

**UNITED STATES COURT OF APPEALS
DISTRICT OF COLUMBIA CIRCUIT**

CENTER FOR A SUSTAINABLE COAST,)	
<i>et al.</i> ,)	
)	
Petitioners,)	No. 09-1262
)	
v.)	
)	
NUCLEAR REGULATORY COMMISSION)	
and THE UNITED STATES OF AMERICA,)	
)	
Respondents.)	
_____)	

**PETITIONERS' LIST AND COPIES OF UNDERLYING
DECISIONS FROM WHICH PETITION ARISES**

Pursuant to the Court's October 28, 2009 Order, Petitioners Center for a Sustainable Coast, et al., hereby list and provide copies of the underlying decisions from which this petition for review arises:

Attachment 1: *Southern Nuclear Operating Co.*, Early Site Permit No. ESP-004, published at 74 Fed. Reg. 44,879 (August 31, 2009);

Attachment 2: *S. Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), LBP-07-03, 65 NRC 237 (2007) (Board Memorandum and Order Ruling on Standing and Contentions);

Attachment 3: *S. Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), LBP-08-2, 67 NRC 54 (2008) (Board Memorandum and Order Ruling on Dispositive Motion and Associated Motion to Strike Regarding Environmental Contention 1.2);

Attachment 4: *S. Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), (unpublished order) (Jan. 26, 2009) (Board Memorandum and Order Ruling on In Limine Motions);

Attachment 5: *S. Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), (unpublished order) (Feb. 23, 2009) (Board Memorandum and Order Ruling on In Limine Motions);

Attachment 6: *S. Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), LBP-09-07, __ NRC __, slip op., (June 22, 2009) (First Partial Initial Decision);

Attachment 7: *S. Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), LBP-09-19, __ NRC __, slip op., (Aug. 17, 2009) (Second and Final Partial Initial Decision).

Respectfully submitted,

/s/

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Counsel for Petitioners

November 25, 2009

place at NSF, 4201 Wilson Blvd., Arlington, Virginia 22230.

These meetings will be closed to the public. The proposals being reviewed include information of a proprietary or confidential nature, including technical information; financial data, such as salaries; and personal information concerning individuals associated with the proposals. These matters are exempt under 5 U.S.C. 552b(c)(4) and (6) of the Government in the Sunshine Act. NSF will continue to review the agenda and merits of each meeting for overall compliance of the Federal Advisory Committee Act.

These closed proposal review meetings will not be announced on an individual basis in the **Federal Register**. NSF intends to publish a notice similar to this on a quarterly basis. For an advance listing of the closed proposal review meetings that includes the names of the proposal review panel and the time, date, place, and any information on changes, corrections, or cancellations, please visit the NSF Web site: <http://www.nsf.gov/events/advisory.jsp>. This information may also be requested by telephoning 703/292-8180.

Dated: August 26, 2009.

Susanne Bolton,

Committee Management Officer.

[FR Doc. E9-20892 Filed 8-28-09; 8:45 am]

BILLING CODE 7555-01-P

NUCLEAR REGULATORY COMMISSION

[NRC-2009-0380]

Office of New Reactors; Interim Staff Guidance on Ensuring Hazard-Consistent Seismic Input for Site Response and Soil Structure Interaction Analyses

AGENCY: Nuclear Regulatory Commission (NRC).

ACTION: Solicitation of public comment.

SUMMARY: The NRC staff is soliciting public comment on its Proposed Interim Staff Guidance (ISG) DC/COL-ISG-017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML092230543). This ISG supplements the guidance provided to the NRC staff in Sections 2.5 and 3.7 of NUREG-0800, "Standard Review Plan (SRP) for the Review of Safety Analysis Reports for Nuclear Power Plants," March 2007, and DC/COL-ISG-01, "Interim Staff Guidance on Seismic Issues Associated with High Frequency Ground Motion in Design Certification and Combined License Applications,"

issued May 19, 2008 (ADAMS Accession No. ML081400293). The NRC staff issues DC/COL-ISGs to facilitate timely implementation of current staff guidance and to facilitate activities associated with review of applications for design certifications and combined licenses by the Office of New Reactors. The NRC staff intends to incorporate the final approved DC/COL-ISG-017 into the next revision of SRP Sections 2.5 and 3.7 and Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," June 2007.

DATES: Comments must be filed no later than 30 days from the date of publication of this notice in the **Federal Register**. Comments received after this date will be considered, if it is practical to do so, but the Commission is able to ensure consideration only for comments received on or before this date.

ADDRESSES: You may submit comments by any one of the following methods. Please include Docket ID NRC-2009-0380 in the subject line of your comments. Comments submitted in writing or in electronic form will be posted on the NRC Web site and on the Federal rulemaking Web site *Regulations.gov*. Because your comments will not be edited to remove any identifying or contact information, the NRC cautions you against including any information in your submission that you do not want to be publicly disclosed.

The NRC requests that any party soliciting or aggregating comments received from other persons for submission to the NRC inform those persons that the NRC will not edit their comments to remove any identifying or contact information, and therefore, they should not include any information in their comments that they do not want publicly disclosed.

Federal Rulemaking Web site: Go to <http://www.regulations.gov> and search for documents filed under Docket ID NRC-2009-0380. Address questions about NRC dockets to Carol Gallagher 301-492-3668; e-mail Carol.Gallagher@nrc.gov.

Mail comments to: Michael T. Lesar, Chief, Rulemaking and Directives Branch (RDB), Division of Administrative Services, Office of Administration, Mail Stop: TWB-05-B01M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by fax to RDB at (301) 492-3446.

The NRC ADAMS provides text and image files of NRC's public documents. These documents may be accessed through the NRC's Public Electronic

Reading Room on the Internet at <http://www.nrc.gov/reading-rm/adams.html>. Persons who do not have access to ADAMS or who encounter problems in accessing the documents located in ADAMS should contact the NRC Public Document Room reference staff by telephone at 1-800-397-4209, 301-415-4737, or by e-mail at pdr.resource@nrc.gov.

FOR FURTHER INFORMATION CONTACT: Mr. William F. Burton, Chief, Rulemaking and Guidance Development Branch, Division of New Reactor Licensing, Office of New Reactors, U.S. Nuclear Regulatory Commission, Washington, DC, 20555-0001; telephone 301-415-6332 or e-mail at william.burton@nrc.gov.

SUPPLEMENTARY INFORMATION: The agency posts its issued staff guidance in the agency external Web page (<http://www.nrc.gov/reading-rm/doc-collections/isg/>).

The NRC staff is issuing this notice to solicit public comments on the proposed DC/COL-ISG-017. After the NRC staff considers any public comments, it will make a determination regarding the proposed DC/COL-ISG-017.

Dated at Rockville, Maryland, this 25th day of August 2009.

For the Nuclear Regulatory Commission,

William F. Burton,

Branch Chief, Rulemaking and Guidance Development Branch, Division of New Reactor Licensing, Office of New Reactors.

[FR Doc. E9-20916 Filed 8-28-09; 8:45 am]

BILLING CODE 7590-01-P

NUCLEAR REGULATORY COMMISSION

[NRC-2008-0252; Docket No. 052-00011]

Notice of Issuance of Early Site Permit and Limited Work Authorization for the Vogtle Electric Generating Plant ESP Site

AGENCY: Nuclear Regulatory Commission.

ACTION: Notice of Issuance of Early Site Permit and Limited Work Authorization.

FOR FURTHER INFORMATION CONTACT: Christian Araguas, Project Manager, AP1000 Projects Branch, Division of New Reactor Licensing, Office of New Reactors, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. *Telephone:* (301) 415-3637; *e-mail:* christian.araguas@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. Introduction

Pursuant to 10 CFR 2.106, the Nuclear Regulatory Commission (NRC) is providing notice of the issuance of Early Site Permit (ESP) ESP-004 to Southern Nuclear Operating Company (SNC), Georgia Power Company, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and the City of Dalton, Georgia, an incorporated municipality in the State of Georgia acting by and through its Board of Water, Light and Sinking Fund Commissioners, for approval of a site located in Burke County, Georgia, 26 miles southeast of Augusta, Georgia for two nuclear power reactors; this action is separate from the filing of an application for a construction permit or combined license for such a facility. The NRC has found that the application for an early site permit (ESP), and accompanying limited work authorization (LWA), filed by Southern Nuclear Operating Company (SNC), on behalf of itself and the other four entities named above, complies with the applicable requirements of the Atomic Energy Act of 1954, as amended, and the applicable rules and regulations of the Commission. All required notifications to other agencies or bodies have been duly made. There is reasonable assurance that the permit holders will comply with the regulations in 10 CFR Chapter I and the health and safety of the public will not be endangered. There is reasonable assurance that the site is in conformity with the provisions of the Act and the Commission's regulations. SNC is technically qualified to engage in the activities authorized. Issuance of the ESP will not be inimical to the common defense and security or to the health and safety of the public. Issuance of the LWA will provide reasonable assurance of adequate protection to public health and safety and will not be inimical to the common defense and security. The proposed complete and integrated emergency plans are in accordance with the applicable standards of 10 CFR 50.47, and the requirements of Appendix E to 10 CFR Part 50, and provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. The proposed inspections, tests, analyses and acceptance criteria, including those on emergency planning, are necessary and sufficient, within the scope of the ESP and LWA, to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the license, the provisions of the Act, and the

Commission's regulations. The issuance of this ESP, subject to the Environmental Protection Plan (EPP) and the conditions for the protection of the environment set forth in the permit, is in accordance with the National Environmental Policy Act of 1969, as amended, and with the applicable sections of 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," as referenced by Subpart A, "Early Site Permits," of 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," and all applicable requirements therein have been satisfied.

Accordingly, this early site permit was issued on August 26, 2009, and is effective immediately.

II. Further Information

The NRC has prepared a Safety Evaluation Report (SER) and Final Environmental Impact Statement (FEIS) that document the information that was reviewed and NRC's conclusion. In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," details with respect to this action, including the SER and accompanying documentation included in the early site permit package, are available electronically at the NRC's Electronic Reading Room at <http://www.nrc.gov/reading-rm/adams.html>. From this site, persons can access the NRC's Agencywide Document Access and Management System (ADAMS), which provides text and image files of NRC's public documents. The ADAMS accession numbers for the documents related to this notice are:

ML092260348 NUREG-1923, "Safety Evaluation Report for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant (VEGP) ESP Site"
ML082260190 NUREG-1872, "Final Environmental Impact Statement for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site."
ML082550040 Errata to NUREG-1872, "Final Environmental Impact Statement for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site." (Errata)
ML091550858 VEGP Early Site Permit Application—Revision 5

Persons who do not have access to ADAMS or who encounter problems in accessing the documents located in ADAMS should contact the NRC Public Document Room (PDR) Reference staff by telephone at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov.

These documents may also be viewed electronically on the public computers

located at the NRC's Public Document Room (PDR), O 1 F21, One White Flint North, 11555 Rockville Pike, Rockville, MD 20852. The PDR reproduction contractor will copy documents for a fee.

Dated at Rockville, Maryland, this 26th day of August, 2009.

For the Nuclear Regulatory Commission.

Eileen M. McKenna,

*Acting Chief, AP1000 Projects Branch,
Division of New Reactor Licensing, Office of
New Reactors.*

[FR Doc. E9-20915 Filed 8-28-09; 8:45 am]

BILLING CODE 7590-01-P

POSTAL REGULATORY COMMISSION

[Docket No. CP2009-62; Order No. 289]

New Competitive Postal Product

AGENCY: Postal Regulatory Commission.
ACTION: Notice.

SUMMARY: The Commission is noticing a recently-filed Postal Service request to add an Inbound Direct Entry Contract with Foreign Postal Administrations contract to the Competitive Product List. This notice addresses procedural steps associated with this filing.

DATES: Comments are due September 2, 2009.

ADDRESSES: Submit comments electronically via the Commission's Filing Online system at <http://www.prc.gov>.

FOR FURTHER INFORMATION CONTACT: Stephen L. Sharfman, General Counsel, 202-789-6820 and stephen.sharfman@prc.gov.

SUPPLEMENTARY INFORMATION:

- I. Introduction
- II. Notice of Filing
- III. Ordering Paragraphs

I. Introduction

On August 21, 2009, the Postal Service filed a notice, pursuant to 39 U.S.C. 3633 and 39 CFR 3015.5, announcing that it has entered into an additional Inbound Direct Entry Contract (IDE), which it states fits within the previously established Inbound Direct Entry Contracts.¹ The Postal Service states that the instant contract is functionally equivalent to previously submitted IDE contracts and is supported by Governors' Decision 08-6 filed in Docket No. MC2008-6.² *Id.* at

¹ Notice of United States Postal Service of Filing Functionally Equivalent Inbound Direct Entry Contracts Negotiated Service Agreement, August 21, 2009 (Notice).

² See Docket No. MC2008-6, Decision of the Governors of the United States Postal Service on the

Cite as 65 NRC 237 (2007)

LBP-07-3

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**ATOMIC SAFETY AND LICENSING BOARD****Before the Licensing Board:****G. Paul Bollwerk, III, Chairman**
Nicholas G. Trikouros
Dr. James F. Jackson

In the Matter of

Docket No. 52-011-ESP
(ASLBP No. 07-850-01-ESP-BD01)**SOUTHERN NUCLEAR OPERATING
COMPANY**
(Early Site Permit for Vogtle
ESP Site)**March 12, 2007**

In this 10 C.F.R. Part 52 proceeding regarding the application of Southern Nuclear Operating Company (SNC) for an early site permit (ESP) for an additional two reactors at the Vogtle Electric Generating Plant site, ruling on a petition filed jointly by five public interest organizations seeking to intervene to contest the SNC ESP request, the Licensing Board concludes that, having established the requisite standing and proffering two admissible environmental contentions, each of the Petitioners is admitted as a party to the proceeding.

RULES OF PRACTICE: STANDING TO INTERVENE

In determining whether an individual or organization should be granted party status in a proceeding based on standing "as of right," the agency has applied contemporaneous judicial standing concepts that require a participant to establish (1) it has suffered or will suffer a distinct and palpable injury that constitutes injury-in-fact within the zones of interests arguably protected by the governing statutes (e.g., the Atomic Energy Act of 1954 (AEA), the National Environmental

Policy Act of 1969 (NEPA)); (2) the injury is fairly traceable to the challenged action; and (3) the injury is likely to be redressed by a favorable decision. See *Yankee Atomic Electric Co.* (Yankee Nuclear Power Station), CLI-96-1, 43 NRC 1, 6 (1996).

**RULES OF PRACTICE: STANDING TO INTERVENE
(PRESUMPTION BASED ON GEOGRAPHIC PROXIMITY)**

In cases involving the possible construction or operation of a nuclear power reactor, proximity to the proposed facility has been considered sufficient to establish the requisite standing elements. See *Florida Power & Light Co.* (St. Lucie Nuclear Power Plant, Units 1 and 2), CLI-89-21, 30 NRC 325, 329 (1989).

**RULES OF PRACTICE: STANDING TO INTERVENE
(REPRESENTATIONAL)**

When an entity seeks to intervene on behalf of its members, that entity must show it has an individual member who can fulfill all the necessary standing elements and who has authorized the organization to represent his or her interests. See *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), CLI-00-20, 52 NRC 151, 163 (2000).

**RULES OF PRACTICE: STANDING TO INTERVENE
(CONSTRUCTION OF PETITION)**

In assessing a petition to determine whether these elements are met, which a presiding officer must do even though there are no objections to a petitioner's standing, the Commission has indicated that a presiding officer is to "construe the petition in favor of the petitioner." *Georgia Institute of Technology* (Georgia Tech Research Reactor, Atlanta, Georgia), CLI-95-12, 42 NRC 111, 115 (1995).

RULES OF PRACTICE: CONTENTIONS (SPECIFICITY AND BASIS)

Section 2.309(f) of the Commission's rules of practice specifies the requirements that must be met if a contention is to be deemed admissible. Specifically, a contention must provide (1) a specific statement of the legal or factual issue sought to be raised; (2) a brief explanation of its basis; (3) a concise statement of the alleged facts or expert opinions, including references to specific sources and documents, that support the petitioner's position and upon which the petitioner intends to rely at hearing; and (4) sufficient information demonstrating that a

genuine dispute exists in regard to a material issue of law or fact, including references to specific portions of the application that the petitioner disputes, or in the case when the application is alleged to be deficient, the identification of such deficiencies and supporting reasons for this belief. See 10 C.F.R. § 2.309(f)(1)(i), (ii), (v), and (vi). In addition, the petitioner must demonstrate that the issue raised in the contention is both "within the scope of the proceeding" and "material to the findings the NRC must make to support the action that is involved in the proceeding." *Id.* § 2.309(f)(1)(iii)-(iv). Failure to comply with any of these requirements is grounds for dismissing a contention. See *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-99-10, 49 NRC 318, 325 (1999); see also *Arizona Public Service Co.* (Palo Verde Nuclear Generating Station, Units 1, 2, and 3), CLI-91-12, 34 NRC 149, 155-56 (1991).

RULES OF PRACTICE: CONTENTIONS (CHALLENGE OF COMMISSION RULE)

An adjudication is not the proper forum for challenging applicable statutory requirements or the basic structure of the agency's regulatory process. *Philadelphia Electric Co.* (Peach Bottom Atomic Power Station, Units 2 and 3), ALAB-216, 8 AEC 13, 20, *aff'd in part on other grounds*, CLI-74-32, 8 AEC 217 (1974). Similarly, a contention that attacks a Commission rule, or which seeks to litigate a matter that is, or clearly is about to become, the subject of a rulemaking, is inadmissible. See 10 C.F.R. § 2.335; *Potomac Electric Power Co.* (Douglas Point Nuclear Generating Station, Units 1 and 2), ALAB-218, 8 AEC 79, 85, 89 (1974). This includes contentions that advocate stricter requirements than agency rules impose or that otherwise seek to litigate a generic determination established by a Commission rulemaking. See *Florida Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 and 4), LBP-01-6, 53 NRC 138, 159 (2001); *Pacific Gas and Electric Co.* (Diablo Canyon Nuclear Power Plant, Units 1 and 2), LBP-93-1, 37 NRC 5, 29-30 (1993); *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), LBP-82-106, 16 NRC 1649, 1656 (1982); see also *Yankee Atomic Electric Co.* (Yankee Nuclear Power Station), CLI-96-7, 43 NRC 235, 251 (1996); *Arizona Public Service Co.* (Palo Verde Nuclear Generating Station, Units 1, 2, and 3), LBP-91-19, 33 NRC 397, 410, *aff'd in part and rev'd in part on other grounds*, CLI-91-12, 34 NRC 149 (1991). By the same token, a contention that simply states the petitioner's views about what regulatory policy should be does not present a litigable issue. See *Peach Bottom*, ALAB-216, 8 AEC at 20-21 & n.33.

