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)	)	**January 9, 2009**

SOUTHERN NUCLEAR OPERATING COMPANY'S
INITIAL STATEMENT OF POSITION ON JOINT INTERVENORS'
ENVIRONMENTAL CONTENTION 1.3 (DRY COOLING SYSTEM ALTERNATIVES)

Pursuant to 10 C.F.R. § 2.1207(a)(1) and the Atomic Safety and Licensing Board's ("ASLB" or "Board") May 7, 2007, July 3, 2008, July 14, 2008, and October 24, 2008 Orders[1], Southern Nuclear Operating Company ("SNC") submits its Initial Statement of Position ("Position Statement") setting forth the legal standards, arguments, witnesses and evidence regarding Environmental Contention 1.3 ("EC 1.3") that SNC will present at the hearing on the contested issues in this proceeding. This Statement is based on the written, prefiled testimony of Dr. Charles C. Coutant, James W. Cuchens, and Thomas C. Moorer, and SNC's Exhibits, which are being filed concurrently herewith. For the reasons set forth below and supported by the attached testimony and evidence, Joint Intervenors' EC 1.3 cannot be sustained.[2]

[1] Memorandum and Order (Prehearing Conference and Initial Scheduling Order), (May 7, 2007); Memorandum and Order (Revised General Schedule), (July 3, 2008); Memorandum and Order (Revised General Schedule), (July 14, 2008); Memorandum and Order (Revised General Schedule) (October 24, 2008).

[2] Joint Intervenors include the Center for a Sustainable Coast, Savannah Riverkeeper, Southern Alliance for Clean Energy, Atlanta Women's Action for New Directions, and Blue Ridge Defense League.

I. INTRODUCTION

EC 1.3 asserts that the Environmental Report ("ER") included with the application for the Early Site Permit ("ESP") in this proceeding failed to adequately analyze a dry cooling system as an alternative to the closed-cycle wet cooling (water-driven) system SNC proposed. 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.

Atomic Safety and Licensing Board, Memorandum and Order ("*ASLB Order*") at app. A (March 12, 2007).

The record in this proceeding, including the written, prefiled testimony and exhibits accompanying this Position Statement, demonstrates (i) that the ER and the Final Environmental Impact Statement ("FEIS") adequately analyze dry cooling as an alternative; (ii) that the area of the Savannah River in the vicinity of the Vogtle site does not have "extremely sensitive biological resources" that are necessary for the maintenance of the shortnose sturgeon or robust redhorse; (iii) that the evidence demonstrates the lack of significant impacts on the shortnose sturgeon and robust redhorse; and (iv) that dry cooling is not a feasible alternative to the standard wet cooling for an AP1000, as specified in DCD Rev. 17, located at the Vogtle site. Moreover, to the extent further analysis is necessary, the evidence presented herein provides sufficient basis for the Board to satisfy 10 C.F.R. § 51.45(b)(3).

As noted above, this Position Statement is supported by written, pre-filed testimony from Dr. Charles C. Coutant ("Coutant 1.3 Testimony"), James W. Cuchens ("Cuchens Testimony"), and Thomas C. Moorer ("Moorer 1.3 Testimony"). Section II of this Position Statement sets forth the procedural background of this proceeding related to EC 1.3. Section III sets forth the applicable legal standards governing contested proceedings, the consideration of environmental

alternatives, and the authority of the Board to supplement the FEIS. Section IV provides an overview of the written, prefiled testimony submitted concurrently herewith. Section V presents SNC's bases for its position with regard to EC 1.3.

II. PROCEDURAL BACKGROUND

Pursuant to 10 C.F.R. Part 52, SNC filed an application for an ESP for two additional units at the existing Vogtle Electric Generating Plant ("Vogtle") site. The 3,169-acre Vogtle site is located on a coastal plain bluff on the southwest side of the Savannah River in eastern Burke County, Georgia. The site is approximately 30 river miles above the U.S. 301 bridge and directly across the river from the Department of Energy's Savannah River Site (Barnwell County, South Carolina). Southern Nuclear Operating Company Vogtle Early Site Permit Application ("Application") Part 1, Section 1. SNC has selected two Westinghouse Electric Company, LLC AP1000 standard reactors as the proposed design to be constructed and operated at the Vogtle site. Application Part 2, Section 1.1.

The Joint Intervenors sought intervention and raised numerous proposed contentions in this proceeding. Of relevance here, 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." *ASLB Order* at 18. The NRC Staff favored admitting a more limited version, namely, "the ER's discussion of alternative cooling technology related to dry cooling in Section 9.4 of the ER fails to consider the environmental and economic benefits of dry cooling over the proposed cooling system." *ASLB Order* at 18. SNC, relying in part on EPA's analysis of the feasibility of dry cooling in the preamble to its regulations under Section 316(b) of the Clean Water Act[3], responded that the ER's treatment of

[3] National Pollutant Discharge Elimination System: Regulations Addressing Cooling Water Intake Structures for New Facilities, 66 Fed. Reg. 65,255, at 65,282 (Dec. 18, 2001).

dry cooling was sufficient and that there was no need for further discussion of the technology in the ER. *ASLB Order* at 20.

The Board, however, admitted the proposed contention but narrowed its scope as explained below. In this regard, the Board rejected the contention to the extent it was based on an asserted failure of the ER to address the "no-action alternative." *ASLB Order* at 19. Further, the Board thought that it was appropriate for SNC to rely on EPA's findings on the lack of feasibility of a dry cooling system and the uneconomically-high cost, in terms of energy efficiency and dollars, the system would entail. *Id*. at 19-20. However, the Board pointed out that the EPA had not rejected dry cooling in all cases. In particular, the Board quoted the EPA regulations as:

> no[t]. . . disput[ing] that dry cooling may be the appropriate cooling technology for some facilities. This could be the case in areas with limited water available for cooling or water bodies with extremely sensitive biological resources (e.g., endangered species, specially protected areas).

