reservoir releases because such impacts were not "reasonably foreseeable" in the NEPA context. *See City of Oxford*, 428 F. 3d at 1353-54. Rather, the evidence established that no such releases were expected.

24. Even assuming that dredging is "reasonably foreseeable" for purposes of NEPA, the Staff's analysis was consistent with 40 C.F.R. § 1502.22, which requires an agency to state that the information is incomplete or unavailable, state the relevance of the missing

information, summarize the existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts and evaluate such impacts based on theoretical approaches or scientific methods generally accepted in the scientific community. 40 C.F.R. § 1502.22(b). The Staff did this, making clear that, at the time the FEIS was published, such information was lacking. *See* Exhibit NRC000001a, b at 4-27, 7-21.

25. The Board may consider the entire record when evaluating the Staff's analysis. *Louisiana Energy Servs., L.P.* (Claiborne Enrichment Center), CLI-98-3, 47 NRC at 89. SNC presented undisputed evidence that if dredging were to occur, the scope of such dredging would be much less than that assumed by the Joint Intervenors or even by the Staff in the FEIS and impacts from that scope would not be more than MODERATE, and would more likely be SMALL.

26. Should the Corps decide to dredge the Savannah River Federal navigation channel, its action will be subject to a NEPA process.

27. The Board may proceed with issuance of the ESP, despite the unavailability of information related to dredging. *See Sierra Club v. Sigler*, 695 F. 2d 957, 970 (5th Cir. 1983). This Board's issuance of an ESP is not limited by the potential for future information to arise. *See In re Louisiana Energy Servs., L.P.* (Nat'l Enrichment Facility), LBP-06-08, 63 NRC at 286. If new and significant information arises after issuance of an ESP, it would be addressed in the Combined Operating License NEPA analysis. *See* 10 C.F.R. § 52.39(c).

28. The evidence establishes that (1) dredging of the Savannah River Navigation Channel is not reasonably foreseeable at this time; (2) the amount of dredging that would occur if it were to occur is small; (3) the impacts from such a small amount of dredging

would be SMALL; and (4) the Staff's finding that the impacts from dredging in the FEIS would be no more than moderate is conservative and supported by the evidence. Applicant has met its burden as to EC 6 and the contention is rejected.

Respectfully submitted,

(Original signed by M. Stanford Blanton)

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Dated this 24th day of April, 2009.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	**)**	**Docket No. 52-011-ESP**
	)	
Southern Nuclear Operating Company	**)**	**ASLBP No. 07-850-01-ESP-BD01**
	)	
(Early Site Permit for Vogtle ESP Site)	**)**	

SOUTHERN NUCLEAR OPERATING COMPANY'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW REGARDING ENVIRONMENTAL CONTENTIONS

CERTIFICATE OF SERVICE

I hereby certify that copies of SOUTHERN NUCLEAR OPERATING COMPANY'S FINDINGS OF FACT AND CONCLUSIONS OF LAW REGARDING ENVIRONMENTAL CONTENTIONS in the above captioned proceeding have been served by electronic mail as shown below and/or by e-submittal this 24th day of April, 2009.

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