RULES OF PRACTICE: CONTENTIONS (SCOPE OF PROCEEDING)

All proffered contentions must be within the scope of the proceeding as defined by the Commission in its initial hearing notice and order referring the proceeding to the Licensing Board. *See* 10 C.F.R. § 2.309(f)(1)(iii); *Florida Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 and 4), CLI-00-23, 52 NRC 327, 329 (2000); *Duke Power Co.* (Catawba Nuclear Station, Units 1 and 2), ALAB-825, 22 NRC 785, 790-91 (1985). As a consequence, any contention that falls outside the specified scope of the proceeding must be rejected. *See Portland General Electric Co.* (Trojan Nuclear Plant), ALAB-534, 9 NRC 287, 289 n.6 (1979).

RULES OF PRACTICE: CONTENTIONS (SUPPORTING INFORMATION OR EXPERT OPINION)

It is the petitioner's obligation to present factual information and/or expert opinion necessary to support its contention. *See* 10 C.F.R. § 2.309(f)(1)(v); *Georgia Institute of Technology* (Georgia Tech Research Reactor, Atlanta, Georgia), LBP-95-6, 41 NRC 281, 305, *vacated in part and remanded on other grounds*, CLI-95-10, 42 NRC 1, and *aff'd in part*, CLI-95-12, 42 NRC 111 (1995). While a Board may appropriately view a petitioner's supporting information in a light favorable to the petitioner, failure to provide such information regarding a proffered contention requires that the contention be rejected. *See Palo Verde*, CLI-91-12, 34 NRC at 155. In this connection, neither mere speculation nor bare or conclusory assertions, even by an expert, alleging that a matter should be considered will suffice to allow the admission of a proffered contention. *See Fansteel, Inc.* (Muskogee, Oklahoma Site), CLI-03-13, 58 NRC 195, 203 (2003). If a petitioner neglects to provide the requisite support for its contentions, it is not within the Board's power to make assumptions of fact that favor the petitioner, nor may the Board supply information that is lacking. *See Palo Verde*, CLI-91-12, 34 NRC at 155; *Duke Cogema Stone & Webster* (Savannah River Mixed Oxide Fuel Fabrication Facility), LBP-01-35, 54 NRC 403, 422 (2001); *Georgia Tech Research Reactor*, LBP-95-6, 41 NRC at 305.

RULES OF PRACTICE: CONTENTIONS (SUPPORTING INFORMATION OR EXPERT OPINION)

Providing any material or document as a basis for a contention, without setting forth an explanation of its significance, is inadequate to support the admission of the contention. *See Fansteel*, CLI-03-13, 58 NRC at 205. Along these lines, any supporting material provided by a petitioner, including those portions of the

material that are not relied upon, is subject to licensing board scrutiny. *See Yankee Atomic Electric Co.* (Yankee Nuclear Power Station), LBP-96-2, 43 NRC 61, 90 (1996), *rev'd in part on other grounds*, CLI-96-7, 43 NRC 235 (1996). Thus, the material provided in support of a contention will be carefully examined by a licensing board to confirm that it does indeed supply an adequate basis for the contention as asserted by the petitioner. *See Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), ALAB-919, 30 NRC 29, 48 (1989), *vacated in part on other grounds and remanded*, CLI-90-4, 31 NRC 333 (1990).

RULES OF PRACTICE: CONTENTIONS (SUPPORTING INFORMATION OR EXPERT OPINION)

Simply attaching material or documents as a basis for a contention, without setting forth an explanation of that information's significance, is inadequate to support the admission of the contention. *See Fansteel*, CLI-03-13, 58 NRC at 204-05. Along these lines, any supporting material provided by a petitioner, including those portions of the material that are not relied upon, is subject to Board scrutiny. *See Yankee Atomic Electric Co.* (Yankee Nuclear Power Station), LBP-96-2, 43 NRC 61, 90 (1996), *rev'd in part on other grounds*, CLI-96-7, 43 NRC 235 (1996). Thus, the material provided in support of a contention will be carefully examined by the Board to confirm that on its face it does supply an adequate basis for the contention. *See Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), ALAB-919, 30 NRC 29, 48 (1989), *vacated in part on other grounds and remanded*, CLI-90-4, 31 NRC 333 (1990).

RULES OF PRACTICE: CONTENTIONS (MATERIALITY)

To be admissible, the regulations require that all contentions assert an issue of law or fact that is material to the outcome of a licensing proceeding, meaning that the subject matter of the contention must impact the grant or denial of a pending license application. *See* 10 C.F.R. § 2.309(f)(1)(iv). This requirement of materiality often dictates that any contention alleging deficiencies or errors in an application also indicate some significant link between the claimed deficiency and either the health and safety of the public or the environment. *See Yankee Nuclear*, LBP-96-2, 43 NRC at 75-76; *see also Pacific Gas and Electric Co.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), LBP-02-23, 56 NRC 413, 439-41 (2002), *petition for review denied*, CLI-03-12, 58 NRC 185, 191 (2003).

RULES OF PRACTICE: CONTENTIONS (CHALLENGE TO LICENSE APPLICATION)

All properly formulated contentions must focus on the license application in question, challenging either specific portions of or alleged omissions from the application (including the Safety Analysis Report and the Environmental Report) so as to establish that a genuine dispute exists with the applicant on a material issue of law or fact. *See* 10 C.F.R. § 2.309(f)(1)(vi). Any contention that fails directly to controvert the application or that mistakenly asserts the application does not address a relevant issue can be dismissed. *See Sacramento Municipal Utility District* (Rancho Seco Nuclear Generating Station), LBP-93-23, 38 NRC 200, 247-48 (1993), *review declined*, CLI-94-2, 39 NRC 91 (1994); *Texas Utilities Electric Co.* (Comanche Peak Steam Electric Station, Unit 2), LBP-92-37, 36 NRC 370, 384 (1992).

RULES OF PRACTICE: CONTENTIONS (SCOPE)

Although licensing boards generally are to litigate “contentions” rather than “bases,” it has been recognized that “[t]he reach of a contention necessarily hinges upon its terms coupled with its stated bases.” *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-899, 28 NRC 93, 97 (1988), *aff’d sub nom. Massachusetts v. NRC*, 924 F.2d 311 (D.C. Cir.), *cert. denied*, 502 U.S. 899 (1991); *see also Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-02-28, 56 NRC 373, 379 (2002).

NEPA: ENVIRONMENTAL ANALYSIS (AQUATIC BASELINE)

A National Environmental Policy Act (NEPA) analysis relating to aquatic impacts must, as a practical matter, have a baseline from which to operate. *See American Rivers v. Federal Energy Regulatory Commission*, 201 F.3d 1186, 1195 n.15 (9th Cir. 2000). It is equally apparent, however, that nothing in the agency’s 10 C.F.R. Part 51 NEPA regulations, *see* 10 C.F.R. § 51.45(b) (environmental report (ER) must contain “description of the environment affected”), or the Staff’s ER preparation guidance regarding providing a description of the local environment, *see* Office of Standards Development, U.S. Nuclear Regulatory Commission [(NRC)], Preparation of [ERs] for Nuclear Power Stations, Regulatory Guide 4.2, at 2-3 to -4 (rev. 2, July 1976) (ADAMS Accession No. ML003739519), indicates exactly how, as a general matter, such a baseline is to be established.

NEPA: ENVIRONMENTAL ANALYSIS (BASELINE SCOPE)

The appropriate scope of the baseline 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. *See* Office of Nuclear Reactor Regulation, [NRC], “Standard Review Plans for Environmental Reviews for Nuclear Power Plants,” NUREG-1555, at 4.3.2-1 to -2 (Oct. 1999); Office of Nuclear Regulatory Research, [NRC], General Site Suitability Criteria for Nuclear Power Stations, Regulatory Guide 4.7, at 4.7-14 to -15 (rev 2, Apr. 1998) (ADAMS Accession No. ML003739894).

NEPA: ENVIRONMENTAL ANALYSIS (NO-ACTION ALTERNATIVE)

No-action alternative discussions can be brief and can incorporate by reference other sections of an ER discussing the project’s adverse consequences. *See Hydro Resources, Inc.* (P.O. Box 15910, Rio Rancho, NM 87174), CLI-01-4, 53 NRC 31, 54 (2001) (“[f]or the ‘no action’ alternative, there need not be much discussion”); *Louisiana Energy Services, L.P.* (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 98 (1998) (“[w]e do not find the [final environmental impact statement’s (FEIS)] incorporation by reference approach unreasonable as such”).

NEPA: INDEPENDENT INQUIRY BY FEDERAL AGENCY

Established case law teaches that, except for its overall NEPA balancing, the NRC can limit its analysis of aquatic impacts to those determined by the Environmental Protection Agency (EPA), *see New England Coalition on Nuclear Pollution v. NRC*, 582 F.2d 87, 98 (1st Cir. 1978), when EPA has analyzed an alternative technology extensively and made conclusions as to its suitability.

NEPA: ENVIRONMENTAL ANALYSIS (ENVIRONMENTAL JUSTICE)

The NRC has made a commitment as part of its NEPA review process to strive to reach the environmental justice goals described in Executive Order 12898. *See* 69 Fed. Reg. 52,040, 52,041-42 (Aug. 24, 2004) (final Commission environmental justice policy statement). As the Commission previously has noted in reviewing environmental justice claims, “[a]dverse impacts that fall heavily on minority and impoverished citizens call for particularly close scrutiny.” *Claiborne Enrichment Center*, CLI-98-3, 47 NRC at 106. There are, however, two requirements necessary to implicate this close environmental justice scrutiny. First, support

must be presented regarding the alleged existence of adverse impacts or harm on the physical or human environment. Second, a supported case must be made that these purported adverse impacts could disproportionately affect poor or minority communities in the vicinity of the facility at issue. *See* 69 Fed. Reg. at 52,047.

NEPA: SUFFICIENCY OF CONTENTIONS (ENVIRONMENTAL JUSTICE)

The NRC requires that environmental justice contentions be based on the specific characteristics of a particular minority community. *See Claiborne Enrichment Center*, CLI-98-3, 47 NRC at 100.

RULES OF PRACTICE: CONTENTIONS (SUPPORTING INFORMATION OR EXPERT OPINION)

It being well established that the Board cannot be expected to sift through reams of data to determine whether a contention is admissible, *see Georgia Tech Research Reactor*, LBP-95-6, 41 NRC at 305; *International Uranium (USA) Corp.* (Receipt of Material from Tonawanda, New York), LBP-98-21, 48 NRC 137, 142 n.7 (1998); *Tennessee Valley Authority* (Browns Ferry Nuclear Plant, Units 1 and 2), LBP-76-10, 3 NRC 209, 216 (1976), a nonselective citation is not consistent with the obligation to provide analyses and expert opinion supporting a contention.

NEPA: ENVIRONMENTAL ANALYSIS (ENVIRONMENTAL JUSTICE)

NRC has expressed a commitment to considering cumulative impacts in its environmental justice analysis, making nearby nuclear facility-related harm an appropriate issue to consider cumulatively with any impacts from proposed reactors. *See* 69 Fed. Reg. at 52,042-43.

NEPA: ENVIRONMENTAL ANALYSIS (ENVIRONMENTAL JUSTICE)

In accord with the environmental justice executive order, the NRC has obligated itself to address only the disproportionate distribution of "high and adverse" effects in its NEPA analysis. *See Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-02-20, 56 NRC 147, 154 (2002).

NEPA: SUFFICIENCY OF CONTENTIONS (MATERIALITY)

RULES OF PRACTICE: CONTENTIONS (MATERIALITY)

While one of the central purposes of NEPA is information gathering and disclosure, information immaterial to the proceeding does not necessarily need to be included. *See Exelon Generation Co., LLC* (Early Site Permit for Clinton ESP Site), CLI-05-29, 62 NRC 801, 811 (2005) ("There may, of course, be mistakes in the [draft environmental impact statement (DEIS)], but in an NRC adjudication, it is intervenors' burden to show their significance and materiality. Our boards do not sit to 'flyspeck' environmental documents or to add details or nuances."); *see also Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-02-25, 56 NRC 340, 349 (2002) ("NEPA does not call for examination of every conceivable aspect of federally licensed projects" (internal quotes omitted)).

RULES OF PRACTICE: CONTENTIONS (CHALLENGE OF COMMISSION RULE)

A challenge to an agency rule is not permitted in an agency adjudication. *See* 10 C.F.R. § 2.335(a); *see also Entergy Nuclear Vermont Yankee, LLC* (Vermont Yankee Nuclear Power Station), CLI-07-3, 65 NRC 13, 20 (2007) (contention seeking ER analysis of long-term effects of high-density pool spent fuel storage inappropriately challenges rule-based generic environmental findings for reactor life extension proceedings). The agency's procedural rules do, however, offer an opportunity to request a waiver or exception to the application of a rule in a particular adjudicatory proceeding. *See* 10 C.F.R. § 2.335(b); *see also Vermont Yankee*, CLI-07-3, 65 NRC at 20.

RULES OF PRACTICE: COMMISSION CONSIDERATION OF PROCECURAL MATTERS

The Commission has the authority to enter case-specific procedural orders to facilitate the efficient resolution of issues before a licensing board. *See Long Island Lighting Co.* (Shoreham Nuclear Power Station, Unit 1), CLI-88-9, 28 NRC 567, 569 (1988) (noting "the Commission's inherent supervisory authority over the conduct of adjudicatory proceedings"); *see also, e.g., Louisiana Energy Services, L.P.* (National Enrichment Facility), CLI-04-3, 59 NRC 10, 16-21 (2004)⁴(establishing general schedule for proceeding).

**NEPA: FINAL ENVIRONMENTAL IMPACT STATEMENT
(LICENSING BOARD DECISION AS AMENDMENT)**

Any Licensing Board merits litigation-based findings have the effect of amending or supplementing the FEIS. *See Louisiana Energy Services, L.P.* (National Enrichment Facility), CLI-06-15, 63 NRC 687, 707 n.91 (2006).

RULES OF PRACTICE: REOPENING OF PROCEEDINGS

If admitted contentions are resolved before the FEIS is issued so as to conclude the contested portion of a proceeding, an intervenor (or anyone else) could timely seek to litigate contentions regarding FEIS data or conclusions that differ significantly from the ER or the DEIS. *See* 10 C.F.R. § 2.309(c), (f)(2).

**MEMORANDUM AND ORDER
(Ruling on Standing and Contentions)**

On August 15, 2006, Southern Nuclear Operating Company (SNC) applied to the Nuclear Regulatory Commission (NRC) for an early site permit (ESP) under 10 C.F.R. Part 52 for an additional two reactors at the Vogtle Electric Generating Plant site near Waynesboro, Georgia. On December 11, 2006, five organizations — the Center for a Sustainable Coast, Savannah Riverkeeper, the Southern Alliance for Clean Energy, the Atlanta Women's Action for New Directions, and the Blue Ridge Environmental Defense League (hereinafter referred to collectively as Joint Petitioners) — jointly filed a hearing petition seeking to intervene and challenge the ESP application, or more particularly, certain aspects of the SNC Environmental Report (ER).

For the reasons set forth below, we find that each of the Joint Petitioners has established the requisite standing to intervene in this proceeding and that they have submitted two admissible contentions, which are set forth in an appendix to this decision. Accordingly, we admit each of the Joint Petitioners as a party to this proceeding. Additionally, we outline certain procedural and administrative rulings regarding the litigation of these admitted contentions, as well as certify to the Commission a question regarding the Licensing Board's ability to proceed with litigating the merits of the two admitted contentions on the basis of the NRC Staff's draft environmental impact statement (DEIS).

I. BACKGROUND

A. SNC Early Site Permit Application

Under the Part 52 licensing process, an entity may apply for an ESP that allows it to resolve key site-related environmental, safety, and emergency planning issues before choosing the design of a nuclear power facility for, or deciding to build such a facility on, that site. Thus, if granted, an ESP essentially allows an entity to "bank" a possible site for the future construction of a specified number of new nuclear power generation facilities.

SNC filed its ESP application on behalf of itself and the owners of the Vogtle Electric Generating Plant site (Georgia Power Company, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and the City of Dalton, Georgia). In addition to the ER that is the focus of the Joint Petitioners concerns, the application consists of a section on Administrative Information (AI) about SNC and the site owners, a Site Safety Analysis Report (SSAR), an Emergency Plan (EP), and a Site Redress Plan (SRP). The particular site for which SNC seeks to obtain an ESP is the Vogtle Electric Generating Plant site (Plant Vogtle), where an existing two-unit nuclear power facility has been producing electricity since 1987. SNC is the licensed operator of the existing generating units at the Plant Vogtle site. *See* [SNC] Vogtle Early Site Permit Application (Rev. 1, Nov. 2006).¹

B. Joint Petitioners Hearing Request/Licensing Board Establishment and Initial Procedures

In response to the October 5, 2006 notice of hearing and opportunity to petition for leave to intervene regarding the Vogtle ESP application, 71 Fed. Reg. 60,195 (Oct. 12, 2006), Joint Petitioners filed a timely request for hearing and petition to intervene that sought to establish the case for their standing and the admissibility of what they designated as five contentions. *See* Petition for Intervention (Dec. 11, 2007) [hereinafter Intervention Petition]. Thereafter, on December 15, 2006, this Atomic Safety and Licensing Board was established to adjudicate the Vogtle ESP

¹ Revision 1 of the Vogtle ESP application can be found in the agency's ADAMS document management system at Accession Nos. ML063210521, ML063210525 (AI), ML063210528 (SSAR), ML063210530 (SSAR), ML063210533 (SSAR), ML063210535 (SSAR), ML063210537 (SSAR), ML063210541 (SSAR), ML063210542 (SSAR), ML063210543 (SSAR), ML063210544 (SSAR), ML063210546 (SSAR), ML063210549 (SSAR), ML063210551 (SSAR), ML063210553 (SSAR), ML063210554 (SSAR), ML063210555 (ER), ML063210558 (ER), ML063210560 (ER), ML063210562 (ER), ML063210565 (ER), ML063210568 (SRP), ML063210569 (EP).

proceeding.² See 71 Fed. Reg. 77,071 (Dec. 22, 2006). In the December 18, 2006 initial prehearing order, in addition to establishing several procedural measures to govern matters such as the filing of time extension motions, the Licensing Board indicated that it would treat the three designated subparts of the first of the Joint Petitioners contentions as three separate contentions and requested that for these and their other contentions, Joint Petitioners designate each as being in one or more of the following subject matter categories: (1) Administrative, (2) Site Safety Analysis, (3) Environmental, (4) Emergency Planning, or (5) Miscellaneous. See Licensing Board Memorandum and Order (Initial Prehearing Order) (Dec. 18, 2006) at 1-2 (unpublished) [hereinafter Initial Prehearing Order]. This prehearing order also set a January 10, 2007 deadline for SNC and Staff responses to the Joint Petitioners contention supplement and a January 17, 2007 deadline for the Joint Petitioners response, which was later extended to January 24, 2007. See *id.* at 3; Licensing Board Order (Granting in Part Motion for Time Extension To File Reply Pleading) (Jan. 16, 2007) at 2 (unpublished).