Id. at 20 (*quoting* 66 Fed. Reg. at 65,282).

The Board noted that Joint Intervenors "have asserted there are extremely sensitive resources present in the Savannah River in the vicinity of the Vogtle facility," citing the alleged presence of the shortnose sturgeon and robust redhorse. *ASLB Order at 20*. The Board concluded that whether such species are present and whether their presence alone makes the area in question a water body with "extremely sensitive biological resources" were material, factual and legal disputes, and that "If the Vogtle site thus contains these extremely sensitive resources, it is *arguable* that, consistent with this EPA analysis, applicant SNC should be required to conduct *further analysis as to whether*, considering the present sensitive species and other pertinent factors, *dry cooling is appropriate for the Vogtle site*." *Id.* at 20-21 (emphasis added).

On September 10, 2007, the NRC Staff issued its Draft Environmental Impact Statement ("DEIS") in this proceeding. On August 14, 2008, the NRC Staff issued the FEIS. NUREG-1872, "Final Environmental Impact Statement for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site" (August 2008) (Exhibit NRC000001). Chapter 9 of the DEIS and FEIS discuss alternatives to SNC's proposal and provides analysis of the benefits and environmental impact, costs, and feasibility of dry cooling beyond that contained in the ER. Nevertheless, the DEIS and FEIS conclude, as does the ER, that dry cooling is not a reasonable alternative for the proposed additional Vogtle units. FEIS, Section 9.3.2.

The NRC Staff prepared a Biological Assessment pursuant to Section 7 of the Endangered Species Act ("ESA") and submitted the same to the National Oceanic and Atmospheric Administration ("NOAA") in January 2008. In doing so, NRC Staff requested a concurrence from the National Marine Fisheries Service ("NMFS") on its findings in the DEIS with regard to the shortnose sturgeon. Coutant 1.3 Testimony at 9-10. The NMFS is the designated authority for the shortnose sturgeon because the species is migratory from marine waters into coastal rivers and thus under marine protection (strictly fresh water species would be under the jurisdiction of the US Fish and Wildlife Service). Coutant 1.3 Testimony at 10. 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, pp. 3-4 ("NMFS Letter").

III. APPLICABLE LEGAL STANDARDS

A. Contested Hearings

The Board reviews contested issues *de novo*, applying the same substantive standard applicable to the NRC Staff's NEPA review. "[W]hen resolving contentions litigated through

the adversary process, [boards must] bring their own 'de novo' judgment to bear. In such cases, boards must decide, based on governing regulatory standards and the evidence submitted, whether the applicant has met its burden of proof (except where the NRC Staff has the burden)." *Exelon Generation Company, LLC, et al*., CLI-05-17, 62 NRC 134, at *18 (2005). 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 of Louisiana Energy Servs., L.P*. (Claiborne Enrichment Center), LBP-97-8, 45 NRC 367, 373 (1997), *rev'd in part on other grounds, Louisiana Energy Servs., L.P. (Clairborne Enrichment Center)*, CLI-98-3, 47 NRC 77 (1998). Thus, SNC and the NRC Staff share the burden of demonstrating that the EIS complies with NEPA.

When the adequacy of the NRC 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.'" *In re Louisiana Energy Servs., L.P.* (National Enrichment Facility) ASLBP 04-826-01-ML, 61 NRC 385, 403 (2005) (internal citations 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." *Baltimore Gas & Elec. Co. v Nat. Res. Def. Council*, 462 U.S. 87, 97 (1983). As the Supreme Court has held, Congress authorized agencies to adopt "an appropriate method of conducting the hard look" required by NEPA. *Id.* at 100-101. 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's 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 of Hydro Resources, Inc. (P.O. Box 777, Crownpoint, New Mexico 87313), ASLBP 95-706-01-ML, 64 NRC 53, 80 n.27 (2006) (internal citations omitted).

In other words, the "hard look" requirement is tempered by a "rule of reason." *See La. Energy Servs.*, 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 Nat. Res. Def. Council, Inc. v. Kleppe, 429 U.S. 1307, 1311 (1976) (*citing Nat. Res. Def. Council v. Calloway*, 524 F. 2d 79, 88 (2d Cir. 1975)). More generally, the Council on Environmental Quality ("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). "NEPA does not call for certainty or precision, but an *estimate* of anticipated (not unduly speculative) impacts." *Louisiana Energy Servs.*, L.P., LBP-06-08, 63 NRC 241, 259 (2006), (*citing In re Louisiana Energy Servs.*, L.P., CLI-05-20, 62 NRC 523, 536 (2005)).

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." *Vermont Pub. 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 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." *Id.* 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 Envtl. Council v. U.S. Dep't. of Transp.*, 159 F. Supp. 2d 260, 275-76 (W.D. Va. 2001) (holding that forty page discussion of environmental consequences and studies performed in the FEIS 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"). Rather, an FEIS "shall be kept concise and shall be no longer than absolutely necessary to comply with NEPA." *Piedmont*, 159 F. Supp. 2d at 275 (citation omitted). "[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) (citation omitted).

B. Consideration of Alternatives

The regulatory basis for EC 1.3 is that the ER and the subsequent NEPA evaluation by the NRC Staff do not satisfy 10 C.F.R. § 51.45(b)(3). 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).

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); *In re Long Island Lighting Company (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).

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.

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. Therefore, an agency is not constrained by NEPA from deciding that other values (such as economic considerations) outweigh environmental issues. *Robertson v. Methow Valley Citizens Council ("Roberston"),* 490 U.S. 332, 350 (1989).