Within 10 days of the initial prehearing order, Joint Petitioners timely complied with the Board's request regarding contention designation with a supplemental pleading indicating that their seven issue statements were all environmental contentions (EC). See Joint Supplement to Petition for Intervention (Dec. 27, 2006). Thereafter, SNC and the NRC Staff both responded to the Joint Petitioners hearing request on January 10, 2007. See Southern Nuclear Operating Company's Answer in Response to Petition for Intervention (Jan. 10, 2007) at 11 [hereinafter SNC Answer]; NRC Staff Answer to Petition for Intervention (Jan. 10, 2007) at 14 [hereinafter Staff Answer]. The next day, the Board issued an order establishing the location and timing for an initial prehearing conference intended to provide the participants with an opportunity to present oral argument and answer Board questions regarding contention admissibility. See Licensing Board Memorandum and Order (Initial Prehearing Conference Schedule; Argument Allocations; Opportunity for Written Limited Appearance Statements) (Jan. 11, 2007) at 1 (unpublished). Finally, on January 24, Joint Petitioners filed their reply to the SNC and Staff answers. See Petitioners' Reply to NRC Staff Answer and SNC Answer to Petition for Intervention of [Joint Petitioners] (Jan. 24, 2007) [hereinafter Joint Petitioners Reply].

On February 13, 2007, in Waynesboro, Georgia, the Board conducted a 1-day prehearing conference during which it heard oral presentations from the partici-

pants regarding the admissibility of the Joint Petitioners seven contentions. See Tr. at 5-192. Less than 2 weeks later, on February 26, 2007, the Commission issued a series of decisions that arguably had an impact on one of the Joint Petitioners proffered environmental contentions, EC 4, regarding the need to include in the ER a discussion of the impacts of a terrorist attack on the existing and proposed Vogtle facilities.³ The next day, the Board issued an order permitting the participants to provide supplemental briefs and responsive filings addressing the impact of these Commission decisions on the admissibility of that contention, which SNC and the Staff did on March 1, 2007. See Licensing Board Memorandum and Order (Briefing Schedule Regarding Impact of Commission Decisions on Joint Petitioners Environmental Contention 4) (Feb. 27, 2007) at 1-2 (unpublished); [SNC] Brief on the Commission's Recent Decisions Concerning Analysis of Terrorist Impacts Under NEPA on the Admissibility of EC 4 (Mar. 1, 2007) [hereinafter SNC NEPA Terrorist Impacts Brief]; NRC Staff Brief Addressing Impact of Commission Decisions on Joint Petitioners' Proposed [EC] 4 (Mar. 1, 2007) [hereinafter Staff NEPA Terrorist Impacts Brief].

II. ANALYSIS

A. Joint Petitioners Standing

1. Standards Governing Standing

In determining whether an individual or organization should be granted party status in a proceeding based on standing "as of right," the agency has applied contemporaneous judicial standing concepts that require a participant to establish (1) it has suffered or will suffer a distinct and palpable injury that constitutes injury-in-fact within the zones of interests arguably protected by the governing statutes (e.g., the Atomic Energy Act of 1954 (AEA), the National Environmental Policy Act of 1969 (NEPA)); (2) the injury is fairly traceable to the challenged action; and (3) the injury is likely to be redressed by a favorable decision. See *Yankee Atomic Electric Co.* (Yankee Nuclear Power Station), CLI-96-1, 43 NRC 1, 6 (1996). In this regard, in cases involving the possible construction or operation of a nuclear power reactor, proximity to the proposed facility has been considered sufficient to establish the requisite standing elements. See *Florida Power & Light Co.* (St. Lucie Nuclear Power Plant, Units 1 and 2), CLI-89-21, 30

² Further, acting on a Commission directive designating this proceeding as a pilot for the use of an electronic, Internet-based document submission system in agency adjudicatory proceedings generally, the Chief Administrative Judge established procedures requiring the use of an E-Submittal process for all filings in this proceeding. See Chief Administrative Judge Memorandum and Order (Establishing Procedures for Submitting Documents Using Agency Electronic Information Exchange/E-Submittal Process) (Dec. 15, 2006) (unpublished).

³ See *Pacific Gas and Electric Co.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), CLI-07-11, 65 NRC 148 (2007); *System Energy Resources, Inc.* (Early Site Permit for Grand Gulf ESP Site), CLI-07-10, 65 NRC 144 (2007); *Nuclear Management Co., LLC* (Palisades Nuclear Plant), CLI-07-9, 65 NRC 139 (2007); *AmerGen Energy Co., LLC* (Oyster Creek Nuclear Generating Station), CLI-07-8, 65 NRC 124 (2007).

NRC 325, 329 (1989). Further, when an entity seeks to intervene on behalf of its members, that entity must show it has an individual member who can fulfill all the necessary standing elements and who has authorized the organization to represent his or her interests. See *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), CLI-00-20, 52 NRC 151, 163 (2000). In assessing a petition to determine whether these elements are met, which a presiding officer must do even though there are no objections to a petitioner's standing, the Commission has indicated that we are to "construe the petition in favor of the petitioner." *Georgia Institute of Technology* (Georgia Tech Research Reactor, Atlanta, Georgia), CLI-95-12, 42 NRC 111, 115 (1995). We apply these rules and guidelines in evaluating each of the Joint Petitioners standing presentations.

2. Atlanta Women's Action for New Directions (Atlanta WAND)

DISCUSSION: Intervention Petition at 4-5 & Exh. 1; SNC Answer at 6 n.7; Staff Answer at 9 & Attach. A.

RULING: Atlanta WAND is a not-for-profit organization whose members oppose the issuance of an ESP to SNC. Attached to the Joint Petitioners hearing request are the affidavits of three WAND members, each of whom states that Atlanta WAND is authorized to represent his or her interests. All three members reside within 50 miles of the Plant Vogtle site, and at least one lives within 30 miles of the facility. These individuals' asserted health, safety, and environmental interests and their agreement to permit Atlanta WAND to represent their interests are sufficient to establish Atlanta WAND's standing to intervene in this proceeding.

3. Blue Ridge Environmental Defense League (BREDL)

DISCUSSION: Intervention Petition at 4-5 & Exh. 1; SNC Answer at 6 n.7; Staff Answer at 10 & Attach. A.

RULING: BREDL is a not-for-profit organization whose members oppose the issuance of an ESP to SNC. Attached to the Joint Petitioners hearing request are the affidavits of sixteen BREDL members, each of whom states that BREDL is authorized to represent his or her interests. All sixteen members reside within 50 miles of the Plant Vogtle site, and at least one lives within 25 miles of the facility. These individuals' asserted health, safety, and environmental interests and their agreement to permit BREDL to represent their interests are sufficient to establish BREDL's standing to intervene in this proceeding.

4. Center for a Sustainable Coast (CSC)

DISCUSSION: Intervention Petition at 4-5 & Exh. 1; SNC Answer at 6 n.7; Staff Answer at 10-11 & Attach. A.

RULING: CSC is a not-for-profit corporation whose members oppose the issuance of an ESP to SNC. Attached to the Joint Petitioners hearing request are the affidavits of three CSC members, each of whom states that CSC is authorized to represent his or her interests. One member resides within 39 miles of the Plant Vogtle site. This individual's asserted health, safety, and environmental interests and his agreement to permit CSC to represent his interests are sufficient to establish CSC's standing to intervene in this proceeding.

5. Savannah Riverkeeper (SR)

DISCUSSION: Intervention Petition at 4-5 & Exh. 1; SNC Answer at 6 n.7; Staff Answer at 8-9 & Attach. A.

RULING: SR is a not-for-profit organization whose members oppose the issuance of an ESP to SNC. Attached to the Joint Petitioners hearing request are the affidavits of three SR members, each of whom states that SR is authorized to represent his interests. All three reside within 40 miles of the Plant Vogtle site, and at least one lives within 35 miles of the facility. These individuals' asserted health, safety, and environmental interests and their agreement to permit SR to represent their interests are sufficient to establish SR's standing to intervene in this proceeding.

6. Southern Alliance for Clean Energy (SACE)

DISCUSSION: Intervention Petition at 4-5 & Exh. 1; SNC Answer at 6 n.7; Staff Answer at 8 & Attach. A.

RULING: SACE is a not-for-profit organization whose members oppose the issuance of an ESP to SNC. Attached to the Joint Petitioners hearing request are the affidavits of three SACE members, each of whom states that SACE is authorized to represent his or her interests. Two members reside within 50 miles of the Plant Vogtle site, and at least one lives within 36 miles of the facility. These individuals' asserted health, safety, and environmental interests and their agreement to permit SACE to represent their interests are sufficient to establish SACE's standing to intervene in this proceeding.

B. Joint Petitioners Contentions

1. Contention Admissibility Standards

Section 2.309(f) of the Commission's rules of practice specifies the requirements that must be met if a contention is to be deemed admissible. Specifically, a contention must provide (1) a specific statement of the legal or factual issue sought to be raised; (2) a brief explanation of its basis; (3) a concise statement of the alleged facts or expert opinions, including references to specific sources and documents, that support the petitioner's position and upon which the petitioner intends to rely at hearing; and (4) sufficient information demonstrating that a genuine dispute exists in regard to a material issue of law or fact, including references to specific portions of the application that the petitioner disputes, or in the case when the application is alleged to be deficient, the identification of such deficiencies and supporting reasons for this belief. *See* 10 C.F.R. § 2.309(f)(1)(i), (ii), (v), and (vi). In addition, the petitioner must demonstrate that the issue raised in the contention is both "within the scope of the proceeding" and "material to the findings the NRC must make to support the action that is involved in the proceeding." *Id.* § 2.309(f)(1)(iii)-(iv). Failure to comply with any of these requirements is grounds for dismissing a contention. *See Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-99-10, 49 NRC 318, 325 (1999); *see also Arizona Public Service Co.* (Palo Verde Nuclear Generating Station, Units 1, 2, and 3), CLI-91-12, 34 NRC 149, 155-56 (1991).

NRC case law has further developed these requirements, as is summarized below:

a. Challenges to Statutory Requirements/Regulatory Process/Regulations

An adjudication is not the proper forum for challenging applicable statutory requirements or the basic structure of the agency's regulatory process. *Philadelphia Electric Co.* (Peach Bottom Atomic Power Station, Units 2 and 3), ALAB-216, 8 AEC 13, 20, *aff'd in part on other grounds*, CLI-74-32, 8 AEC 217 (1974). Similarly, a contention that attacks a Commission rule, or which seeks to litigate a matter that is, or clearly is about to become, the subject of a rulemaking, is inadmissible. *See* 10 C.F.R. § 2.335; *Potomac Electric Power Co.* (Douglas Point Nuclear Generating Station, Units 1 and 2), ALAB-218, 8 AEC 79, 85, 89 (1974). This includes contentions that advocate stricter requirements than agency rules impose or that otherwise seek to litigate a generic determination established by a Commission rulemaking. *See Florida Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 and 4), LBP-01-6, 53 NRC 138, 159 (2001); *Pacific Gas and Electric Co.* (Diablo Canyon Nuclear Power Plant, Units 1 and 2), LBP-93-1, 37 NRC 5, 29-30 (1993); *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), LBP-82-106, 16 NRC 1649, 1656 (1982); *see also Yankee*

Atomic Electric Co. (Yankee Nuclear Power Station), CLI-96-7, 43 NRC 235, 251 (1996); *Arizona Public Service Co.* (Palo Verde Nuclear Generating Station, Units 1, 2, and 3), LBP-91-19, 33 NRC 397, 410, *aff'd in part and rev'd in part on other grounds*, CLI-91-12, 34 NRC 149 (1991). By the same token, a contention that simply states the petitioner's views about what regulatory policy should be does not present a litigable issue. *See Peach Bottom*, ALAB-216, 8 AEC at 20-21 & n.33.

b. Challenges Outside Scope of Proceeding

All proffered contentions must be within the scope of the proceeding as defined by the Commission in its initial hearing notice and order referring the proceeding to the Licensing Board. *See* 10 C.F.R. § 2.309(f)(1)(iii); *Florida Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 and 4), CLI-00-23, 52 NRC 327, 329 (2000); *Duke Power Co.* (Catawba Nuclear Station, Units 1 and 2), ALAB-825, 22 NRC 785, 790-91 (1985). As a consequence, any contention that falls outside the specified scope of the proceeding must be rejected. *See Portland General Electric Co.* (Trojan Nuclear Plant), ALAB-534, 9 NRC 287, 289 n.6 (1979).

c. Need for Adequate Factual Information or Expert Opinion

It is the petitioner's obligation to present factual information and/or expert opinion necessary to support its contention. *See* 10 C.F.R. § 2.309(f)(1)(v); *Georgia Institute of Technology* (Georgia Tech Research Reactor, Atlanta, Georgia), LBP-95-6, 41 NRC 281, 305, *vacated in part and remanded on other grounds*, CLI-95-10, 42 NRC 1, and *aff'd in part*, CLI-95-12, 42 NRC 111 (1995). While a Board may appropriately view a petitioner's supporting information in a light favorable to the petitioner, failure to provide such information regarding a proffered contention requires the contention be rejected. *See Palo Verde*, CLI-91-12, 34 NRC at 155. In this connection, neither mere speculation nor bare or conclusory assertions, even by an expert, alleging that a matter should be considered will suffice to allow the admission of a proffered contention. *See Fansteel, Inc.* (Muskogee, Oklahoma Site), CLI-03-13, 58 NRC 195, 203 (2003). If a petitioner neglects to provide the requisite support for its contentions, it is not within the Board's power to make assumptions of fact that favor the petitioner, nor may the Board supply information that is lacking. *See Palo Verde*, CLI-91-12, 34 NRC at 155; *Duke Cogema Stone & Webster* (Savannah River Mixed Oxide Fuel Fabrication Facility), LBP-01-35, 54 NRC 403, 422 (2001); *Georgia Tech Research Reactor*, LBP-95-6, 41 NRC at 305.

Likewise, simply attaching material or documents as a basis for a contention,

without setting forth an explanation of that information's significance, is inadequate to support the admission of the contention. See *Fansteel*, CLI-03-13, 58 NRC at 204-05. Along these lines, any supporting material provided by a petitioner, including those portions of the material that are not relied upon, is subject to Board scrutiny. See *Yankee Atomic Electric Co.* (Yankee Nuclear Power Station), LBP-96-2, 43 NRC 61, 90, *rev'd in part on other grounds*, CLI-96-7, 43 NRC 235 (1996). Thus, the material provided in support of a contention will be carefully examined by the Board to confirm that on its face it does supply an adequate basis for the contention. See *Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), ALAB-919, 30 NRC 29, 48 (1989), *vacated in part on other grounds and remanded*, CLI-90-4, 31 NRC 333 (1990).

d. Materiality

To be admissible, the regulations require that all contentions assert an issue of law or fact that is material to the outcome of a licensing proceeding, meaning that the subject matter of the contention must impact the grant or denial of a pending license application. See 10 C.F.R. § 2.309(f)(1)(iv). This requirement of materiality often dictates that any contention alleging deficiencies or errors in an application also indicate some significant link between the claimed deficiency and either the health and safety of the public or the environment. See *Yankee Nuclear*, LBP-96-2, 43 NRC at 75-76; see also *Pacific Gas and Electric Co.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), LBP-02-23, 56 NRC 413, 439-41 (2002), *petition for review denied*, CLI-03-12, 58 NRC 185, 191 (2003).

e. Insufficient Challenges to the Application

All properly formulated contentions must focus on the license application in question, challenging either specific portions of or alleged omissions from the application (including the Safety Analysis Report and the Environmental Report) so as to establish that a genuine dispute exists with the applicant on a material issue of law or fact. See 10 C.F.R. § 2.309(f)(1)(vi). Any contention that fails directly to controvert the application or that mistakenly asserts the application does not address a relevant issue can be dismissed. See *Sacramento Municipal Utility District* (Rancho Seco Nuclear Generating Station), LBP-93-23, 38 NRC 200, 247-48 (1993), *review declined*, CLI-94-2, 39 NRC 91 (1994); *Texas Utilities Electric Co.* (Comanche Peak Steam Electric Station, Unit 2), LBP-92-37, 36 NRC 370, 384 (1992).

2. Scope of Contentions

Although licensing boards generally are to litigate "contentions" rather than "bases," it has been recognized that "[t]he reach of a contention necessarily hinges upon its terms coupled with its stated bases." *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-899, 28 NRC 93, 97 (1988), *aff'd sub nom. Massachusetts v. NRC*, 924 F.2d 311 (D.C. Cir.), *cert. denied*, 502 U.S. 899 (1991); see also *Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-02-28, 56 NRC 373, 379 (2002). As outlined below, exercising our authority under 10 C.F.R. §§ 2.316, 2.319, 2.329, we have acted to further define the Joint Petitioners admitted contentions when redrafting would clarify the scope of the contention.

3. Environmental Contentions (EC)

EC 1.1 — ER FAILS TO INCLUDE AN ADEQUATE AQUATIC HABITAT BASELINE⁴

CONTENTION: The ER fails to use quantitative analysis and field surveys to assess baseline habitat conditions and species diversity and abundance in the project's area.

DISCUSSION: Intervention Petition at 7-9; SNC Answer at 11-16; Staff Answer at 14-15; Joint Petitioners Reply at 6-8; Tr. at 13-64.

RULING: Although, to some degree, Joint Petitioners intermingle the substance of this contention with that of contentions EC 1.2 and EC 1.3, the crux of their concern reflected in this issue statement is that the SNC ER suffers from a fundamental deficiency in that its analysis regarding the impacts and effects of the proposed ESP on the aquatic environment in the area of the Plant Vogtle site is based on information that is inadequate to establish the requisite environmental baseline. According to Joint Petitioners, the ER is inadequate because SNC has failed to include, i.e., omitted, a site-specific description of the Plant Vogtle aquatic environs that is based on recent field studies or a quantitative analysis of the circumstances regarding aquatic species assemblage, migration by anadromous (i.e., moving from the sea to rivers to breed) and diadromous (i.e.,

⁴In noting relative to their initial "contention" that the three "subcontentions" would be treated as separate issue statements, the Board afforded Joint Petitioners the opportunity to label and restate those contentions, including utilizing any of the information contained in support of the "main" contention. See Initial Prehearing Order at 3 n.2. In that regard, because Joint Petitioners did not assign a title to each of these three contentions, the Board has done so based on the contention's content and stated bases. The language of these and the Joint Petitioners other contentions as set forth below is verbatim.

migrating between salt- and freshwater) species, or habitat utilization within the proposed intake and discharge sites and/or the project area. Rather, according to Joint Petitioners, SNC has chosen to rely on long-term studies of the Savannah River Site (SRS), a Department of Energy (DOE) nuclear weapons facility that is across the river from the Plant Vogtle site, that collected data in the vicinity of Plant Vogtle. Applicant SNC opposes the admission of this baseline contention as failing to set forth sufficient information to show the existence of a genuine dispute and as lacking a legal basis. The Staff does not oppose its admission in part, finding a sufficient basis for challenge to the ER based on an asserted lack of discussion of baseline aquatic ecology conditions in the Savannah River.

Joint Petitioners correctly indicate that a NEPA analysis relating to aquatic impacts must, as a practical matter, have a baseline from which to operate. *See American Rivers v. Federal Energy Regulatory Commission*, 201 F.3d 1186, 1195 n.15 (9th Cir. 2000). It is equally apparent, however, that nothing in the agency's Part 51 NEPA regulations, *see* 10 C.F.R. § 51.45(b) (ER must contain "description of the environment affected"), or the Staff's ER preparation guidance regarding providing a description of the local environment, *see* Office of Standards Development, U.S. Nuclear Regulatory Commission [(NRC)], Preparation of [ERs] for Nuclear Power Stations, Regulatory Guide 4.2, at 2-3 to -4 (rev. 2, July 1976) (ADAMS Accession No. ML003739519) [hereinafter Regulatory Guide 4.2], indicates exactly how, as a general matter, such a baseline is to be established.

Although Joint Petitioners have provided the affidavit of Dr. Shawn Paul Young in which he suggests that the existing reference material and studies cited by SNC in its environmental report are inadequate to provide the necessary baseline, he does so in the context of his concern that there is inadequate information to assess the impacts upon the Savannah River aquatic population of the additional intake and discharge outlets that would be constructed and utilized for two additional Vogtle units. *See* Intervention Petition, Exh. 1.3, at 3-9 (Declaration of Shawn Paul Young, Ph.D.) [hereinafter Young Declaration]. In contrast, it appears uncontested that the Applicant has adequately described the general aquatic resources of the Savannah River, including the river's important species and their habitats. *See* Intervention Petition at 8-9; ER at 2.4-7 to-16. In that regard, during the February 13 initial prehearing conference argument concerning this contention, Joint Petitioners counsel explained their position in a colloquy with one of the Board members:

JUDGE TRIKOUROS: So what you're saying — and really this goes to an earlier — a question that I was going to ask. In general, the baseline for that river on a general basis has been characterized adequately to your knowledge, based on work done by [the DOE SRS] and also the existing Vogtle units?

MR. SANDERS: I believe that the general population data and — yes. Let me

just say yes. I think that there is sufficient information about the river in general. We are talking about the specific site.

JUDGE TRIKOUROS: Now, when you talk about the site, are you talking about some region around the intake and some region around the discharge? Is that what you're calling the site?

MR. SANDERS: Well, you see, again, this illustrates the problem with the ER is that it doesn't — that is should be identifying the site. It talks about the Savannah River in general, but it doesn't provide a description of the stretch of the river that is immediately adjacent to Plant Vogtle where the intake and discharge structure will be located. That's really the problem is that there really isn't that specific description of the exact site.

So there's the Savannah River. There's the Middle Savannah River around Plant Vogtle. There's, you know, the Savannah River below the city of Augusta. There's a description of that sort of stuff, but they didn't take the next step and actually describe the flow and habitat conditions on the river right there.

Tr. at 18-19.

As this discussion suggests, the information provided by Joint Petitioners would be inadequate to support the admission of a contention that the aquatic baseline set forth in the ER is wholly insufficient. At the same time, in support of their argument the ER is deficient because of its lack of site-specific studies, Joint Petitioners have not demonstrated with any references — nor are we aware of any — that suggest site-specific studies are generally required. Rather, the appropriate scope of the baseline 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. *See* Office of Nuclear Reactor Regulation, [NRC], "Standard Review Plans for Environmental Reviews for Nuclear Power Plants," NUREG-1555, at 4.3.2-1 to -2 (Oct. 1999) [hereinafter NUREG-1555]; Office of Nuclear Regulatory Research, [NRC], General Site Suitability Criteria for Nuclear Power Stations, Regulatory Guide 4.7, at 4.7-14 to -15 (rev 2, Apr. 1998) (ADAMS Accession No. ML003739894). Although, as we explain below, aspects of this contention may come into play relative to EC 1.2, *see infra* p. 259, we conclude Joint Petitioners have failed to provide sufficient factual or expert information to support its stated scope and, accordingly, we decline to admit this issue statement.⁵ *See* 10 C.F.R. § 2.309(f)(1)(v).

⁵ In their intervention petition, Joint Petitioners declared:

The ER's analysis of the cooling system intake and discharge structures and operation is not based on field surveys or quantitative analysis. ER § 5.3; 10 C.F.R. § 51.45(c). Thus, the ER

(Continued)

EC 1.2 — ER FAILS TO IDENTIFY AND CONSIDER COOLING SYSTEM IMPACTS ON AQUATIC RESOURCES

CONTENTION: The ER fails to identify and consider direct, indirect, and cumulative impacts of the proposed cooling system intake and discharge structures on aquatic resources.

DISCUSSION: Intervention Petition at 10-13; SNC Answer at 16-23; Staff Answer at 16-19; Joint Petitioners Reply at 8-12; Tr. at 65-97.

RULING: SNC asserts that this contention regarding the inadequacy of the ER's discussion of intake/discharge structure aquatic impacts associated with impingement/entrainment and chemical and thermal effluent discharges should be dismissed as lacking sufficient factual and legal support and as not material to the agency's findings relative to ESP issuance. The Staff does not oppose its admission.

In contrast to contention EC 1.1, we find the Joint Petitioners submission, in particular the affidavit of Dr. Shawn Paul Young, provides sufficient factual support for the admission of this contention. For each of the asserted deficiencies concerning the ER impact discussion regarding the intake/discharge structure for the two new proposed facilities — impingement/entrainment, chemical discharges, and thermal discharges, including cumulative impacts from these items associated with the existing Vogtle facilities — Dr. Young's affidavit provides specific references to a number of alleged errors in the ER. See Young Declaration at 3-11. Moreover, in the absence of a National Pollutant Discharge Elimination System (NPDES) permit for the new intake/discharge facility, we are unable to find dispositive of this contention's admissibility the SNC effort, see Tr. at 88-89, to rely upon an EPA rulemaking regarding the "best available technology" status of a closed-cycle recirculating cooling system, see 66 Fed. Reg. 65,256 (Dec. 18, 2001), purported to be like that proposed for the new Vogtle facilities. See

fails to identify the current aquatic species assemblage or the presence or absence of threatened, endangered, or rare species in the project area. Similarly, the ER contains no data concerning upstream and downstream migration of anadromous and diadromous species in this section of the Savannah River or their habitat utilization within the project area. Likewise, the ER does not address specific habitat types and utilization by resident and anadromous fish in the project area. Nor does the ER examine flow-habitat relationships and the potential impacts of the project on habitat availability.

Intervention Petition at 8. In its answer to the intervention petition, the Staff indicated this statement was sufficient to support the admission of this contention as it related to the adequacy of the ER's discussion of current aquatic species assemblage, migration/habitat utilization by anadromous/diadromous species, and habitat types/utilization by anadromous fish, but was insufficient to support the contention's admission relative to flow-habitat relationships and habitat availability impacts. See Staff Answer at 14-15; see also Tr. at 47-49. Given the factual support provided by Joint Petitioners, however, we are unable to conclude that any aspects of this contention are admissible.

NUREG-1555, at 5.3.1.2-5 to -6, 5.3.2.2-5 to -6 (if current NPDES permit or state equivalent is not available, Staff reviewer must continue with analysis of applicant's cooling water intake/discharge system impacts).

Accordingly, we conclude that this contention, as set forth in Appendix A to this opinion, is supported by bases establishing a genuine material dispute adequate to warrant further inquiry. In admitting this contention, we note that litigation regarding its merits may involve the question of the adequacy of the baseline information provided by SNC relative to the portion of the Savannah River that encompasses the project area associated with the intake/discharge structures for both the existing and proposed Vogtle facilities.

EC 1.3 — ER ALTERNATIVES DISCUSSION FAILS TO ADDRESS AQUATIC SPECIES IMPACTS

CONTENTION: The ER fails to satisfy 10 C.F.R. § 51.45(b)(3) because it fails to address impacts to aquatic species in its discussion of alternatives. In particular, the ER's discussion of the no-action alternative and of alternative cooling technologies fails to consider environmental and economic benefits of avoiding construction of the proposed cooling system.

DISCUSSION: Intervention Petition at 14-15; SNC Answer at 24-26; Staff Answer at 19-22; Joint Petitioners Reply at 12-14; Tr. at 97-117.

RULING: Joint Petitioners posit two bases in support of EC 1.3: the ER discussion of the no-action alternative does not provide an adequate discussion of economic and environmental benefits, and the ER discussion of the dry-cooling alternative and aquatic impacts is insufficient because extremely sensitive biological resources are present. Applicant SNC opposes this contention, arguing that it lacks a genuine factual or legal basis necessary for admission under 10 C.F.R. § 2.309(f). The Staff originally opposed admitting the contention altogether, but at oral argument stated it would favor admitting a limited version of the contention if the Board admitted EC 1.2. The Staff's revised EC 1.3 would provide that "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." Tr. at 108.

The Board concludes the Joint Petitioners argument addressing the no-action alternative is inadmissible because it does not specifically address any deficiencies in the ER discussion of the no-action alternative. Nor do Joint Petitioners address why more information regarding the no-action alternative is needed in the face of prior Commission statements noting that such discussions can be brief and can incorporate by reference other sections of the ER discussing the project's adverse consequences. See *Hydro Resources, Inc.* (P.O. Box 15910, Rio Rancho, NM 87174), CLI-01-4, 53 NRC 31, 54 (2001) ("[f]or the 'no action' alternative, there need not be much discussion"); *Louisiana Energy Services, L.P.* (Claiborne

Enrichment Center), CLI-98-3, 47 NRC 77, 98 (1998) (“[w]e do not find the FEIS’s incorporation by reference approach unreasonable as such”). By failing to point to specific parts of the ER’s discussion of the no-action alternative they find inadequate and to provide support for that dispute, Joint Petitioners have failed to provide sufficient information to show that a genuine dispute exists with the Applicant. *See* 10 C.F.R. § 2.309(f)(1)(vi).

The Joint Petitioners other, and seemingly primary, argument relative to this contention challenges whether SNC has provided an adequate analysis of dry cooling as an alternative cooling system for the proposed Vogtle facilities. SNC generally is obligated in the ER to discuss project alternatives and emphasize those that “appear promising in terms of environmental protection.” Regulatory Guide 4.2, at 10-1; *see also* Joint Petitioners Reply at 14. In this regard, the Staff’s regulatory guide instructs applicants to include alternatives that “although not necessarily economically attractive, . . . are based on feasible technology available to the applicant during the design state.” *Id.*

Established case law teaches that, except for its overall NEPA balancing, the NRC can limit its analysis of aquatic impacts to those determined by the EPA, *see New England Coalition on Nuclear Pollution v. NRC*, 582 F.2d 87, 98 (1st Cir. 1978), when EPA has analyzed an alternative technology extensively and made conclusions as to its suitability. In light of that authority, it is not untoward that an applicant would seek to rely on that analysis. So in this context, in which EPA has rejected dry cooling as the best available technology for cooling systems (or as a national minimum requirement), finding that its environmental benefits are not so great as to offset its costs, regional disparities, and losses in energy efficiency, *see* 66 Fed. Reg. at 65,282, it hardly comes as a surprise the SNC discussion of dry cooling relies in significant part upon the EPA’s analysis and conclusions regarding dry cooling, *see* ER at 9.4-2. Nor is such reliance necessarily inappropriate, given the deference to the EPA’s analyses in areas such as these.

In that analysis, however, EPA also stated:

Although EPA has rejected dry cooling technology as a national minimum requirement, EPA 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. This could be the case in areas with limited water available for cooling or waterbodies with extremely sensitive biological resources (e.g., endangered species, specially protected areas).

66 Fed. Reg. at 65,282. 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.

Joint Petitioners have asserted there are extremely sensitive resources present in the Savannah River in the vicinity of the Vogtle facility and have given examples of what they believe to be extremely sensitive species, including the shortnose sturgeon (which is a federally listed endangered species) and the robust redbow (which until 1997 was thought to be extinct). *See* Intervention Petition at 15. SNC disputes that such species are present and appears to argue that the term “extremely sensitive” does not mean federally listed endangered species. *See* SNC Answer at 25-26; Tr. at 107. The EPA has not defined the term “extremely sensitive biological resources,” other than to offer two examples, “i.e., endangered species and specially protected areas.” 66 Fed. Reg. at 65,282. The Board concludes that the meaning of this term and whether such resources are present are material factual and legal disputes best resolved in merits litigation regarding this contention.

Accordingly, we conclude that this contention concerning the need for an additional discussion of dry cooling as an alternative cooling system, as set forth in Appendix A to this opinion, is supported by bases establishing a genuine material dispute adequate to warrant further inquiry.

EC 2 — ENVIRONMENTAL JUSTICE — IMPACT ON MINORITY AND LOW-INCOME POPULATIONS

CONTENTION: The ER for the proposed new reactors at Plant Vogtle is inadequate to satisfy the NEPA because it fails to provide a thorough analysis of the disparate environmental impacts of the project on the minority and low-income communities residing in close proximity to the site. The ER fails to consider factors particular to those communities which will magnify the environmental impacts of the proposed reactors in a way that is both disparate and significant. In particular, the ER fails to acknowledge the widespread practice of subsistence fishing in the Savannah River, and the likelihood that this population’s intake of radionuclides and other toxic substances generated by the proposed reactors will be significant and disproportionate to the rates of ingestion by the general population. In addition, the ER fails to address the fact that cancer rates in the minority and low-income communities surrounding Plant Vogtle are already higher than for the general population, and therefore that those communities are more vulnerable to the adverse impacts of additional radiological and chemical pollution in the environment. Finally, the ER fails to address disparate impacts on the minority and low-income communities during a radiological emergency and evacuation.

DISCUSSION: Intervention Petition at 15-26; SNC Answer at 26-40; Staff Answer at 23-29; Joint Petitioners Reply at 14-25; Tr. at 118-48.

RULING: In support of this contention, Joint Petitioners argue that the ER has neglected to discuss adequately three adverse impacts that fall disproportionately

upon the minority and low-income populations that the ER acknowledges are in the communities surrounding the proposed Vogtle facilities: the area's heightened cancer rates, the evacuation methods used in the event of an emergency, and the effects of eating cesium (Cs)-137-laden fish caught by minority and low-income community residents engaged in subsistence fishing. Both SNC and the Staff oppose admitting this contention, arguing that it runs afoul of 10 C.F.R. § 2.309(f)(1) in that it neither includes sufficient information to show that a genuine dispute exists nor raises an issue material to these proceedings.

As noted by Joint Petitioners and the Staff, the NRC has made a commitment as part of its NEPA review process to strive to reach the environmental justice goals described in Executive Order 12898. *See* 69 Fed. Reg. 52,040, 52,041-42 (Aug. 24, 2004) (final Commission environmental justice policy statement). As the Commission previously has noted in reviewing environmental justice claims, "adverse impacts that fall heavily on minority and impoverished citizens call for particularly close scrutiny." *Claiborne Enrichment Center*, CLI-98-3, 47 NRC at 106.

There are, however, two requirements necessary to implicate this close environmental justice scrutiny. First, support must be presented regarding the alleged existence of adverse impacts or harm on the physical or human environment. Second, a supported case must be made that these purported adverse impacts could disproportionately affect poor or minority communities in the vicinity of the facility at issue. *See* 69 Fed. Reg. at 52,047. Joint Petitioners have not met these two requirements relative to any of their three alleged disproportionate impacts.

Initially, we note Joint Petitioners argument regarding heightened cancer rates in the area of the existing Vogtle facilities is not supported by relevant evidence regarding such enhanced rates or any other possible harm. Although Joint Petitioners present one article discussing a study that found increased cervical and esophageal cancer rates in the vicinity of the SRS, they also note the study's observation that "these types of cancer are not necessarily associated with exposure to radioactive materials." Intervention Petition at 23. No evidence of heightened rates for any cancers typically associated with radiation exposure is presented. In fact, the overall conclusion of the sole study cited by Joint Petitioners is that "most cancer rates in the area are about the same as in similar communities." *Id.*, Exh. 2.7, at 1 (*Researchers Find Cancer Rates Normal Near Nuclear Plant*, Cancer Weekly, Feb. 3, 1997, at 13-14). All told,⁶ the evidence

⁶ Joint Petitioners also make an assertion that this portion of EC 2 is supported by pre- and post-Vogtle facility mortality data concerning Burke County, but cite only to a general nationwide database of mortality data in which it is not apparent where the data that supposedly support their assertion are to be found. *See* Intervention Petition at 24 n.30. It being well established that the Board cannot be expected to sift through reams of data to determine whether a contention is admissible, *see Georgia*

(Continued)

presented for this argument is inadequate to provide the necessary "alleged facts or expert opinions which support the requestor's/petitioner's position on the issue." 10 C.F.R. § 2.309(f)(1)(v). Additionally, without relevant evidence of heightened cancer rates, there is no evidence of either adverse or disparate impacts. As such, this aspect of EC 2 fails to show, as is required by section 2.309(f)(1)(iv), "that the issue raised in the contention is material to the findings the NRC must make to support the action that is involved in the proceeding."

The emergency planning prong of EC 2 also fails to meet NRC contention admissibility standards because of its lack of relevant supporting material. The NRC requires that environmental justice contentions be based on the specific characteristics of a particular minority community. *See Claiborne Enrichment Center*, CLI-98-3, 47 NRC at 100. Thus, in the *Claiborne Enrichment Center* proceeding, to support an argument that the minority community surrounding the site would be disproportionately impacted by a longer bypass road, the petitioners presented evidence that a larger proportion of this community did not have cars. *Id.* at 107-08. No information of this type has been presented here. Instead, Joint Petitioners simply cite to a report regarding the evacuation of the urban poor population of New Orleans, Louisiana, during Hurricane Katrina and note that the area around Plant Vogtle would present different challenges, without explaining what those different challenges might be.⁷ *See* Intervention Petition at 25-26; Joint Petitioners Reply at 25. This general, unsupported argument is not only insufficient to provide the necessary factual or expert opinion support for this contention in accord with section 2.309(f)(1)(v), but also is so vague as to fail to demonstrate a disagreement with the Applicant as required by section 2.309(f)(1)(vi).

Finally, there is the Joint Petitioners primary environmental justice assertion that poor and minority populations will be disproportionately harmed by the cumulative impacts of the new Vogtle facilities given the current presence of Cs-137 pollution in the Savannah River fish population that is a subsistence food source. This concern, however, also lacks an adequate showing of adverse impacts, without which disparate impacts have no significance, making the

Tech Research Reactor, LBP-95-6, 41 NRC at 305; *International Uranium (USA) Corp.* (Receipt of Material from Tonawanda, New York), LBP-98-21, 48 NRC 137, 142 n.7 (1998); *Tennessee Valley Authority* (Browns Ferry Nuclear Plant, Units 1 and 2), LBP-76-10, 3 NRC 209, 216 (1976), this nonselective citation is not consistent with the Joint Petitioners obligation to provide analyses and expert opinion supporting their contention.