C. The Board's Decision Supplements and Amends the FEIS

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., Louisiana Energy Servs.,* CLI-06-15, 63 NRC at 707 n.91 ("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."). 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 395, 404. Thus, the Board may consider the full record before it, including the testimony attached hereto, 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 Southern Nuclear Operating Company*, 52-011-ESP, 65 NRC 237, 277 (2007).

IV. SNC'S WITNESSES

SNC's written, prefiled testimony on EC 1.3 will be presented by the following witnesses:

A. Dr. Charles Coutant

Dr. Coutant is a scientist with a Ph. D. in Biology who has conducted thermal effects and other cooling water studies since 1959. He also has extensive experience researching impacts to aquatic resources from entrainment and impingement. Dr. Coutant participated in the preparation of the NRC's rules implementing NEPA and has been participating in NEPA EIS preparations since 1971. Dr. Coutant has nearly fifty (50) years' experience conducting thermal effects and other cooling water studies. Coutant 1.3 Testimony at 1-3.

Dr. Coutant testifies that the area of the Savannah River in the vicinity of the Vogtle site does not have "extremely sensitive biological resources" that are necessary for the maintenance of the shortnose sturgeon or robust redhorse and that the shortnose sturgeon and robust redhorse will not be impacted by the proposed cooling system. He also testifies regarding the adequacy of the FEIS. Coutant 1.3 Testimony at 3.

B. James W. Cuchens

Mr. Cuchens is Principal Engineer for Southern Company Generation Engineering and Construction Services (SCG Engineering) in Birmingham, Alabama. He earned a B.S. degree in Mechanical Engineering from Mississippi State University in 1973 and holds professional engineering licenses in Alabama (PE # 13752), Florida (PE # 37700), Georgia (PE # 16164), and Mississippi (PE # 09905). Mr. Cuchens 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. 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. With regard to cooling, he 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 Testimony at 1-3.

Mr. Cuchens testifies regarding the feasibility of dry cooling technology for the Vogtle 3 and 4 nuclear units and sponsors "Feasibility of Air-Cooled Condenser Cooling System for the Standardized AP1000 Nuclear Plant" ("Revised Report") (Exhibit SNC000024). He also responds to specific assertions in the Declaration of Mr. Bill Powers, which supported the Joint

Intervenors' Answer Opposing SNC's Motion for Summary Disposition ("Joint Intervenors MSD Answer"). Cuchens Testimony at 3.

C. Tom Moorer

Mr. Moorer is employed by SNC as the Project Manager for Environmental Support. He has over 30 years of experience in the environmental field, including 18+ years of experience in environmental engineering, licensing, and regulatory compliance in nuclear power. Mr. Moorer testifies regarding the environmental issues associated with and potential adverse impacts to land and wildlife resources that would arise if a dry cooling system is utilized at Vogtle Units 3 and 4. Based on these impacts, Mr. Moorer testifies that dry cooling is not a feasible alternative for Vogtle Units 3 and 4 and that wet cooling should be used at the Vogtle site. Moorer 1.3 Testimony at 1-3.

V. SNC'S STATEMENT OF POSITION

As demonstrated by SNC's witnesses, the analysis contained and conclusions reached in the FEIS are adequate, reasonable and more than satisfy the NRC Staff's NEPA responsibilities. The FEIS clearly evidences that the NRC Staff took the required "hard look" at the relevant environmental consequences and Joint Intervenors have failed to demonstrate how the inclusion or consideration of more information was required or could have affected the NRC Staff's ultimate conclusions. Specifically, SNC's position on the merits of EC 1.3 is: (A) the NRC Staff's NEPA evaluation of dry cooling is adequate because (i) the area of the Savannah River in the vicinity of the Vogtle site does not have "extremely sensitive biological resources" that are necessary for the maintenance of the shortnose sturgeon or robust redhorse; and (ii) the evidence demonstrates the lack of significant impacts on the shortnose sturgeon and robust redhorse; and

(B) dry cooling is not a feasible cooling alternative for proposed Vogtle Units 3 and 4 and, therefore, no further analysis is required.

Alternatively, to the extent the Board determines that further analysis is necessary, the evidence submitted in support of SNC's position provides a sufficient record for the Board to satisfy 10 C.F.R. § 51.45(b)(3) by augmenting the analysis of dry cooling contained in the FEIS and to make the requisite baseline findings required by Section 102 of NEPA. *See Louisiana Energy Services, L.P.* (National Enrichment Facility), CLI-06-15, 63 NRC 687, 707 n.91 (2006) (stating that adjudicatory findings on NEPA issues, including the *ASLB* decision, become part of the environmental "record of decision" and in effect supplement the FEIS); *In the Matter of Dominion Nuclear North Anna, LLC*, LBP-07-09, 65 NRC 539, 559 n. 32 (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))). 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. *Dominion Nuclear North Anna*, LBP-07-09, 65 NRC at 559-560 *(citing* 10 C.F.R. § 51.105(a)(1)-(3)).

A review of the entire record demonstrates that the NRC Staff's FEIS meets the requirements of 10 C.F.R. Part 51; therefore, Joint Intervenors' EC 1.3 cannot be sustained.

A. The ER and FEIS Adequately Analyze Dry Cooling As An Alternative

EC 1.3 is based on the Board's observation that it was at least "arguable" that dry cooling should be analyzed *in more detail* than as set forth in the ER "[*i]f* the Vogtle site . . . contains . . . extremely sensitive resources." *ASLB Order* at 20 (emphasis added). As noted in Section II

above, the FEIS presents such further 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.

FEIS, Section 9.3.2.

The conclusion in the FEIS regarding dry cooling is not perfunctory, or based merely upon the analysis by the EPA in the rulemaking cited in the ER, but fully discusses 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.[4] Accordingly, regardless of whether there are extremely sensitive biological resources in the vicinity of the Vogtle site, the analysis of dry cooling in the FEIS is adequate under 10 C.F.R. § 51.45(b)(3).