⁷ Joint Petitioners never specifically reference or discuss the section of the SNC emergency plan that addresses the process for evacuating those without cars, *see* EP at J-5, which seemingly would be the unique characteristic of the affected poor and minority communities at issue.

potential issue immaterial to the environmental findings associated with the SNC ESP application and thus an inadmissible contention.⁸

At the contention admissibility stage, it is appropriate to ask as a threshold matter whether, assuming the Board could find the Joint Petitioners supporting evidence credible, they have shown that the issue raised in this contention is material to legitimate health and safety or environmental concerns about which the NRC must make findings. See 10 C.F.R. § 2.309(f)(1)(iv). Here, even if the Board assumes subsistence fishing takes place on the Savannah River, as Joint Petitioners contend, and a disproportionate number of local residents who are poor or members of a minority group eat the 50 kilograms (kg) or more of fish per year from the river that the Joint Petitioners proffered supporting study sets as the "subsistence" consumption level, see Intervention Petition, Exh. 2.4, at 431 (J. Burger et al., *Factors in Exposure Assessment: Ethnic and Socioeconomic Differences in Fishing and Consumption of Fish Caught Along the Savannah River*, 19 Risk Analysis 427 (1999)) [hereinafter Burger Study], Joint Petitioners have not alleged, much less presented any supporting information suggesting, that consuming 50 kg/year of fish from the Savannah River will create levels of Cs-137 in those eating the fish that violate NRC or EPA dose limits.⁹

As is explained in its ER, see ER at 5.4-1, SNC evaluated the dose to the maximally exposed individual (MEI) from liquid effluents from the Vogtle facilities using the methodology of relevant Staff Regulatory Guide 1.109, [OSD], [NRC], Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I, Regulatory Guide 1.109 (rev. 1, Oct. 1977) (ADAMS Accession No. ML003740384), with input from the Vogtle Offsite Dose Calculation Manual (ODCM) (ver. 22, June 25, 2004) (referenced in ER at 5.4-13). In this regard, the two sources of ingestion evaluated by SNC were ingestion of fish and ingestion of drinking water

from the river. See ER at 5.4-1 to -2. The postulated total radiological releases from liquid effluents, which included a range of corrosion, activation, and fission products, were, excluding tritium, 0.26 curie (Ci)/year. Cs-137, the radionuclide found in various fish samples, see Intervention Petition at 19, was determined to be released at the rate of 0.013 Ci/year, one-twentieth of the total release. See ER at 3.5-15 (Table 3.5-1).

Bioaccumulation of Cs-137 and other radiological isotopes was considered in the MEI analysis in the ER accompanying the Vogtle ESP application, in accordance with the Vogtle ODCM. In evaluating the dose from these liquid radiological releases, SNC assumed an individual fish consumption of 21 kg/year and a drinking water consumption of 730 liters/year. See ER at 5.4-7 (Table 5.4-2). Using these assumptions, the calculated MEI total body and maximum organ annual doses from all radionuclide releases for both fish and water ingestion from the two new Vogtle units and the existing Vogtle units are, however, substantially less than the 10 C.F.R. Part 50, App. I, and 40 C.F.R. Part 190 limits. See ER at 5.4-7, 5.4-10 (Tables 5.4-2, 5.4-8, 5.4-9).

Although the drinking water dose was not identified by Joint Petitioners as contributing to an environmental justice concern, Joint Petitioners did identify fish consumption associated with subsistence fishing as a concern. See Intervention Petition at 20; Burger Study at 432-37. Given the large margin that would have to be eliminated before regulatory limits were violated, a review of the information available in the ER and the Vogtle ODCM indicates that, commensurate with the Joint Petitioners concern regarding subsistence fishing, an increase to 50 kg/year of fish from the 21 kg/year currently assumed under the SNC ER would result in an MEI dose that would still remain well below the current regulatory limits for liquid releases and for all pathways.

It should be added that when the SRS cesium releases into the river are taken into account as well, doses still remain under regulatory limits. The Cs-137 released from the SRS was 0.134 Ci/year and accounted for about 57% of the 0.08-millirem (mrem) MEI total body dose from liquid radiological releases in 2005, assuming a fish ingestion of 19 kg/year and a regulatory limit of 25 mrem/year. See Washington Savannah River Co., [SRS] [ER] for 2005, WSRC-TR-2006-0007, at 43 (Table 6-1), 48 (www.srs.gov/general/pubs/ERsum/er06/er2005.htm).¹⁰ While increasing the fish consumption rate for SRS to 50 kg/year would proportionally increase the dose, that dose still would be well below the NRC and EPA limits. Moreover, the cumulative annual dose from the SRS, existing Vogtle units, and proposed Vogtle units from liquid releases would remain well below the regulatory limit if the liquid pathway dose were increased to account for the

⁸ In contesting the admission of this contention, the Staff asserted that the Joint Petitioners argument wrongly focuses on impacts resulting from the SRS. NRC, however, has expressed a commitment to considering cumulative impacts in its environmental justice analysis, making SRS-related harm an appropriate issue to consider cumulatively with any impacts from the proposed reactors. See 69 Fed. Reg. at 52,042-43. Additionally, SNC's argument that there are no subsistence fishermen on the Savannah River based on its inquiries to the appropriate governmental entities improperly goes to the merits of the Joint Petitioners contention. See *Commonwealth Edison Co.* (Braidwood Nuclear Power Station, Units 1 and 2), LBP-85-20, 21 NRC 1732, 1741 (1985).

⁹ Although Joint Petitioners cite as a primary source for their assertions regarding subsistence fishing a report from the Institute for Energy and Environment Research, see Intervention Petition at 20 n.14 (citing Arjun Makhijani, Ph.D., and Michele Boyd, Institute for Energy and Environmental Research, Nuclear Dumps by the Riverside: Threats to the Savannah River from Radioactive Contamination at the [SRS] (2004) (Exh. 2.3) [hereinafter IEER Study]), it is apparent that the basis for the conclusions in this report is the Burger study that is attached as Exhibit 2.4 to the Joint Petitioners hearing request, see Tr. at 133. We thus look to that article as the supporting basis for this aspect of their contention.

¹⁰ This report is the most recent version of the annual SRS report that is cited in the SNC ER at 10.5-4 and in the IEER Study at 76-77.

higher fish consumption associated with subsistence fishing.¹¹ Certainly, Joint Petitioners have not provided any information that suggests a contrary result.

When a contention alleges that increases in radioactive releases create higher doses, but does not provide information or expert opinion to dispute the conclusion that the higher doses would still be under NRC regulatory limits, and no evidence has been presented to show that the higher levels will cause harm, sufficient information to show that a material dispute exists has not been provided and the contention making these claims should not be admitted. See 10 C.F.R. § 2.309(f)(1)(iv), (vi). Illustrative is *Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Unit 2), LBP-03-12, 58 NRC 75, 83, 93-94, *aff'd*, CLI-03-14, 58 NRC 207 (2003), in which an applicant sought a change to that facility's technical specifications regarding fuel-handling procedures that the petitioners alleged could increase the amounts of radiological effluents released offsite. Because the projected increased levels remained below regulatory limits and the petitioner did not provide a basis for showing why the increased levels might be unsafe, the Board found the petitioner had not provided a sufficient basis to demonstrate a genuine dispute on a material issue and dismissed the contention, a ruling with which the Commission agreed.¹² Similarly, in accord with the environmental justice executive order, the NRC has obligated itself to address only the disproportionate distribution of "high and adverse" effects in its NEPA analysis. See *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-02-20, 56 NRC 147, 154 (2002). A dosage increase that remains well under regulatory limits is not a "high and adverse" effect.¹³

¹¹ Indeed, even increasing fish consumption to 100 kg/year, the high-end figure for black subsistence fisherman found in the Burger paper, see Burger Study at 432 (Table IV), would still not exceed NRC or EPA regulatory limits on an individual facility or cumulative basis.

¹² Additionally, a contention based on the dangers of a dose below NRC regulatory limits could be considered an impermissible challenge to the Commission's regulations. In *Millstone*, the Commission found the petitioner's argument that "any increase in dose, no matter the amount, and regardless of whether the change complies with NRC radiological dose requirements, is unacceptable," amounted to an attack upon NRC dosage regulations. *Millstone*, CLI-03-14, 58 NRC at 217-18; see also *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), LBP-82-106, 16 NRC 1649, 1656 (1982) ("In the absence of a 'regulatory gap,' . . . an attempt to advocate stricter requirements than those imposed by the regulations will result in a rejection of the contention, the latter as an impermissible collateral attack on the Commission's rules").

¹³ While one of the central purposes of NEPA is information gathering and disclosure, information immaterial to the proceeding does not necessarily need to be included. See *Exelon Generation Co., LLC* (Early Site Permit for Clinton ESP Site), CLI-05-29, 62 NRC 801, 811 (2005) ("There may, of course, be mistakes in the DEIS, but in an NRC adjudication, it is intervenors' burden to show their significance and materiality. Our boards do not sit to 'flespeck' environmental documents or to add details or nuances."); see also *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-02-25, 56 NRC 340, 349 (2002) ("NEPA does not call for examination of every conceivable aspect of federally licensed projects" (internal quotes omitted)).

Joint Petitioners assert repeatedly that the adverse impacts created by plant releases will fall disproportionately on the poor and minorities because most of those who eat more than 50 kg of fish per year are African American.¹⁴ Without adverse effects, however, how those impacts are distributed is immaterial to this proceeding, and so the Joint Petitioners contention seeking further consideration of those impacts is not admissible.

In sum, Joint Petitioners have not provided sufficient relevant support in any of their three environmental justice arguments to show "some significant link between the claimed deficiency and either the health and safety of the public or the environment." *Louisiana Energy Services, L.P.* (National Enrichment Facility), LBP-04-14, 60 NRC 40, 56 (2004). Without this link, EC 2 does not assert an issue of law or fact that is material to the findings the NRC must make in this licensing proceeding and thus cannot be admitted. See 10 C.F.R. § 2.309(f)(1)(iv).

EC 3 — FAILURE TO EVALUATE WHETHER AND IN WHAT TIME FRAME SPENT FUEL GENERATED BY PROPOSED REACTORS CAN BE SAFELY DISPOSED OF

CONTENTION: The ER for the Vogtle ESP is deficient because it fails to discuss the environmental implications of the substantial likelihood that spent fuel generated by the new reactors will have to be stored at the Vogtle site for more than 30 years after the reactors cease to operate, and perhaps indefinitely. The Waste Confidence Decision does not support SNC's failure to address this issue in the ER, because it has been outdated by changed circumstances and new and significant information. [(Footnote omitted.)] As required [by] NEPA, the NRC may not permit construction or operation of the new Vogtle reactors unless and until it has taken into account these changed circumstances and new and significant information. 10 C.F.R. § 51.92; see also *Marsh v. Oregon Natural Resources Council*, 490 U.S. 360 (1989).

DISCUSSION: Intervention Petition at 26-31; SNC Answer at 41-49; Staff Answer at 29-33; Joint Petitioners Reply at 25-27; Tr. at 148-52.

RULING: As both SNC and the Staff point out, this contention challenging the agency's Waste Confidence Decision, which is embodied in 10 C.F.R. § 51.23, seemingly suffers from two potentially fatal deficiencies. First, it constitutes a challenge to an agency rule, which is not permitted in an agency adjudication. See 10 C.F.R. § 2.335(a); see also *Entergy Nuclear Vermont Yankee, LLC* (Vermont

¹⁴ Although Joint Petitioners seek to claim that low income is a relevant environmental justice factor in connection with subsistence fishing, ultimately their material does not support an argument that adverse impacts, were there any, fall disproportionately upon the area's poor. See Burger Study at 431 ("There were few significant differences as a function of income"); *id.* at 436 ("Income did not enter any of the models independently as a significant variable").

Yankee Nuclear Power Station), CLI-07-3, 65 NRC 13, 20 (2007) (contention seeking ER analysis of long-term effects of high-density pool spent fuel storage inappropriately challenges rule-based generic environmental findings for reactor life extension proceedings). Additionally, notwithstanding the fact the agency's procedural rules offer an opportunity to request a waiver or exception to the application of a rule in a particular adjudicatory proceeding, *see* 10 C.F.R. § 2.335(b); *see also Vermont Yankee*, CLI-07-3, 65 NRC at 20, the contention fails to address any of the elements required to seek and obtain such a waiver.

Apparently recognizing this difficulty, in their reply pleading Joint Petitioners indicated they intend to submit a rulemaking petition to the Commission in an attempt to have the Waste Confidence Decision reconsidered in light of what they assert is new and significant information regarding, among other things, (1) lack of any progress regarding a second high-level radioactive waste repository in addition to the proposed Yucca Mountain, Nevada facility; (2) the prospect that a number of new power reactors will be constructed and operated; and (3) whether, in light of the terrorist attacks of September 11, 2001, spent fuel can continue to be safely stored at existing power reactor sites during the lengthy period that will be required for a HLW repository to be licensed, constructed, and operated. Moreover, acknowledging their contention is likely to be dismissed from this proceeding, they request that the Board issue a ruling "retaining" them as parties in this proceeding pending agency completion of action on their rulemaking petition. *See* Joint Petitioners Reply at 27; *see also* Tr. at 149, 152. While we agree that Joint Petitioners' statement EC 3 must be dismissed, we cannot agree to their request essentially to grant them provisional/conditional party status based on an anticipated (but as yet unrealized) challenge associated with possible agency action on a promised (but yet-to-be-submitted) rulemaking petition.¹⁵

EC 4 — FAILURE TO ADDRESS ENVIRONMENTAL IMPACTS OF INTENTIONAL ATTACKS

CONTENTION: The [ER] for the Vogtle ESP application is inadequate to satisfy [NEPA] and NRC regulation 10 C.F.R. § 51.45(b) and (c) for the following reasons:

(a) it fails to address the environmental impacts of intentional attacks on the proposed nuclear power plants, or to evaluate a reasonable range of alternatives for avoiding or mitigating those impacts.

(b) it fails to address the cumulative impacts of an intentional attack on the existing Plant Vogtle, or to evaluate a reasonable range of alternatives for avoiding or mitigating those impacts.

¹⁵ If a future rulemaking regarding the Waste Confidence Decision were instituted, presumably it would address how it should be applied to any pending proceedings.

DISCUSSION: Intervention Petition at 32-36; SNC Answer at 49-57; Staff Answer at 33-35; Joint Petitioners Reply at 27-29; SNC NEPA Terrorist Impacts Brief at 2-4; Staff NEPA Terrorist Impacts Brief at 2-4; Tr. at 152-61.

RULING: In various rulings, including its recent decision in the *Grand Gulf* ESP proceeding,¹⁶ the Commission has made clear its position that a NEPA analysis is not the vehicle for exploring questions about the potential for a terrorist attack upon a proposed nuclear facility. To be sure, the ruling of the United States Court of Appeals for the Ninth Circuit in *San Luis Obispo Mothers for Peace v. NRC*, 449 F.3d 1016 (9th Cir. 2006), *cert. denied*, __ U.S. __, 127 S. Ct. 1124 (2007), indicates that this Commission precedent is not applicable to independent spent fuel storage installation (ISFSI) licensing proceedings in the Ninth Circuit. At this juncture, however, as the Commission's *Grand Gulf* determination makes clear, the Board must, in this case being litigated far outside the boundaries of the Ninth Circuit, apply the Commission's existing case law directives.¹⁷ As a consequence, we dismiss this contention,¹⁸ finding it is outside the scope of this proceeding and fails to present a dispute regarding a material issue of law or fact.¹⁹ *See* 10 C.F.R. § 2.309(f)(1)(iii), (vi).

EC 5 — FAILURE TO EVALUATE ENERGY ALTERNATIVES

CONTENTION: The ER for the Vogtle ESP is deficient because the Alternatives analysis is flawed on two accounts: First, it is based on premature and incomplete information that cannot be adequately assessed at this point in time, as Georgia Power has been ordered to submit a detailed assessment of the maximum achievable cost effective potential for energy efficiency and demand response programs in its service area in 2007. [(Footnote omitted.)] Second, it lacks a full and objective evaluation of all reasonable alternatives.

¹⁶ *See Grand Gulf*, CLI-07-10, 65 NRC at 146-47; *see also Palisades*, CLI-07-9; 65 NRC at 141-42; *Oyster Creek*, CLI-06-8, 65 NRC at 128-34; *Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Unit 3), CLI-02-27, 56 NRC 367, 371 (2002); *Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-02-26, 56 NRC 358, 365-66 (2002); *Private Fuel Storage*, CLI-02-25, 56 NRC at 346-57; *Duke Cogema Stone & Webster* (Savannah River Mixed Oxide Fuel Fabrication Facility), CLI-02-24, 56 NRC 335, 338-39 (2002).

¹⁷ *Compare Grand Gulf*, CLI-07-10, 65 NRC at 146-47, with *Diablo Canyon*, CLI-07-11, 65 NRC at 149-51.

¹⁸ Although Joint Petitioners suggested that, in accord with 10 C.F.R. § 2.323(f), we refer any ruling dismissing this contention to the Commission for its further consideration, *see* Joint Petitioners Reply at 29, given the very recent vintage of the Commission decisions regarding this matter, *see supra* note 3, we decline to do so as it would serve no useful purpose at this point.

¹⁹ In doing so, we also note that, unlike the *Diablo Canyon* ISFSI proceeding, this case concerns the licensing of a power reactor for which the ER already contains an analysis of the impacts of a beyond design basis severe accident, *see* ER at 7.2-1 to -8, that might envelop any impacts asserted to arise from a terrorism incident, *see* Tr. at 154-55; *see also Oyster Creek*, CLI-07-8, 65 NRC at 131.

DISCUSSION: Intervention Petition at 36-39; SNC Answer at 58-63; Staff Answer at 35-41; Joint Petitioners Reply at 29-34; Tr. at 161-85.

RULING: In their initial pleading in support of this contention, Joint Petitioners argue the ER is incomplete in that it neither takes into account the 2007 version of SNC corporate affiliate Georgia Power's Integrated Resources Plan (IRP), which was not due to be filed with state regulators until after the deadline for filing contentions in this proceeding, nor includes a complete assessment of all reasonable alternatives. Both SNC and the Staff oppose admitting this contention, arguing that it fails to meet the requirements of 10 C.F.R. § 2.309(f) because it raises issues that fall outside the scope of, or are not material to, these proceedings and because it fails to include sufficient information to show that a genuine dispute exists.

The first prong of the contention is the Joint Petitioners claim the information in the ER is "premature, and necessarily incomplete" because it does not include information subsequently submitted in the 2007 version of Georgia Power's IRP. Intervention Petition at 37. Joint Petitioners argue that "Georgia Power has been ordered to submit a detailed assessment of the maximum achievable cost effective potential for energy efficiency and demand response" in this document, *id.* at 36, and that the ER is incomplete because it does not reflect this assessment. Additionally, Joint Petitioners challenge the adequacy of the ER's analysis because (1) the 2004 IRP did not include nuclear power as an option for meeting identified future needs; and (2) the two proposed additional Vogtle units have not been approved by (or even been submitted for approval by) the Georgia Public Service Commission (GPSC). *See id.* at 38.

Both SNC and the Staff argue that this prong of the Joint Petitioners claim fails to satisfy the pleading requirements of 10 C.F.R. § 2.309 because it neither includes any specific challenge to the ER's need for power discussion nor provides any factual or legal citations to support the assertion the ER is deficient. Additionally, SNC notes the Commission has established that "a state-approved need for power analysis can serve as the basis for satisfying the Commission's need for power requirements" and that the current IRP was approved by state regulators as recently as 2006. SNC Answer at 59.

Initially, the Board notes that the ER, in an attempt to resolve this "need for power" issue now rather than awaiting the filing of a COL application relative to the proposed facilities, includes a section on the need for power in its "Energy Alternatives" analysis. As a consequence, SNC has opened the door for consideration and resolution of this issue as part of the ESP hearing process.²⁰

²⁰ Applicants are not required to evaluate the need for power at the ESP stage. 10 C.F.R. § 52.17(a)(2) (the "environmental report must focus on the environmental effects of the construction and operation of a reactor . . . and . . . need not include an assessment of the benefits (for example, need for power)"). In this case, however, SNC has chosen to include such an assessment.

The legal requirements for this analysis are found in 10 C.F.R. § 51.45(b)-(c) and are supplemented by NRC guidance that, although not legally binding, provides potential applicants with information about how to comply with regulatory requirements. *See* Regulatory Guide 4.2, at 9-1 to -4. This guidance specifies that an applicant must consider alternatives that do not require the creation of new power generating capacity to "support[] the justification for new generating capacity." *Id.* at 9-1. The Standard Review Plan related to this guidance directs Staff reviewers to consider energy conservation as one such alternative. *See* NUREG-1555, at 9.2.1-1.

In the relevant ER section, SNC describes the methods used in its most recent IRP to assess potential energy conservation (i.e., demand side management, or DSM) measures and notes that "no new DSM programs were identified for development" to supplement those already in place. ER at 9.2-3. SNC also cites a report prepared for the state that concludes that energy conservation programs "are insufficient to meet future demand." *Id.* at 9.2-4 (citing Intervention Petition, Exh. 5.2 (ICF Consulting, Georgia Environmental Facilities Authority Assessment of Energy Efficiency Potential in Georgia, Final Report (May 5, 2005)) [hereinafter ICF Report]).

Joint Petitioners present the ICF Report in support of their argument that a more complete analysis of the need for power is both possible and necessary. This position has some facial merit, in that GPSC has ordered Georgia Power to include an analysis resembling that in the ICF Report in the 2007 version of its IRP.²¹ However, nothing presented in the Joint Petitioners pleadings or in its exhibits addresses the fundamental problem with the contention, which is the lack of "sufficient information to demonstrate that a genuine dispute exists . . . on a material issue of law or fact." 10 C.F.R. § 2.309(f)(1)(vi).

Joint Petitioners provide no direct critique of the analysis currently in the ER and no factual or expert support for their claim that a new analysis would yield a materially different result. They do not even purport to do so, saying instead that the information in the ER "cannot be adequately assessed" until the 2007 IRP is

²¹ Intervention Petition, Exh. 5.1, at 4 (*In Re: Georgia Power Company Request for an Accounting Order*, Order (GPSC June 22, 2006)) ("Georgia Power Company's filing in the 2007 IRP shall include a detailed assessment of the maximum achievable cost effective potential for energy efficiency and demand response programs in its service area. *Such assessment shall follow the scope and detail used in the May 5, 2005 Georgia Environmental Facilities Authority Final Report on Assessment of Energy Efficiency Potential in Georgia*" (emphasis added)). We note, in passing, that the participants represent the content of the ICF Report in very different ways. To SNC, the report says that "[e]nergy conservation would offset only a small fraction of the energy needed in the region." ER at 9.2-4. To Joint Petitioners it says that "demand side resources could significantly offset the need for new capacity in the future." Intervention Petition at 38. Neither provides support for its interpretation of the document. This difference, however, does not influence our decision. The document at issue here is the ER, not the ICF Report.

prepared according to the model of the ICF Report. Intervention Petition at 36. However, contentions in NRC proceedings are to be filed "based on documents or other information available at the time the petition is to be filed," which at this stage in the proceeding means the most recent IRP filing as described in the ER. See 10 C.F.R. § 2.309(f)(2). The fact that a new analysis is being prepared, taken alone, does not provide support for the claim that the analysis in the ER is flawed. This problem was noted at oral argument by SNC's counsel, who stated:

the fact that there's still somebody working on demand-side options does not raise a question of fact regarding whether the conclusions in the ER are correct. I mean, if they think the conclusions in the ER are incorrect, they ought to tell us what their conclusion is and support it.

Tr. at 184. Similarly, the Joint Petitioners citation to a state order requiring a new analysis does not, without further explanation, point to any specific flaw in the existing analysis.

The Joint Petitioners argument is also flawed because a fully analyzed determination by the GPSC that nuclear power is an appropriate option for meeting future demand is not a relevant consideration in the context of an appropriate need-for-power analysis. In fact, the NRC's concern in this context is whether there is a high-quality process for assessing the need for power in the jurisdiction in which a proposed facility is located. See NUREG-1555, at 8.2.1-1. Ultimately, in considering an authorization request for the two new Vogtle units, the GPSC might determine that, for any of a number of economic reasons, those facilities are, or are not, the appropriate generating source to meet any state-determined need for power. That, however, is not a determination that is within the scope of the NRC's concerns in the context of its NEPA analysis. Rather, this agency is to evaluate the nature of the GPSC IRP process for assessing the need for power, which Joint Petitioners have not suggested is in any way inadequate in this case. (In fact, Joint Petitioners arguably have suggested the opposite by insisting the ongoing GPSC process be fully followed).

Thus, the portion of this contention based on the lack of a completed IRP process and GPSC approval of the proposed Vogtle facilities must be dismissed as outside the scope of the proceeding, 10 C.F.R. § 2.309(f)(1)(iii), and lacking adequate factual or expert opinion support, *id.* § 2.309(f)(1)(v), as well as for failing to bring forward relevant information sufficient to show that there is a material issue of fact or law, *id.* § 2.309(f)(1)(vi).

The second prong of the contention encompasses the first, but is considerably broader in that it challenges SNC's overall presentation of alternatives to the proposed action under 10 C.F.R. § 51.45(b)-(c). As specified in Regulatory Guide 4.2, a complete analysis of alternatives includes consideration of alternatives such as DSM that do not require new generating capacity, as well as of alternatives

that do require new capacity. Regulatory Guide 4.2, at 9-1. The ER includes the consideration of a range of alternatives of the second type, including wind power, solar technologies, hydroelectric, geothermal, waste-to-energy, and several other power-generating technologies. ER at 9.2.-4 to -18. Joint Petitioners allege that this consideration is inadequate because (1) it does not include the potential for combined heat and power (CHP) generation;²² (2) it does not include a sufficient analysis of biomass technologies and feedstocks; and (3) it makes erroneous claims regarding Integrated Gasification Combined Cycle (IGCC) plants. Intervention Petition at 39 n.47.

Joint Petitioners do not adequately support these allegations. With regard to CHP, Joint Petitioners allege that a discussion of it should have been included in the ER because there is a "technical potential" for up to 6445 MW of generating capacity in Georgia. Neither Joint Petitioners nor the slide presentation they rely upon explains either the significance or requirements of this generating capacity or why CHP should have been discussed as an alternative to nuclear power. In fact, Joint Petitioners do not include any other information regarding CHP. Their similarly brief discussion of the ER's deficiencies regarding biomass and the risk assessment of IGCC plants also does not include any evidence or explanation of why the ER assessment is wrong. Instead, in support of the former, Joint Petitioners simply state that "[i]n Georgia, some biomass energy technologies, particularly those utilizing gasification technologies, along with some existing biomass feedstocks, such as pecan hulls, pine bark, and poultry litter, among others, could be more cost effective and should be studied as alternatives to new nuclear reactors," while the latter is only explicated with the declaration that "an overall risk comparison has not been made available nor has it been reviewed yet by the [GPSC]." Intervention Petition at 39 n.47. More support than this is needed for an admissible contention.

The Joint Petitioners discussion of these alternatives also fails to show that including the omitted discussions would result in material changes to the ER's analysis and thus be material to the decision before the Board. See *supra* note 13. The ER evaluates all power sources based upon base load power capacity, but Joint Petitioners neither discuss how CHP or biomass could be a base load power source nor challenge this evaluation. Without this, the SNC response that the mere potential for a decentralized, widely distributed power source or for biomass power does not mean those sources represent viable alternative sources of base load generating capacity, and so are immaterial, is persuasive. SNC Answer at 62. Similarly, Joint Petitioners never explain why a different risk assessment for

²² Joint Petitioners do not define this term, but SNC notes that it is usually interpreted to refer to small generating units, geographically disbursed and located near customers, that produce both heat and electrical power. See SNC Answer at 61-62.

IGCC plants would change the conclusions reached in the ER in any material way.

In short, Joint Petitioners have not provided sufficient argument or factual support in relation to either prong of this contention to demonstrate — to the preliminary extent required at the contention admissibility stage — that the alternatives analysis presented in the ER fails to comply with 10 C.F.R. § 51.45(b)-(c) or any associated guidance. In the absence of such a showing, the contention lacks sufficient factual or expert support and fails to assert any issue of law or fact that is material to the findings the NRC must make in this proceeding. For these reasons, it cannot be admitted. *See* 10 C.F.R. § 2.309(f)(1)(iv), (v).

III. PROCEDURAL/ADMINISTRATIVE MATTERS

As indicated above, each of the Joint Petitioners is admitted as a party to this proceeding because they all have established standing and have set forth at least one admissible contention. Below is procedural guidance for further litigating the above-admitted contentions.

A. General Guidance

Unless all parties agree that this proceeding should be conducted pursuant to 10 C.F.R. Part 2, Subpart N, this proceeding will be conducted in accordance with the procedures of 10 C.F.R. Part 2, Subparts C and L. Assuming the parties currently do not consent to conducting this proceeding under Subpart N, the parties should conduct a meeting within 10 days of the date of this issuance to discuss their particular claims and defenses and the possibility of settlement or resolution of any part of the proceeding and to make arrangements for the required disclosures under 10 C.F.R. § 2.336(a).²³

²³ Among the items to be discussed is whether the Staff's section 2.336(b) hearing file can be provided electronically via the NRC Web site sooner than 30 days from the date of this issuance. In that regard, in accord with section 2.336(b), the Staff should create an electronic hearing file. The Staff shall make available to the parties and the Licensing Board a list that contains the ADAMS accession number, date and title of each item so as to make the item readily retrievable from the agency's Web site, www.nrc.gov, using the ADAMS "Find" function. Additionally, the Staff should create (or have created) a separate folder in the agency's Electronic Hearing Docket (EHD) associated with the Vogtle ESP proceeding. Thereafter, the Staff should provide notice to the other parties and the Licensing Board regarding the availability of the Hearing File materials in the EHD.

If the Staff thereafter provides any updates to the hearing file, it should place a copy of those items in the hearing file portion of the Vogtle ESP EHD folder and indicate it has done so in a notification regarding the update that is sent to the Licensing Board and the parties. Additionally, if at any juncture

(Continued)

The Board will oversee the discovery process through status reports and/or conferences, and expects that each of the parties will comply with the process to the maximum extent possible, with the understanding that failing to do so will result in appropriate Board sanctions.²⁴

Pursuant to 10 C.F.R. § 2.332(d), the Board is to consider the Staff's projected schedule for completion of its safety and environmental evaluations in developing the hearing schedule. Accordingly, on or before *Friday, March 23, 2007*, the Staff shall submit to the Board through the E-Submittal system a written estimate of its projected schedule for completion of its safety and environmental evaluations, including but not limited to its best estimate of the dates for issuance of the draft and final safety evaluation reports and the draft and final environmental impact statements.

The Board will then conduct a prehearing conference call to discuss initial discovery disclosures, scheduling, and other matters on a date to be established by the Board in a subsequent order. The parties should be prepared to address the following matters at the prehearing conference call:

1. Estimates (discussed during their meeting) regarding exactly when this case will be ready to go to hearing and the time necessary to try each of the admitted contentions if they were to go to hearing.
2. Establishing time limits for updating mandatory disclosures under 10 C.F.R. § 2.336(d) and for updating the hearing file under 10 C.F.R. § 2.1203(c).
3. Whether any party intends to assert a privilege or protected status for any information or documents otherwise required to be disclosed herein and, if so, proposals for the submission of privilege logs under 10 C.F.R. § 2.336(a)(3), (b)(5), procedures and time limits for challenges to such assertions, and the development of a protective order and nondisclosure agreement.
4. Whether any of the parties anticipate submitting a motion for summary

the Staff anticipates placing any nonpublic documents into the hearing file for this proceeding, it should promptly notify the Licensing Board of that intent prior to placing those documents into the Vogtle ESP EHD hearing file folder and await further instructions regarding those documents from the Licensing Board.

²⁴ In this regard, when a party claims a privilege and withholds information otherwise discoverable under the rules, the party shall expressly make the claim and describe the nature of what is not being disclosed to the extent that, without revealing what is sought to be protected, other parties will be able to determine the applicability of the privilege or protection. The claim and identification of privileged materials must occur within the time provided for disclosing withheld materials. *See* 10 C.F.R. § 2.336(a)(3), (b)(5).

disposition regarding any of the admitted contentions and the timing and page length of such a motion and responses thereto.

5. Establishing time limits for filing "timely" motions for leave to file new or amended contentions under 10 C.F.R. § 2.309(f)(2)(iii), and specifying pleading rules for motions for leave to file new or amended contentions that accommodate both 10 C.F.R. § 2.323 (motions and answers to motions) and *id.* § 2.309(h) (answers and replies to contentions).
6. Establishing time limits for various evidentiary hearing-related filings, including:
 - a. The final list of potential witnesses for each contention pursuant to 10 C.F.R. § 2.336(a)(1).
 - b. Any motion for the use of Subpart G hearing procedures pursuant to 10 C.F.R. § 2.310(d).
 - c. Any unanimous request, pursuant to 10 C.F.R. § 2.310(h), to handle any specific contention under 10 C.F.R. Part 2, Subpart N.
 - d. Any motion for cross-examination under 10 C.F.R. § 2.1204(b).
 - e. The parties' initial written statements of position and written direct testimony with supporting affidavits pursuant to 10 C.F.R. § 2.1207(a)(1), along with consideration of (i) whether the parties should file simultaneously or sequentially, and, if sequentially, which party should file first; and (ii) the timing of filing of written responses, rebuttal testimony, and in limine motions relative to direct or rebuttal testimony.
7. The items outlined in 10 C.F.R. § 2.329(c)(1)-(3).
8. The possibility of settling any of the contentions, in whole or in part, including the status of any current settlement negotiations and the utility of appointing a settlement judge pursuant to 10 C.F.R. § 2.338(b).
9. Whether a site visit would be appropriate and helpful to the Board in the resolution of the contentions.
10. Any other procedural or scheduling matters the Board may deem appropriate.

B. Certified Question to the Commission Regarding Proceeding with Merits Litigation on Admitted Environmental Contentions Following Issuance of the Staff's DEIS

The agency's Part 2 rules of practice require licensing boards to "take into consideration the NRC staff's projected schedule for completion of its safety and environmental evaluations to ensure that the hearing schedule does not adversely impact the staff's ability to complete its reviews in a timely manner." 10 C.F.R. § 2.332(d). To this end, the regulations mandate that, unlike for safety issues, "[w]here an environmental impact statement (EIS) is involved, hearings on environmental issues addressed in the EIS may not commence before the issuance of the final EIS." *Id.* The Commission, however, has the authority to enter case-specific procedural orders to facilitate the efficient resolution of issues before a licensing board. *See Long Island Lighting Co.* (Shoreham Nuclear Power Station, Unit 1), CLI-88-9, 28 NRC 567, 569 (1988) (noting "the Commission's inherent supervisory authority over the conduct of adjudicatory proceedings."); *see also, e.g., Louisiana Energy Services, L.P.* (National Enrichment Facility), CLI-04-3, 59 NRC 10, 16-21 (2004) (establishing general schedule for proceeding).

Given that the admitted issues in this case are all environmental, the Board believes that permitting litigation on the merits of these contentions to proceed following issuance of the DEIS, rather than awaiting the FEIS, could promote "the Commission's dual goals of public safety and timely adjudication." *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-01-26, 54 NRC 376, 381 (2001). In this proceeding, the DEIS currently is scheduled to be made publicly available in July 2007, while the FEIS is not due to be issued until May 2008. Given that any Board merits litigation-based findings have the effect of amending or supplementing the FEIS, *see Louisiana Energy Services, L.P.* (National Enrichment Facility), CLI-06-15, 63 NRC 687, 707 n.91 (2006), permitting merits litigation to proceed based on the DEIS thus could allow for a resolution of the contested portion of this proceeding a number of months earlier.²⁵

In the recent *Louisiana Energy Services (LES)* litigation, without objection from the parties, the Licensing Board proceeded to litigate the merits of environmental contentions based on the DEIS, instead of awaiting the FEIS. *See Louisiana Energy Services, L.P.* (National Enrichment Facility), LBP-05-13, 61 NRC 385, 396 n.1 (2005). The Commission had discussed such a possibility in its notice of hearing, stating that the Board could start the evidentiary hearing without the final EIS or SER if the Board

²⁵ Of course, as is the case in any proceeding, even if the current admitted contentions are resolved before the FEIS is issued so as to conclude the contested portion of this proceeding, Joint Petitioners (or anyone else) could timely seek to litigate contentions regarding FEIS data or conclusions that differ significantly from the ER or the DEIS. *See* 10 C.F.R. § 2.309(c), (f)(2).

in its discretion finds that starting the hearing with respect to one or more safety issues prior to issuance of the final SER (or one or more environmental contentions directed to the Applicant's Environmental Report) will expedite the proceeding without adversely impacting the Staff's ability to complete its evaluations in a timely manner.

Louisiana Energy Services, CLI-04-3, 59 NRC at 17 (footnote omitted). In its review of the Board's findings, the Commission did not speak to the propriety of the licensing board going forward based on the DEIS. See *Louisiana Energy Services, L.P.* (National Enrichment Facility), CLI-05-20, 62 NRC 523 (2005); *Louisiana Energy Services, L.P.* (National Enrichment Facility), CLI-05-28, 62 NRC 721 (2005).

At the request of this Board, see Tr. at 185-87; Licensing Board Memorandum and Order (Submission of Joint Report Regarding Scheduling) (Feb. 16, 2007) (unpublished), the three participants in this proceeding submitted a joint response regarding permitting merits litigation on any admitted contentions to proceed based on the DEIS issued in this cause. See Joint Report Regarding Scheduling (Feb. 23, 2007). The Staff opposes this approach, writing that "[t]he Staff is of the view that NRC regulations do not provide for going to hearing on environmental issues in advance of the issuance of the final EIS." *Id.* at 1. The Staff finds the *LES* proceeding distinguishable from the current proceeding because of the specific authorization given in the *LES* notice of hearing. See *id.* at 3. Joint Petitioners concur with the Staff's argument, adding that "Joint Petitioners believe that expediting this ESP proceeding could potentially undermine its integrity." *Id.* at 4. Applicant SNC does not object to the use of the DEIS as the basis for going forward with an evidentiary hearing. It notes that while the procedural posture in *LES* was different, the Commission could choose to fashion a similar case-specific order in this proceeding because "the substantive reasons for proceeding to hearing on the DEIS in this proceeding (i.e., the need for expeditious decision-making) are as valid as those in *LES*." *Id.* at 5.