1. The Area of the Savannah River in the Vicinity of the Vogtle Site Does not have Extremely Sensitive Biological Resources Necessary for the Maintenance of the Shortnose Sturgeon or Robust Redhorse.

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

[4] *See* FEIS, Section 9.3.2 ("[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.").

the shortnose sturgeon and the robust redhorse[5]). *See ASLB Order* at 20-21. Joint Intervenors' reliance on the alleged presence of "extremely sensitive biological resources" is drawn from the preamble of the final rule for Section 316(b) of the Clean Water Act ("CWA"), which governs cooling water intake structures at new electricity generation facilities. *See* 66 Fed. Reg. 65,255, 65,282. In the preamble, the EPA clearly 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.

> 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.*

However, the EPA stated 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[6] or *waterbodies with extremely sensitive biological resources* (*e.g.*, endangered species, specially protected areas)." *Id.* (emphasis added).

Based on the passage above and Joint Intervenors' allegation that "the Savannah River is host to extremely sensitive biological resources," the Board stated that "*If the Vogtle site thus contains* these extremely sensitive resources, it is arguable that, consistent with this EPA analysis, applicant SNC should be required to conduct further analysis as to whether, considering

[5] The robust redhorse is not listed as an endangered species under the ESA, but its recovery is under supervision of an interagency Robust Redhorse Conservation Committee formed by Memorandum of Agreement in accordance with Section 4(b)(1)(A) of the ESA. Coutant 1.3 Testimony at p. 7.

[6] 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." FEIS, Section 5.3.2.1.

the present sensitive species and other pertinent factors, dry cooling is appropriate for the Vogtle site." *ASLB Order* at 21 (emphasis added). Accordingly, whether sensitive resources are actually present at the Vogtle site is at issue and, if so, whether their presence alone mandates a more detailed analysis of dry cooling under 10 C.F.R. § 51.45(b)(3) and the "Rule of Reason."

Unfortunately, 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. at 65,282. The Board itself acknowledged this in stating, "The EPA has not defined the term 'extremely sensitive biological resources,' other than to offer two examples, 'i.e., endangered species and specifically protected areas.'" *ASLB Order* at 21 (quoting 66 Fed Reg. at 65,282). As explained by Dr. Coutant, 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 that they are sensitive to alterations of the environment in the vicinity of the proposed cooling system. Stated differently, the proposed cooling system would have to pose significant risks to these species. Coutant 1.3 Testimony at 4-5.

There is no dispute that the shortnose sturgeon and robust redhorse have been located in some portions of the Savannah River. However, the mere presence of these species 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 any sensitive areas for these species or that extremely sensitive biological resources are impacted by the proposed project. *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 Mice critical habitat being nearby and their migration into project construction area having been predicted).

In fact, the evidence submitted herein demonstrates 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* Coutant 1.3 Testimony at 4-5; 8-9. Dr. Coutant testifies 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. Coutant 1.3 Testimony at 4-5; FEIS, Sections 5.4.2.6 and 5.4.3.2. Moreover, to the extent that individual specimens from these species have been found in the Savannah River near the Vogtle site, 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. Coutant 1.3 Testimony at 5-7.

Moreover, the very fact that successful spawning occurs consistently many miles upstream of the existing Vogtle 1 and 2 intake and discharge facilities indicates that there is an effective zone of passage for pre-spawning adults moving upstream, spawned adults moving downstream, and juveniles moving downstream. *Id*. 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. *Id*. at 4-5; 8-10. Given that the Vogtle 3 and 4 intake and discharge structures are similarly designed and closely located to that of Vogtle 1 and 2, the Vogtle 3 and 4 facilities would likewise not be in and

would not compromise any extremely sensitive biological resources (which is clear from the entrainment and impingement study conducted by SNC in spring 2008 – none of these species have been collected). *Id.* at 6; Exhibits SNC000004 and SNC000005.

Accordingly, the evidence establishes 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 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. On this basis, EC 1.3 should be rejected in its entirety.

2. The Evidence Demonstrates the Lack of Significant Impacts on The Shortnose Sturgeon and 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. FEIS, Section 9.3.2. With regard to the shortnose sturgeon, the FEIS finds 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) that the design of the intake structure inhibits entrainment and impingement. FEIS, Sections 2.7.2.1-2, 5.4.2.2, and 9.3.2. The FEIS concludes that the "overall impact on aquatic resources of operating the proposed VEGP Units 3 and 4 . . . would be SMALL[.]" FEIS, 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. FEIS, Section 5.4.3.2.

The potential impacts of the closed-cycle cooling system on the robust redhorse are also addressed by the FEIS. FEIS, 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 states that "the potential for impact to the State Listed robust redhorse from entrainment, impingement, and thermal or chemical discharges would be minor." *Id*.

NRC Staff's findings regarding the shortnose sturgeon have been confirmed by NMFS – the designated authority for this species. *See* NMFS Letter (Exhibit SNC000022). After its independent analysis of the potential impacts to the shortnose sturgeon, the NMFS found that the proposed addition of Vogtle 3 and 4 is not likely to adversely affect the shortnose sturgeon and that there is no designated "critical habitat" in or near the project area. 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." NMFS Letter, 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[.]" NMFS Letter, 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.*

The evidence submitted by SNC in support of this Position Statement supports the findings in the FEIS and NMFS Letter. Dr. Coutant studied the literature on these species, including scientific studies, agency status reports, and management plans. His findings and

opinions are fully consistent with the FEIS and NMFS determination. Dr. Coutant determined that the Savannah River at the Vogtle site does not contain critical habitat for either the shortnose sturgeon or robust redhorse and that the proposed project will not affect the spawning grounds of these species. Moreover, Dr. Coutant concluded that because the intake and discharge structures of Vogtle 1 and 2 are not located within and do not compromise any extremely sensitive biological resources, the similarly-designed intake and discharge for Vogtle Units 3 and 4 would not likely be in and compromise any extremely sensitive biological resources. Coutant 1.3 Testimony at 4-6, 10.

As discussed above, the evidence establishes the absence of adverse impacts on "endangered species" or "specifically protected areas" in the area of the Savannah River that would be significantly impacted by proposed Vogtle Units 3 and 4. Therefore, a more detailed analysis of dry cooling as an alternative than that contained in the FEIS is not warranted. Coutant 1.3 Testimony at 8. Moreover, the FEIS and the administrative record demonstrate that NRC Staff considered the issues about which the Joint Intervenors complain and prove that the NRC Staff satisfied both the NEPA requirement to take a "hard look" at the environmental consequences of the proposed closed-cycle wet cooling system and to conduct an analysis of dry cooling as an alternative. *Id.*; s*ee Robertson*, 490 U.S. at 333 (stating "the EIS requirement and NEPA's other 'action-forcing' procedures implement that statute's sweeping policy goals by ensuring that agencies will take a 'hard look' at environmental consequences"); *Marsh v. Oregon Nat. Res. Council*, 490 U.S. 360, 374 (1989) (NEPA requires an agency "to provide a statement of reasons which demonstrates that it took a 'hard look' at the relevant evidence."). Accordingly, the preponderance of the evidence establishes that analysis of dry cooling in the FEIS satisfies the requirements of 10 C.F.R. § 51.45(b)(3). *Exelon*, CLI-05-17, 62 NRC 134, at

*18 (stating the Board must "when resolving contentions litigated through the adversary process . . . bring their own 'de novo' judgment . . . [and] must decide, based on governing regulatory standards and the evidence submitted, whether the applicant has met its burden of proof."). The information in the FEIS clearly provides an adequate basis for the Board to "consider the final balance among conflicting factors contained in the record of the proceeding with a view to determining the appropriate action to be taken." *Dominion Nuclear North Anna*, LBP-07-09, 65 NRC at 559 (citing 10 C.F.R. § 51.105(a)(2)).

B. Dry Cooling Is Not Feasible For Vogtle 3 And 4 and, Therefore, Need Not Be Analyzed In Detail Under NEPA.

The extent to which an alternative must be evaluated under NEPA depends on whether such alternative is reasonable, which is assessed based on many factors with the most basic one being feasibility. *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."); *Grapevine*, 17 F.3d at 1506 (Rule of Reason limits not just the "range of alternatives" an agency must discuss, but also "the extent of which [the agency] must discuss them"); *Private Fuel Storage*, LBP-03-30, 58 NRC at 479 (discussion of alternatives need not include "every possible alternative, but every reasonable alternative"). In the next sections, SNC demonstrates that dry cooling is not a feasible alternative given the limitations of current state-of-the-art dry cooling technology with respect to its implementation on large nuclear power plants, including the AP1000 design. SNC also shows 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, incur prohibitive costs, and cause harm to the environment. *See Center*, 473 F.3d at 682-83; *Midcoast*, 198 F.3d at 967; *Shoreham*, CLI-90-8, 32 NRC at 206 ("[T]here is no need to consider

alternatives of speculative feasibility[.]"); *see also Kelley*, 42 F.3d at 1521 (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); *ASLB Order* at 19 ("[T]he staff's regulatory guidance instructs applicants to include alternatives that 'although not necessarily economically attractive, . . . are based on feasible technology available to the applicant during the design state.'") (citing Regulatory Guide 4.2 at 10-1)). Based on these facts, SNC submits that NEPA's "Rule of Reason" does not require an evaluation of dry cooling at the Vogtle site, certainly not beyond the discussion already included in the FEIS. *See 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.") (citations omitted)).

1. The Standard Cooling Design for the AP1000 and Current Dry Cooling Technology Are Fundamentally Different.

a. Standard Cooling Design for the AP1000

In the standard design of the AP1000, 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. In the closed-cycle wet cooling design of the AP1000, the steam leaves the turbine and goes to a steam surface condenser, 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. 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 flowing through the tower under motive force provided by mechanical fans or natural convection 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. Both circuits recirculate in a continuous process. During this process, the exhaust steam condensing in the condenser exerts a backpressure[7] on the turbines. Cuchens Testimony at 3-4.

b. Dry Cooling System Characteristics

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 air cooled condenser ("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 (in effect, a dry cooling system functions like a giant automobile radiator). 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. Just as with a wet-cooled system, the condensing steam in an ACC exerts a backpressure on the steam turbine. Cuchens Testimony at 4.

The chief governing design characteristic of an air cooled condenser used in a dry cooling system is the Initial Temperature Difference ("ITD"), which 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. Higher backpressure, in turn, limits the efficiency and operability of the turbine. Cuchens Testimony at 7.

[7] During the cooling process 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 which is often referred to as "backpressure" inside a steam condenser and turbine exhaust. Typically, the lower the backpressure (or vacuum), the better turbine performance will be because the lower the pressure, the less restriction is being placed on the turbine exhaust flow. It is similar to an automobile's exhaust system. If you obstruct the exhaust system by placing a tennis ball in the exhaust pipe, the engine's performance will be adversely affected. If that tennis ball is removed, the vehicle's performance will improve. Cuchens Testimony at 4.

2. Current ACC Designs Are Incompatible With The Standard AP1000 Turbine.

For optimum plant efficiency, the standard design for the AP1000 specifies a multi-pressure turbine generator 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. Therefore, the cooling system must allow the AP1000 to operate at the average 2.92" HgA backpressure in order to achieve its designed megawatt output. 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 exceeds the functional operational limit of the AP1000 turbine. Cuchens Testimony at 6.