Under the circumstances, and for the reasons given above, pursuant to 10 C.F.R. §§ 2.319(d), 2.341(f), the Licensing Board thus certifies the following question for authoritative resolution by the Commission:

May the Vogtle ESP Licensing Board go forward with merits litigation on admitted environmental contentions in the proceeding such that any evidentiary hearing could be conducted following the issuance of the Staff's DEIS, as opposed to the FEIS?

IV. CONCLUSION

For the reasons set forth above, we find that each of the Joint Petitioners has established its standing to intervene and that they put forth two litigable

contentions so as to be entitled to party status in this proceeding. The text of their admitted contentions is set forth in Appendix A to this decision.

For the foregoing reasons, it is this 12th day of March 2007, ORDERED, that:

1. Relative to the contentions specified in paragraph 2 below, the Joint Petitioners hearing request is *granted* and those petitioners are admitted as parties to this proceeding.
2. The following Joint Petitioner contentions are *admitted* for litigation in this proceeding: EC 1.2 and EC 1.3.
3. The following Joint Petitioner contentions are *rejected* as inadmissible for litigation in this proceeding: EC 1.1, EC 2, EC 3, EC 4, and EC 5.
4. The parties are to take the actions required by section III.A above in accordance with the schedule established herein.
5. In accordance with the provisions of 10 C.F.R. § 2.341(f), the question set forth in section III.B above is *certified* to the Commission.
6. In accordance with the provisions of 10 C.F.R. § 2.311, as it rules upon an intervention petition, any appeal to the Commission from this Memorandum and Order must be taken within ten (10) days after it is served.

THE ATOMIC SAFETY AND
LICENSING BOARD²⁶

G. Paul Bollwerk, III, Chairman
ADMINISTRATIVE JUDGE

Nicholas G. Trikourous
ADMINISTRATIVE JUDGE

James F. Jackson
ADMINISTRATIVE JUDGE

Rockville, Maryland
March 12, 2007

²⁶Copies of this Memorandum and Order were sent this date by Internet e-mail transmission and the agency's E-Submittal system to counsel for (1) Applicant SNC; (2) Joint Petitioners; and (3) the Staff.

APPENDIX A

Cite as 65 NRC 281 (2007)

LBP-07-4

ADMITTED CONTENTIONS

1. ENVIRONMENTAL CONTENTION (EC) 1.2 — ER FAILS TO IDENTIFY AND CONSIDER COOLING SYSTEM IMPACTS ON AQUATIC RESOURCES

CONTENTION: 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.

2. EC 1.3 — ER DRY COOLING SYSTEM ALTERNATIVES DISCUSSION FAILS TO ADDRESS AQUATIC SPECIES IMPACTS

CONTENTION: 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.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before Administrative Judges:

**Ann Marshall Young, Chair
Dr. Kaye D. Lathrop
Dr. William W. Sager**

In the Matter of

**Docket Nos. 50-387-LR
50-388-LR
(ASLBP No. 07-851-01-LR-BD01)**

**PPL SUSQUEHANNA LLC
(Susquehanna Steam Electric Station,
Units 1 and 2)**

March 22, 2007

In this license renewal proceeding the Licensing Board finds that Petitioner has standing to intervene but has not submitted an admissible contention, and that the proceeding must therefore be terminated.

**RULES OF PRACTICE: STANDING TO INTERVENE;
INTERVENTION**

A petitioner's standing, or right to participate in a Commission licensing proceeding, is derived from section 189a of the Atomic Energy Act (AEA), which requires the NRC to provide a hearing "upon the request of any person whose interest may be affected by the proceeding," and which has been implemented in Commission regulations as 10 C.F.R. § 2.309.

Cite as 67 NRC 54 (2008)

LBP-08-2

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before the Licensing Board:

G. Paul Bollwerk, III, Chairman
Nicholas G. Trikouros
Dr. James F. Jackson

In the Matter of

Docket No. 52-011-ESP
(ASLBP No. 07-850-01-ESP-BD01)

SOUTHERN NUCLEAR OPERATING
COMPANY

(Early Site Permit for Vogtle
ESP Site)

January 15, 2008

In this 10 C.F.R. Part 52 proceeding regarding the application of Southern Nuclear Operating Company (SNC) for an early site permit (ESP) for an additional two reactors at the Vogtle Electric Generating Plant site, ruling on an SNC motion seeking summary disposition regarding environmental contention (EC) 1.2, Environmental Report (ER) Fails To Identify and Consider Cooling System Impacts on Aquatic Resources, the Licensing Board (1) grants the motion as to that portion of the contention challenging the SNC ER as omitting a discussion of the amount of facility chemical discharges, finding that this assertion was subject to dismissal as moot in light of the discussion in the NRC Staff's draft environmental impact statement (DEIS); and (2) denies the motion as to those portions of the contention challenging the adequacy of the ER/DEIS discussions of baseline aquatic data, impingement and entrainment impacts, and thermal discharges, concluding that SNC has failed to demonstrate there are no material factual disputes concerning genuine issues with regard to those portions of the contention.

RULES OF PRACTICE: SUMMARY DISPOSITION (STANDARDS)

For proceedings that are being conducted pursuant to the "informal" hearing procedures of 10 C.F.R. Part 2, Subpart L, summary disposition motions are to be resolved in accord with the standards for dispositive motions for "formal" hearings, as set forth in Part 2, Subpart G. See 10 C.F.R. § 2.1205(c). Summary disposition may be entered with respect to any matter (or all matters) in a proceeding if the motion, along with any appropriate supporting materials (including affidavits, discovery responses, and documents), shows that there is "no genuine issue as to any material fact and that the moving party is entitled to a decision as a matter of law." See 10 C.F.R. §§ 2.710(d)(2), 2.1205(c).

RULES OF PRACTICE: SUMMARY DISPOSITION (BURDEN OF PERSUASION; BURDEN OF PROOF)

The party proffering the summary disposition motion bears the burden of making the requisite showing by providing "a separate, short, and concise statement of the material facts as to which the moving party contends that there is no genuine issue to be heard." 10 C.F.R. § 2.710(a). A party opposing the motion must counter any adequately supported material facts provided by the movant with its own "separate, short, and concise statement of the material facts as to which it is contended there exists a genuine issue to be heard," with the recognition that, to the degree the responsive statement fails to contravene the material facts proffered by the movant, the movant's facts "will be considered to be admitted." *Id.*

RULES OF PRACTICE: DISMISSAL OF CONTENTION (MOOTNESS)

Commission precedent recognizes that for contentions (or portions of contentions) challenging an application as having omitted a required item (or items), post-contention admission events, such as issuance of a Staff DEIS, can render the contention subject to dismissal as moot, *see Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-02-28, 56 NRC 373, 383 (2002).

RULES OF PRACTICE: CONTENTIONS (ENVIRONMENTAL MATTERS; SUPPORTING INFORMATION OR EXPERT OPINION)

When filed with an intervention petition, an environmental contention and its associated bases quite properly address an applicant's ER, rather than the then

still-being-developed Staff DEIS, *see* 10 C.F.R. § 2.309(f)(2) (contentions must be based on documents/information available when hearing petition to be filed).

RULES OF PRACTICE: CONTENTIONS (ENVIRONMENTAL MATTERS; NEED FOR NEW OR AMENDED CONTENTION)

A Board may consider environmental contentions contesting an applicant's ER as challenges to the agency's subsequent DEIS so long as the DEIS analysis or discussion at issue is essentially *in para materia* with the ER analysis or discussion that is the focus of the contention. If it is not, an intervenor attempting to litigate an issue based on expressed concerns about the DEIS may need to amend the admitted contention or, if the information in the DEIS is sufficiently different from that in the ER that supported the contention's admission, submit a new contention. *See* 10 C.F.R. § 2.309(f)(2); *see also McGuire/Catawba*, CLI-02-28, 56 NRC at 383.

RULES OF PRACTICE: CONTENTIONS (NEED FOR NEW OR AMENDED CONTENTION; MODES OF FORMULATION; OMISSION OR INADEQUACY); SUMMARY DISPOSITION (DISPUTE REGARDING NEED FOR NEW OR AMENDED CONTENTION)

In the context of a summary disposition motion, the question about the need to amend or file a new contention becomes relevant when there is a dispute about whether an admitted issue statement (or a relevant portion of such an issue statement) is a contention of omission — i.e., a contention challenging a portion of the application, because it fails in toto to address a required subject matter — or a contention of inadequacy — i.e., one that asserts the pertinent portion of the application contains a discussion or analysis of a relevant subject that is inadequate in some material respect. *See Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-01-23, 54 NRC 163, 171-72 (2001) (dividing all contentions into “a challenge to the application's adequacy based on the validity of the information that is in the application; a challenge to the application's adequacy based on its alleged omission of relevant information; or some combination of these two challenges”); *see also AmerGen Energy Co., LLC* (Oyster Creek Nuclear Generating Station), LBP-06-16, 63 NRC 737, 742 & n.7 (2006).

RULES OF PRACTICE: CONTENTIONS (NEED FOR NEW OR AMENDED CONTENTION); DISMISSAL OF CONTENTION (MOOTNESS)

If intervenors have not sought to amend an environmental contention as admitted, to the degree the contention is one of omission, it is subject to dismissal in connection with those aspects for which it is appropriately established the Staff DEIS provides any purported missing analysis or discussion.

RULES OF PRACTICE: SUMMARY DISPOSITION (SUFFICIENCY OF SUPPORTING EVIDENCE)

The argument that information provided in support of an intervenor's response to a summary disposition motion should not be considered because the information is outside the scope of the intervenor's admitted contention, if true, can be a meritorious assertion.

RULES OF PRACTICE: MOTIONS TO STRIKE; REPLY BRIEFS ON ANSWERS TO MOTIONS

A motion to strike is an inappropriate vehicle to address whether arguments in a summary disposition answer raise matters outside the scope of a contention, as the Board can consider and resolve the issue without such a motion and without “striking” anything. Instead, the issue should have been raised in a reply pleading, for which permission to file should have been sought from the Board before the replies were due. *See* Licensing Board Memorandum and Order (Initial Prehearing Order) (Dec. 18, 2006) at 5 (unpublished); *see also Duke Cogema Stone & Webster* (Savannah River Mixed Oxide Fuel Fabrication Facility), LBP-05-4, 61 NRC 71, 78 (2005) (request to file reply to summary disposition answer granted).

RULES OF PRACTICE: REPLY BRIEFS ON ANSWERS TO MOTIONS

While the current procedural rule governing summary disposition in formal agency adjudications under Part 2, Subpart G (as did its pre-2004 predecessor) clearly discourages the filing of replies to summary disposition responses, *see* 10 C.F.R. § 2.710(a) (2007) (following response by opposing party, no further supporting statements or responses will be entertained); *id.* § 2.749(a) (2003) (same); *but see id.* § 2.1205(b) (2007) (making no mention of replies relative to summary disposition in Part 2, Subpart L proceedings), given the ability of responding parties to interpose additional “factual” information by way of affidavits and

other submissions, as well as the potential that exists under such a motion for a merits disposition of a contention (or portion of a contention), a properly supported request to reply to a summary disposition response would seem to be a reasonable candidate for a favorable Board discretionary decision permitting the filing. Compare 10 C.F.R. § 2.309(h)(2) (petitioner given opportunity to file reply to applicant/staff answers to hearing requests); *id.* § 2.323(c) (permission to file reply to response to motion may be granted in compelling circumstances, such as when moving party could not reasonably anticipate response arguments).

RULES OF PRACTICE: SUMMARY DISPOSITION (SCOPE OF CONTENTION)

While a movant's discussion of a matter in its summary disposition motion does aid the Board in understanding whether the issue is within the scope of the contention, at least to the degree it suggests the parties had notice of the matter, such a discussion does not necessarily establish that the matter is within the scope of a contention given that the movant's discussion may also be outside the scope of the contention. Nonetheless, if a movant discusses a matter in its statement of undisputed facts, it would not be untoward for the Board to view with skepticism any later argument by that movant that a response regarding that issue is outside the scope of the contention, particularly given the onus that is placed upon an opposing party to respond to such a statement. See 10 C.F.R. § 2.710(a) ("All material facts set forth in the statement required to be served by the moving party will be considered to be admitted unless controverted by the statement required to be served by the opposing party").

RULES OF PRACTICE: SUMMARY DISPOSITION (EXPERT OPINION)

Summary disposition is not the vehicle for untangling expert disputes so long as the experts are competent and the information they provide is adequately stated and explained. See *MOX*, LBP-05-4, 61 NRC at 80-81.

RULES OF PRACTICE: CONTENTIONS (ENVIRONMENTAL MATTERS; NEED FOR NEW OR AMENDED CONTENTION)

In the face of a Staff DEIS or final environmental impact statement that includes additional probative information the Staff believes is relevant to the subject matter of an admitted contention initially footed in an applicant's ER, an intervenor would be wise to amend its contention (or submit a new contention) to reflect any relevant changes or additions, thereby avoiding any question

about whether this additional information falls outside the scope of the admitted contention so as to preclude it from consideration as support for the contention. See 10 C.F.R. § 2.309(f)(2).

RULES OF PRACTICE: CONTENTIONS (SPECIFICITY AND BASIS)

In accord with 10 C.F.R. § 2.309(f)(1), the support for a contention, as reflected in its stated bases and any accompanying affidavits or documentary information, should be set forth with reasonable specificity so as "to put the other parties on notice as to what issues they will have to defend against or oppose." *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-899, 28 NRC 93, 97 (1988).

**MEMORANDUM AND ORDER
(Ruling on Dispositive Motion and Associated Motions To Strike
Regarding Environmental Contention 1.2)**

Before the Licensing Board in this 10 C.F.R. Part 52 proceeding regarding the application of Southern Nuclear Operating Company (SNC) for an early site permit (ESP) for two new units at the site of its existing two-unit Vogtle Electric Generating Plant (VEGP) is an SNC motion requesting summary disposition be entered in its favor relative to Joint Intervenors environmental contention (EC) 1.2.¹ This issue statement concerns the identification and consideration of direct, indirect, and cumulative impacts of the proposed cooling system intake and discharge structures on aquatic resources. The NRC Staff supports the SNC dispositive motion, while Joint Intervenors oppose the request. Additionally, both the Staff and SNC have filed motions to strike portions of the Joint Intervenors response to the SNC motion or, in SNC's case, alternatively to file a reply to the Joint Intervenors response, which Joint Intervenors oppose.

For the reasons set forth below, we deny the SNC motion for summary disposition on EC 1.2, as well as the associated SNC and Staff motions to strike portions of the Joint Intervenors response to the SNC dispositive motion.

¹ 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 Environmental Defense League.

I. BACKGROUND

As part of its August 2006 ESP application, SNC was required to include a "complete environmental report," or ER, addressing various issues pertaining to the National Environmental Policy Act of 1969 (NEPA).² In challenging the SNC ESP application, Joint Intervenors posited seven contentions raising concerns about various aspects of the SNC ER, including EC 1.2, ER Fails To Identify and Consider Cooling System Impacts on Aquatic Resources.

In pertinent part, EC 1.2 alleged that the ER had failed to "identify and consider direct, indirect, and cumulative impacts of the proposed cooling system intake and discharge structures on aquatic resources." Petition for Intervention (Dec. 11, 2007) at 10 [hereinafter Intervention Petition]. The Board found that the Joint Intervenors submission, particularly the supporting affidavit of then-Clemson University Adjunct Faculty Member Dr. Shawn Paul Young, "provides sufficient factual support for the admission of this contention." LBP-07-3, 65 NRC 237, 258 (2007). The Board thus admitted the contention as follows:

[EC] 1.2 — ER FAILS TO IDENTIFY AND CONSIDER COOLING SYSTEM IMPACTS ON AQUATIC RESOURCES

CONTENTION: 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.

Id. at 280.

Following the admission of this contention (as well as issue statement EC 1.3, which is the subject of another SNC dispositive motion that we likewise address today, *see* LBP-08-3, 67 NRC 85 (2008)), the Staff provided and has periodically supplemented the hearing file for this proceeding established in accord with 10 C.F.R. § 2.1203, and the parties have made the mandatory disclosures required

² *See* 10 C.F.R. § 52.17(a)(2) ("A complete environmental report as required by 10 CFR 51.45 and 51.50 must be included in the application, provided, however, that such environmental report must focus on the environmental effects of construction and operation of a reactor, or reactors, which have characteristics that fall within the postulated site parameters and provided further that the report need not include an assessment of the benefits (for example, need for power) of the proposed action, but must include an evaluation of alternative sites to determine whether there is any obviously superior alternative to the site proposed"). Although a recent change in the agency's rules governing ESPs has moved the substance of section 52.17(a)(2) to section 51.50(b), *see* 72 Fed. Reg. 49,351, 49,512, 49,523 (Aug. 28, 2007), because the SNC ESP application was docketed well before the September 27, 2007 effective date of this revision, *see* 71 *id.* 60,195, 60,195 (Oct. 16, 2006), in the absence of a request by SNC to apply the new rule's provisions governing application content, *see* 72 *id.* at 49,522 (revised 10 C.F.R. § 52.17(a)), section 52.17(a)(2) as quoted above is applicable in this proceeding.

by section 2.336 relative to this contention.³ *See* Tr. at 199-207, 256-58. In establishing an initial schedule for this proceeding based on the planned Staff issuance of both the draft and final environmental impact statements (DEIS and FEIS) and its safety evaluation report (SER), the Board provided an opportunity for the filing of new or amended contentions relating to either of these documents, as well as for filing for summary disposition regarding any admitted contention or new/amended contention. *See* Licensing Board Memorandum and Order (Prehearing Conference and Initial Scheduling Order) (May 7, 2007) at 3-5 & App. A (unpublished) [hereinafter Initial Scheduling Order].

Subsequently, the Staff issued its SER (albeit with open items) and its DEIS on August 30 and September 10, respectively. *See* Office of New Reactors (NRO), U.S. Nuclear Regulatory Commission (NRC), Safety Evaluation of the [ESP] Application in the Matter of [SNC], for the Vogtle [ESP] Site (Aug. 2007); 1 NRO, NRC, [DEIS] for an [ESP] at the [VEGP] Site, NUREG-1872 (Sept. 2007) [hereinafter DEIS]. Although the Board had established a time frame within which to do so, *see* Initial Scheduling Order, App. A, at 1, Joint Intervenors did not submit any new or amended contentions relative to either of these documents. Thereafter, in accordance with the terms of the Board's initial schedule, *id.*, on October 17, 2007, SNC filed a motion, accompanied by a statement of material facts purportedly not at issue, requesting that summary disposition be entered in its favor in connection with EC 1.2. *See* [SNC] Motion for Summary Disposition on Intervenors' [EC] 1.2 (Cooling System Impacts on Aquatic Resources) (Oct. 17, 2007) [hereinafter SNC 1.2 Dispositive Motion]; [SNC] Statement of Undisputed Facts in Support of Applicant's Motion for Summary Disposition of Intervenors' [EC] 1.2 (Cooling System Impacts on Aquatic Resources) (Oct. 17, 2007) [hereinafter SNC 1.2 Statement of Undisputed Facts]. Thereafter, on October 30, the Staff filed a response, with a supporting affidavit, endorsing the SNC summary disposition motion.⁴ *See* NRC Staff Answer to [SNC] Motion for

³ In accordance with an April 3, 2007 Board memorandum and order issued in response to a March 23, 2007 joint motion from the parties, the parties have agreed, among other things, (1) that they need not identify draft versions of any document, data compilation, correspondence, or other tangible thing that must be disclosed; and (2) to waive the obligation to provide a privilege log required by 10 C.F.R. § 2.336(a)(3), (b)(5). *See* Licensing Board Memorandum and Order (Ruling Regarding Joint Motion on Mandatory Disclosures and Scheduling Prehearing Conference) (Apr. 3, 2007) at 2-4 (unpublished); *see also* Licensing Board Memorandum and Order (Prehearing Conference and Initial Scheduling Order) (May 7, 2007) at 2 (discussing privilege log production waiver and disclosure of electronically stored information (ESI)) (unpublished).