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 ITD. Specifically, the state-of-the-art ACC is designed with an ITD of around 40° F. While there have been a few ACCs built in the United States with an ITD of 35° F, no manufacturer of ACCs has successfully designed or built an ACC with a lower ITD. 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. This is much higher than the 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). Any rise above 4.5"

HgA would put the turbine near or above its alarm point and at risk of tripping.[8] Given this risk, an AP1000 unit at Vogtle would not be able to operate at full rated power in a reliable manner any time the inlet air temperature to the ACC was greater than 95º F.[9] Cuchens Testimony at 6-7, 23-24.

The technological limits on dry cooling are, in part, responsible for the fact that ACCs in the United States have typically been employed in connection with smaller turbines used in combined cycle generating units (which operate at higher design backpressures), and not the much larger baseload plants such as the AP1000. Cuchens Testimony at 10-11. Joint Intervenors claim that the AP1000 could use such smaller higher-backpressure turbines (rated to 8.0" HgA) to accommodate dry cooling.[10] This is not possible because single stage high backpressure turbines are not able to pass the steam flow specified in the AP1000 thermal cycle (the AP1000 turbine is a triple exhaust, six flow low pressure turbine).[11] Regardless of its cooling system design, an AP1000 unit must use a multi-exhaust turbine and a large, multi-exhaust turbine that is capable of safely operating at elevated backpressures has never been designed or manufactured anywhere in the world. Cuchens Testimony at 7-11.

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[8] Steam turbines are designed to trip off line to prevent damage to the turbine if the exhaust backpressure rises above a certain set point. The turbine trip point for the AP1000 design was assumed to be at a backpressure of 6.0" HgA with an alarm set point at 5.0" HgA, above which continuous unit operation is not permissible. Cuchens Testimony at 6.

[9] Moreover, even if the AP1000 unit could be maintained in a stable condition below the trip point, the increase in backpressure associated with using an ACC would result in a loss of approximately 55 MW out of the generator as compared to operation at the current design backpressure of 2.92" HgA. Cuchens Testimony at 6-7, 23-24.

[10] Joint Intervenors MSD Answer at p.4-5. Joint Intervenors reference the GE single-exhaust, dual-flow turbine designed for "Medium Fossil Applications," which is clearly not comparable to the significantly larger and more complex turbine specified in the DCD for the AP1000 nuclear unit located on the Vogtle site. Exhibit SNC000030; Cuchens Testimony at 10.

[11] The use of a turbine designed to allow for operation at higher backpressure limits than those of the current turbine design would also be a dramatic departure from the Toshiba turbine incorporated in the standard AP1000 unit as specified in DCD Rev. 17 and would require revisiting the portions of the DCD performance and safety analyses that are based upon the currently proposed steam turbine design. Cuchens Testimony at 6, 28.

Joint Intervenors cite certain examples of generating units that utilize dry cooling in an effort to support their assertion that dry cooling is a feasible alternative for the AP1000, but these examples are not germane. Joint Intervenors reference the Midlothian plant in Texas, which they allege has the same capacity as the AP1000 and uses dry cooling. *See* Joint Intervenors MSD Answer ¶ 12. Ironically, while the total capacity of the Midlothian plant is 1,650 megawatts (slightly higher than that of Vogtle 3 or Vogtle 4), this capacity is comprised of six separate units of 275 megawatts each.[12] Therefore, no relevant comparison can be made between a Midlothian unit and an AP1000 unit at Vogtle (*i.e.*, comparing six small single stage high backpressure turbines to a single large standard backpressure turbine).[13] To be relevant, any comparison must include dry cooled units of equal size with similar turbine cycles rather than a group of small units compared to a single large unit. In fact, the Midlothian plant is a perfect example of the expected application of ACCs in the context of smaller generating units with higher backpressure turbines. Cuchens Testimony at 11-12. Joint Intervenors have also suggested that the Palo Verde nuclear plant in Arizona utilizes dry cooling, but this suggestion is incorrect. *See* Cuchens Testimony at 10; Powers Declaration at ¶ 9. As demonstrated by Mr. Cuchens' testimony and the information describing the Palo Verde cooling system on the plant's web page, Palo Verde's turbines utilize wet cooling using treated wastewater pumped from the City of Phoenix.[14]

[12] *See* Exhibit SNC000033; Cuchens Testimony at 11-12.

[13] Likewise, Joint Intervenors' comparison of a 515 MW coal-fired unit located in Wisconsin, which would not use a multiple exhaust turbine, and the triple-turbine AP1000 nuclear unit is not relevant**.** *See* Joint Intervenors MSD Answer, Powers Declaration at Attachment C.

[14] *See* Palo Verde Nuclear Generating Station, www.pnm.com/systems/pv.htm (last visited Jan. 6, 2009) (Exhibit SNC000031).

3. Design Changes to the AP1000 Necessary to Achieve Compatibility with Dry Cooling Are Not Feasible.

In order to facilitate even *theoretical* operation of the AP1000 with a dry cooling system, extensive and costly design changes to the AP1000's turbine island would be required, including changes to the turbine building and turbine pedestal.[15] SNC would also be required to design a new support system for the six feedwater heaters or relocate them and the associated piping to a different location within the turbine building. Cuchens Testimony at p. 26. Finally, the sheer size of an ACC system may dictate a change in the entire plant layout given the acreage necessary for a dry cooling system. Moorer 1.3 Testimony at 4. These changes would be required in any scenario where an ACC is utilized with the Vogtle 3 and 4 units. These substantial design changes, coupled with the fact that ACC technology is unproven for application with the AP1000, further demonstrate that the use of an ACC is not feasible and does not warrant further analysis. *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.")

Requiring SNC to utilize an ACC and make the design changes described above would also run counter to the purpose underlying the Commission's policy of developing and utilizing standard plant designs. 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. *See*

[15] Redesign of the turbine pedestal alone would affect many other aspects of the plant. DCD Rev. 17 reports in Section 10.2.2.1 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. Cuchens Testimony at 27.

Final Statement on Policy of Conduct of New Reactor Licensing Proceedings, 73 Fed. Reg. 20,971 (April 17, 2008) (*citing* 10 C.F.R. § 52.63 (2006)). Even if SNC were able to design the hypothetical dry cooling system that Joint Intervenors suggest, SNC would need to: (i) revise the standard plant design; (ii) redesign the entire turbine building structural support system; and (iii) require the development of a new site safety analysis report. With regard to the standard plant design, substantial engineering and redesign efforts would be required and this would result in additional equipment and material costs. As described above, the turbine building, turbine pedestal, feed water heaters and associated piping would need to be redesigned, relocated and/or re-routed. Consequently, any benefits of standardization, such as standardized licensing, procurement, construction, and operation, between Vogtle 3 and 4 and other AP1000 units would be lost or seriously compromised, which further demonstrates that dry cooling is not a feasible alternative. Cuchens Testimony at 4-5; s*ee Private Fuel Storage*, LBP-03-30, 58 NRC at 479.

4. Even if Possible to Design and Construct, a Dry Cooling System Would Result in Significant Harm to the Environment, Prohibitive Expenditures and Decreased Efficiency and Capacity.

a. Harm to the Environment

An ACC designed to operate in conjunction with the AP1000 standard turbine would be extremely large and require SNC to clear more than half a linear mile by 300 feet – an area equivalent to seven football fields – just to accommodate the ACC structure for ***each*** Vogtle unit. *See* Exhibit SNC000024, p. 19. 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 total land use needs for two ACC systems at the Vogtle site is estimated at 250 acres. Moorer 1.3 Testimony at 5, 6-8; Exhibit SNC000040. This additional acreage would also cause substantial harm to the environment as compared to the proposed closed-cycle wet cooling system. The 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* Exhibit SNC000040. Moreover, the ACCs may require the filling of existing bodies of water on the site. Specifically, Mallard Pond may have to be removed to construct the dry cooling system. Finally, given the size of an ACC, the installation of dry cooling at the Vogtle site would have substantial adverse aesthetic impacts. *See* Moorer 1.3 Testimony at 5-6, 8; Exhibit SNC000040; Application, Part 3, Section 2.3.1.1; FEIS, Section 9.3.2.

b. Prohibitive Expenditures

As stated earlier, SNC is not aware of a low backpressure turbine that would reliably operate with a current state-of-the-art ACC system. Moreover, the current limits of ACC technology prevent construction of an ACC that would adequately lower the backpressure. However, using ratios of numbers generated from manufacturer curves for much smaller ACCs, SNC has determined that if such a unit could be designed and built that replicates the performance of a wet cooling system on an AP1000 unit, the estimated cost of construction of such an ACC (excluding cost of large steam ducts, condensate tanks/pumps, foundations, and associated vacuum systems) 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).[16]

None of these costs include any additional engineering or construction costs associated with required design changes to the turbine island and the significant losses of electrical output

[16] Designing and constructing an ACC to operate at a higher backpressure than the current design but still below the AP1000 turbine alarm point at design conditions would cost approximately $420,000,000 more than the wet cooling system, but as described herein, such an ACC would cause serious reliability issues and substantially decrease the output of the units. Cuchens Testimony at 17-18, 21-23.

due to the inordinately large number of fans employed with an ACC of this size. Additionally, an ACC would cost significantly more to maintain and operate over the life of the plant than a wet system.[17] These additional capital, maintenance and operating costs, especially in view of the speculative viability of the technology as applied to an AP1000 in Georgia, render dry cooling infeasible. Cuchens Testimony at 17-18, 21-23; *see Private Fuel Storage*, LBP-03-30, 58 NRC at 479.

c. Decreased Efficiency and Capacity

As described above, utilizing a current state of the art ACC with the large, low backpressure turbines in general use in nuclear power plants today would result in significant decreases in capacity and efficiency. Specifically, the increase in backpressure associated with using the current state-of-the-art ACC with the AP1000 turbine (as compared to a wet cooling system) would result in a loss of output of approximately 55 MW per unit and an additional consumptive power demand of 9-15 MW per unit, which would be a net loss of 64-70 MW per unit compared to the standard AP1000 plant.[18] Based on the increased costs described above, constructing such a unit would cause the citizens of Georgia to spend an additional $420,000,000 on the two units and, in return, have less reliable units that produce 130 MW less electricity. Cuchens Testimony at 23-24.

[17] "Both direct and indirect dry cooling systems. . .are larger and mechanically more complex than corresponding wet cooling systems. . . . [D]ry and hybrid cooling systems will have more fans, meaning more electrical motors, gearboxes and drive shafts. As such, labor requirements for a large ACC can be substantial. At one site with a 60-cell ACC. . . the maintenance staff was increased by two people for such activities as cleaning fan blades and heat exchanger tube fins, monitoring lube-oil systems, and leak-checking the vacuum system." Exhibit SNC000034, W. C. Micheletti & J.M. Burns, Emerging Issues and Needs in Power Plant Cooling Systems from the National Energy Technology Laboratory "Electric Utilities and Water: Emerging Issues and R&D Needs" Workshop at 5 (2002)
(available at: http://www.netl.doe.gov/publications/proceedings/02/EUW/Micheletti_JMB. PDF).

[18] All references to "MW" or "megawatts" are MWe.

Assuming an ACC could be designed and constructed to replicate the performance of a wet cooling system on an AP1000 unit at the Vogtle site and thus not suffer the degradation described above, the size of this ACC unit would nonetheless affect the net output by increasing the consumptive power demand by anywhere from 27-33 MW per unit over that of a wet cooling system. This, as mentioned in the previous section, is theoretical given that there is no such ACC today and the likelihood of designing and building such an ACC is remote. Nevertheless, designing and constructing such an ACC would cause the citizens of Georgia to spend almost $700,000,000 more than if the units are built with a wet cooling system and such units would be less reliable and produce approximately 60 MW less electricity. Cuchens Testimony at 19.

As demonstrated above, the speculative nature and incompatibility of an ACC with a large baseload plant such as the AP1000 show that dry cooling is not a feasible alternative to the proposed closed-cycle wet cooling system. Moreover, application of dry cooling to the AP1000 creates unique problems because the requisite ACC technology is unproven and would result in prohibitive costs and significant impacts to the environment. Moreover, the combination of these extraordinary costs and the reduction in capacity and efficiency would force the citizens of Georgia to pay considerably more money for much less electricity and lower reliability. Accordingly, a detailed discussion of dry cooling is unnecessary in the NEPA analysis of a new AP1000 unit at the Vogtle site. *See 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"); *Shoreham*, CLI-90-8, 32 NRC at 206 ("[T]here is no need to consider alternatives of speculative feasibility[.]") Notwithstanding, the discussions of these factors in the ER and FEIS are certainly adequate, given the admonition that the rule of

reason governs both which alternatives the agency must discuss, and the extent to which it must discuss them. *Grapevine*, 17 F.3d at 1506.

C. The Board's Decision Becomes Part of the FEIS and Therefore Can Resolve Any Inadequacy Asserted By EC 1.3.

If the Board were to determine that additional discussion of dry cooling as an alternative is necessary or proper in the FEIS or the ESP, then the evidence presented by SNC and the Board's de novo review of the evidence provide an adequate basis for supplementation of the FEIS by the Board.[19] The Commission has consistently held that the adjudicatory record, including the ASLB decision and any NRC decision on appeal, in effect become part of the FEIS. *See, e.g., Louisiana Energy Servs.*, CLI-06-05 63 NRC at 707 n.91 ("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 77, 89 (1998) ("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 fact, the ASLB in this ESP proceeding specifically addressed this issue. *Southern Nuclear Operating Company*, 52-011-ESP, 65 NRC at 277. The ASLB stated "that any Board merits litigation-based findings have the effect of amending or supplementing the FEIS[.]" *Id.*; *Philadelphia Electric Co.*, ALAB-819, 22 NRC at 705-707 ("Amendment of the FE[I]S by the adjudicatory hearing record and subsequent Licensing Board decision is entirely proper under

[19] The Commission has stated that NEPA requires a Board to "weigh[] arguments presented by experts and render[] reasonable, record-based factual findings." *Louisiana Energy Servs.*, CLI-06-15 63 NRC at 697. This includes any supplemental evidence presented as part of a contested hearing. The Board's analysis of evidence requires it to ensure that NRC Staff took "a 'hard look' at the environmental impacts of a proposed action and reasonable alternatives to that action." *Louisiana Energy Servs., L.P.*, LBP-06-08, 63 NRC at 258. "This 'hard look' is subject to the 'rule of reason'" and agencies "may accord substantial weight to the preferences of the applicant with regard to the consideration of alternatives, including choices regarding . . . project design." *Id.* at 258-259.

NRC regulations and court precedent."); *see also New England Coalition on Nuclear Pollution v. NRC*, 582 F.2d 87, 93-94 (1st Cir. 1978); *Citizens for Safe Power, Inc. v. NRC*, 524 F.2d 1291, 1294 n.5 (D.C. Cir. 1975); *Ecology Action v. AEC*, 492 F.2d 998, 1001-02 (2nd Cir. 1974).

Even in a case where the final environmental impact statement is found to be deficient, the parties may submit evidence during the contested proceeding that may be used to amend the final environmental impact statement and satisfy its burden of proof. *Louisiana Energy Servs., LP*, LBP-06-08, 63 NRC 241 (2006). In *LES*, intervenors challenged an aspect of the final environmental impact statement and additional written and oral testimony was later provided on the contested issue. The Board found that, even though the NRC Staff's analysis of the contested issue in the final environmental impact statement was "deficient on its face, . . . there [was] sufficient evidence on the record . . . to conclude that the Staff indeed took a hard look at the [contested issue] as required by NEPA." *Id.* at 281-82. Thus, the Board held the "evidence on the record sufficient for the Staff to carry its burden of proof relative to NEPA" and that their decision "amend[ed] the FEIS *pro tanto*[.]" *Id.*

The NRC reviewed the Board's order in *LES* and stated that there was "ample record evidence, including expert opinion, [to] support[] the Board's findings. As is customary, the Board itself included two judges with technical expertise. We therefore defer to the Board's factual findings." *Louisiana Energy Servs.*, CLI-06-05, 63 NRC at 697. Thus, the NRC held that, "[t]he FEIS, as amplified by the Board's decision and our decision today, provides adequate consideration of the reasonably foreseeable potential environmental impacts of [the contested issue]." *Id.* at 700; *see also Private Fuel Storage*, LBP-03-30, 58 NRC at 474.

Accordingly, if the Board finds the analyses in the ER and FEIS inadequate, 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 may 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).

VI. CONCLUSION

For the reasons stated, SNC respectfully requests that the Board rule that the FEIS adequately analyzed dry cooling as an alternative and satisfies the requirements of 10 C.F.R. § 51.45(b)(3).

Respectfully submitted,

(Original signed by M. Stanford Blanton)

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Dated this 9th day of January, 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)	)	**January 9, 2009**

CERTIFICATE OF SERVICE

I hereby certify that copies of SOUTHERN NUCLEAR OPERATING COMPANY'S INITIAL STATEMENT OF POSITION ON JOINT INTERVENORS' ENVIRONMENTAL CONTENTION 1.3 (DRY COOLING SYSTEM ALTERNATIVES) in the above captioned proceeding have been served by electronic mail as shown below and/or by e-submittal this 9th day of January, 2009.

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