⁴ The Staff's answer was filed a day late; however, following the Staff's submission of an unopposed motion to belatedly file its answer, the Board accepted the Staff's answer. *See* NRC Staff's Unopposed Motion To File Answer to Southern's Motion for Summary Disposition of EC 1.2 Out of Time (Nov. 1, 2007); Licensing Board Order (Granting NRC Staff Unopposed Motion To Accept Answer Out of Time) (Nov. 2, 2007) (unpublished).

Summary Disposition of [EC] 1.2 (Oct. 30, 2007) [hereinafter Staff 1.2 Answer]. This was followed on November 13 by the Joint Intervenors answer to the SNC dispositive motion, which included a statement of purported material facts at issue and supporting affidavits, asserting that summary disposition was inappropriate in this instance. See Joint Intervenors Answer Opposing [SNC's] Motion for Summary Disposition of [EC 1.2] (Nov. 13, 2007) [hereinafter Joint Intervenors 1.2 Answer].

Thereafter, on November 21 and 23, respectively, the Staff and SNC submitted motions requesting that portions of the Joint Intervenors November 13, 2007 answer to the SNC October 17, 2007 motion requesting summary disposition of EC 1.2 be stricken as outside the scope of the admitted contention. See NRC Staff's Motion To Strike Portions of Joint Intervenors' Answer Opposing Summary Disposition of EC 1.2 (Nov. 21, 2007) [hereinafter Staff 1.2 Motion To Strike]; [SNC's] Motion To Strike Portions of, or in the Alternative for Leave To Reply to, Intervenors' Answer to Motion for Summary Disposition of EC 1.2 (Nov. 23, 2007) [hereinafter SNC 1.2 Motion To Strike]. Alternatively, pursuant to 10 C.F.R. § 2.323(c), SNC requested that it be given the opportunity to file a reply to the Joint Intervenors answer. See SNC 1.2 Motion To Strike at 1, 5. In a responsive filing dated November 30, 2007, the Staff indicated that it supported the SNC motion to strike. See NRC Staff's Answer to Southern's Motion To Strike or in the Alternative to Reply to Joint Intervenors' Answer to Motion for Summary Disposition of EC 1.2 (Nov. 30, 2007). Joint Intervenors filed a response opposing both motions to strike on December 6, 2007.⁵ See Intervenors' Answer in Response to SNC and NRC Staff Motions To Strike Portions of Intervenors' Answer to Motion for Summary Disposition of EC 1.2 (Dec. 6, 2007) [hereinafter Joint Intervenors Response to 1.2 Motions To Strike].

II. ANALYSIS

A. Summary Disposition Standards

For proceedings such as this one that are being conducted pursuant to the "informal" hearing procedures of 10 C.F.R. Part 2, Subpart L, see LBP-07-3, 65 NRC at 274, summary disposition motions are to be resolved in accord with the standards for dispositive motions for "formal" hearings, as set forth in Part

⁵ After missing the December 3, 2007 deadline to answer the SNC and Staff motions to strike, see 10 C.F.R. § 2.323(c), Joint Intervenors petitioned the Board for a 3-day extension of time in which to respond, which the Board granted. See Joint Intervenors' Unopposed Motion for Extension of Time To File Answers to NRC Staff's Motion To Strike and SNC Motions To Strike and To Supplement Record (Dec. 4, 2007); Licensing Board Order (Granting Extension of Time) (Dec. 5, 2007) at 2 (unpublished).

2, Subpart G, see 10 C.F.R. § 2.1205(c). In that regard, 10 C.F.R. § 2.710(d)(2) provides that summary disposition may be entered with respect to any matter (or all matters) in a proceeding if the motion, along with any appropriate supporting materials (including affidavits, discovery responses, and documents), shows that there is "no genuine issue as to any material fact and that the moving party is entitled to a decision as a matter of law."

The party proffering the motion bears the burden of making the requisite showing by providing "a separate, short, and concise statement of the material facts as to which the moving party contends that there is no genuine issue to be heard." *Id.* § 2.710(a). On the other hand, a party opposing the motion must counter any adequately supported material facts provided by the movant with its own "separate, short, and concise statement of the material facts as to which it is contended there exists a genuine issue to be heard," with the recognition that, to the degree the responsive statement fails to contravene the material facts proffered by the movant, the movant's facts "will be considered to be admitted." *Id.*

Before applying these standards, however, in light of (1) Commission precedent recognizing that for contentions (or portions of contentions) challenging an application as having omitted a required item (or items), post-contention admission events, such as issuance of a Staff DEIS, can render the contention subject to dismissal as moot, see *Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-02-28, 56 NRC 373, 383 (2002); and (2) SNC and Staff insistence that this contention should be resolved consistent with this precedent, see SNC 1.2 Dispositive Motion at 17-18; Staff 1.2 Answer at 12, we consider whether EC 1.2 (or any portion of that issue statement) properly is subject to disposition on this basis.

B. Environmental Contention 1.2 — Contention of Omission or Contention of Inadequacy

While the Joint Intervenors admitted contention and its associated bases quite properly addressed the SNC ER, rather than the then still-being-developed Staff DEIS, see 10 C.F.R. § 2.309(f)(2) (contentions must be based on documents/information available when hearing petition to be filed), as SNC notes, "the Board may consider environmental contentions made against an applicant's ER as challenges to an agency's subsequent DEIS." SNC 1.2 Dispositive Motion at 4 (citing *Louisiana Energy Services, L.P.* (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 84 (1998) (approving a Board decision to treat an intervenor's contentions addressing the ER as challenges to the FEIS)); see also *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-01-23, 54 NRC 163, 172 n.3 (2001) (discussing such a substitution with the superseding DEIS), *petition for review denied*, CLI-04-4, 59 NRC 31, 40-41 (2004). This is appropriate, however, only so long as the DEIS analysis or discussion at issue is

essentially *in para materia* with the ER analysis or discussion that is the focus of the contention. If it is not, an intervenor attempting to litigate an issue based on expressed concerns about the DEIS may need to amend the admitted contention or, if the information in the DEIS is sufficiently different from that in the ER that supported the contention's admission, submit a new contention.⁶ See 10 C.F.R. § 2.309(f)(2); see also *McGuire/Catawba*, CLI-02-28, 56 NRC at 383.

In the context of a summary disposition motion, this question about the need to amend or file a new contention becomes relevant when there is a dispute, as there is here, see *infra* pp. 64-65, about whether an admitted issue statement (or a relevant portion of such an issue statement) is a contention of omission — i.e., a contention challenging a portion of the application, such as the ER, because it fails in toto to address a required subject matter — rather than a contention of inadequacy — i.e., one that asserts the pertinent portion of the application contains a discussion or analysis of a relevant subject that is inadequate in some material respect. See *Private Fuel Storage*, LBP-01-23, 54 NRC at 171-72 (dividing all contentions into “a challenge to the application's adequacy based on the validity of the information that is in the application; a challenge to the application's adequacy based on its alleged omission of relevant information; or some combination of these two challenges”); see also *AmerGen Energy Co., LLC* (Oyster Creek Nuclear Generating Station), LBP-06-16, 63 NRC 737, 742 & n.7 (2006). In *Duke Cogema Stone & Webster* (Savannah River Mixed Oxide Fuel Fabrication Facility), LBP-04-9, 59 NRC 286 (2004), in connection with intervenor contentions of omission charging that an application was missing certain design information, the Licensing Board rejected as improper an intervenor attempt to use those same contentions, once the information had been provided in a subsequent applicant filing, to then challenge the quality of the additional applicant information, and thereby interpose disputed material factual issues. Rather, according to the *MOX* Licensing Board, the contentions should have been amended. See *id.* at 292-93. Since they were not, the *MOX* Board concluded that a dispositive motion seeking dismissal of the contentions as moot was appropriate. See *id.* at 293.

In this instance, because Joint Intervenors have not sought to amend EC 1.2 as admitted, to the degree the contention is one of omission, it is subject to dismissal in connection with those aspects for which it is appropriately established the Staff DEIS provides any purported missing analysis or discussion. Here, an evaluation of EC 1.2 in this regard is made somewhat more complicated by the fact that the Board did not, in admitting the contention, explicitly state whether EC 1.2,

⁶In establishing the schedule for possible summary disposition motions regarding the Joint Intervenors admitted contentions following the release of the Staff DEIS (as well as the FEIS), the Board recognized the potential need to amend or file new contentions prior to the submission of dispositive motions. See Initial Scheduling Order, App. A, at 1-2.

or any portion of EC 1.2, was a “contention of omission.” Nonetheless, in asserting summary disposition is appropriate, SNC and the Staff contend EC 1.2 is a contention of omission, while Joint Intervenors argue that, with the exception of chemical analysis issues, it is not. See SNC 1.2 Dispositive Motion at 17-18; Staff 1.2 Answer at 12; Joint Intervenors 1.2 Answer at 19-20.

In reaching a determination about whether this contention is properly classified as one of omission or inadequacy, we note initially that the text of EC 1.2, both as originally proposed by Joint Intervenors (i.e., the SNC ER “fails to identify and consider direct, indirect, and cumulative impacts of the proposed cooling system intake and discharge structures on aquatic resources”) and as subsequently admitted by the Board (i.e., the SNC ER “fails to identify and consider direct, indirect, and cumulative impingement/entrainment and chemical and thermal effluent discharge impacts”), does not denominate it definitively as either. Therefore, it is necessary to examine the arguments and bases put forward by Joint Intervenors for each of the contention's four aspects: baseline information, impingement/entrainment, thermal impacts, and chemical impacts.

Most of the claims in the Joint Intervenors original petition addressing baseline issues allege that necessary information has been omitted, though Joint Intervenors also posited arguments that the missing information should be of a certain quality (for instance, based on site-specific information) and criticized the data presented. See Declaration of Shawn Paul Young, Ph.D. (Dec. 7, 2006) at 7 [hereinafter 2006 Young Declaration]. While the Board ultimately rejected the Joint Intervenors baseline assertions associated with EC 1.1, it allowed some discussion of baseline information to be included within EC 1.2 and, in doing so, outlined the parameters of the baseline EC 1.2 discussion as “the adequacy of the baseline information provided by SNC relative to the portion of the Savannah River that encompasses the project area associated with the intake/discharge structures for both the existing and proposed Vogtle facilities,” LBP-07-3, 65 NRC at 259. Thus the baseline information portion of EC 1.2 will be treated as an inadequacy contention.

For the entrainment/impingement and thermal impacts portions of the issue statement, in their initial petition Joint Intervenors asserted that the calculations regarding impacts made by SNC were inaccurate and used incorrect assumptions. See, e.g., Intervention Petition at 10, 12; 2006 Young Declaration at 6, 8. These portions of the contention thus are inadequacy arguments as well.

Finally, the Joint Intervenors argument concerning chemical impacts was that certain information, particularly the quantity and toxicity of all chemical discharges, should have been included in the ER. See Intervention Petition at 12. As Joint Intervenors acknowledge, this is a contention of omission. See Joint Intervenors 1.2 Answer at 19.

We thus conclude that, with the exception of the portion of the contention relating to chemical discharges, EC 1.2 is a contention of inadequacy rather than one of omission.

C. SNC and Staff Motions To Strike

In addition to resolving the question of the status of EC 1.2 as a contention of omission or inadequacy, prior to assessing the merits of the SNC motion relative to the summary disposition standards in section II.A, above, we also find it appropriate to address the procedural validity of the SNC and Staff motions to strike portions of the Joint Intervenors summary disposition answer. A major premise of both those motions is that, in filing their response, Joint Intervenors sought improperly to expand the scope of the admitted contention without amending their issue statement.⁷ See Staff 1.2 Motion To Strike at 1; SNC 1.2 Motion To Strike at 1.

To be sure, the argument that information provided in support of an intervenor's response to a dispositive motion should not be considered because the information is outside the scope of the intervenor's admitted contention, if true, can be a meritorious assertion. Whether a motion to strike is the appropriate procedural vehicle for raising such a claim relative to a dispositive motion response is, however, a different question.

Rule 12(f) of the Federal Rules of Civil Procedure does provide for the submission of a motion to strike, upon which the court can act to order "stricken from any pleading any insufficient defense or any redundant, immaterial, impertinent, or scandalous matter." There is no explicit mention of such a motion in the agency's rules of practice, but assuming there need not be, see 10 C.F.R. § 2.323(b), in the context of a summary disposition motion we do not consider a "motion to strike" to be the appropriate vehicle for raising the argument posited by both SNC and the Staff here. As Joint Intervenors correctly recognized in a related filing in this proceeding, see Intervenors' Answer Opposing NRC Staff and SNC Motions To Strike Portions of Intervenors' Answer to Motion Opposing Summary Disposition of [EC] 1.3 (Dec. 6, 2007) at 2-3 [hereafter Joint Intervenors Response to 1.3 Motions To Strike], the issue of the scope of EC 1.2 is a matter that the Board can consider and resolve without such a motion and without "striking" anything. Consequently, the Staff and SNC arguments made in their motions to strike should have been framed in reply pleadings, for which permission to file should

⁷ SNC asks that the following five areas of discussion be stricken from the Joint Intervenors responsive brief and supporting affidavits: (1) the use and the contents of cited Academy of Natural Sciences reports, (2) a DEIS-referenced site visit by the Staff regarding screen basket cleaning, (3) larval fish mobility, (4) methodologies for estimating the Savannah River's minimum flow rate, and (5) the cumulative impacts of withdrawals associated with facilities other than Vogtle's existing units. See SNC 1.2 Motion To Strike at 2-3. In a request similar to that associated with SNC area 4, the Staff asks that we strike the portions of the Joint Intervenors answer discussing Savannah River Drought Level 4 flow conditions and which gauge along the river should be used for measuring river flow. See Staff 1.2 Motion To Strike at 4.

have been sought from the Board 3 business days before the replies were due.⁸ See Licensing Board Memorandum and Order (Initial Prehearing Order) (Dec. 18, 2006) at 5 (unpublished); see also *Duke Cogema Stone & Webster* (Savannah River Mixed Oxide Fuel Fabrication Facility), LBP-05-4, 61 NRC 71, 78 (2005) (request to file reply to summary disposition answer granted).

Both the Staff and SNC motions to strike (and the associated SNC request for leave to file a reply) are thus denied. Nonetheless, without regard to the Staff and SNC motions to strike (and as it would have done even if the motions had not been filed), in reviewing the SNC dispositive motion the Board will consider whether the information the parties provided as a basis for granting or denying the SNC summary disposition request is within the scope of EC 1.2 as admitted and is adequate to support their position regarding resolution of the motion.⁹

⁸ Of course, in accord with the procedures we have established in this case, a reply would have been due within 7 days after the submission of the Joint Intervenors summary disposition motion response rather than the 10 days generally provided for a motion. Compare Licensing Board Memorandum and Order (Initial Prehearing Order) (Dec. 18, 2006) at 5 n.4 (unpublished) with 10 C.F.R. § 2.323(a). If SNC and the Staff needed additional time for their replies, however, the appropriate mechanism for obtaining that relief would have been a time extension motion, perhaps filed in conjunction with their request for leave to file a reply.

We also think it worth observing that while the current procedural rule governing summary disposition in formal agency adjudications under Part 2, Subpart G (as did its pre-2004 predecessor) clearly discourages the filing of replies to summary disposition responses, see 10 C.F.R. § 2.710(a) (2007) (following response by opposing party, no further supporting statements or responses will be entertained); *id.* § 2.749(a) (2003) (same); but see *id.* § 2.1205(b) (2007) (making no mention of replies relative to summary disposition in Part 2, Subpart L proceedings), given the ability of responding parties to interpose additional "factual" information by way of affidavits and other submissions, as well as the potential that exists under such a motion for a merits disposition of a contention (or portion of a contention), a properly supported request to reply to a summary disposition response would seem to be a reasonable candidate for a favorable Board discretionary decision permitting the filing. Compare 10 C.F.R. § 2.309(h)(2) (petitioner given opportunity to file reply to applicant/staff answers to hearing requests); *id.* § 2.323(c) (permission to file reply to response to motion may be granted in compelling circumstances, such as when moving party could not reasonably anticipate response arguments).

⁹ In this regard, Joint Intervenors argue that if an issue was first raised by the movant in a summary disposition motion, discussion of that issue in a response should not be stricken. See Joint Intervenors Response to 1.2 Motion To Strike at 3. While a movant's discussion of a matter in its summary disposition motion does aid the Board in understanding whether the issue is within the scope of the contention, at least to the degree it suggests the parties had notice of the matter, such a discussion does not necessarily establish that the matter is within the scope of a contention given that the movant's discussion may also be outside the scope of the contention. Nonetheless, if a movant discusses a matter in its statement of undisputed facts, it would not be untoward for the Board to view with skepticism any later argument by that movant that a response regarding that issue is outside the scope of the contention, particularly given the onus that is placed upon an opposing party to respond to such

(Continued)

D. Analysis of Summary Disposition Request

With these precepts in mind, we turn to the substance of the SNC motion, considering whether SNC has shown that there exists no genuine issue as to any material fact in connection with each of the four subject areas specified above, as well as the arguments proffered both in support of, and in opposition to, the SNC dispositive motion relative to the proper scope of the admitted contention. In doing so, in each instance we look first at the initial intervention request submitted by Joint Intervenors and the Board's contention admission decision, followed by the parties' arguments regarding summary disposition for that portion of the contention.

1. Baseline Aquatic Data for Vogtle Site

a. Joint Intervenors Intervention Petition

In support of issue statement EC 1.1, which also concerned proposed facility impacts on Savannah River fishery resources, in their intervention request Joint Intervenors alleged that to evaluate the impacts of the cooling system for the proposed facilities, the baseline information in the ER should have included more data regarding the habitats and life histories of particular species and that, without such information, the ER was deficient. *See* Intervention Petition at 9. Joint Intervenors argued the ER does not "identify the current aquatic species assemblage or the presence or absence of threatened, endangered, or rare species in the project area," and "contains no data concerning upstream and downstream migration of anadromous [(i.e., moving from the sea to rivers to breed)] and diadromous [(i.e., migrating between salt and freshwater)] species in this section of the Savannah River or their habitat utilization within the project area." *Id.* at 8. Their expert, Dr. Shawn Young, alleged in support of the petition that the ER analysis lacked "a comprehensive discussion of all of the species likely to inhabit this reach of the Savannah River at different times of the year." 2006 Young Declaration at 7. To cure these defects, Joint Intervenors argued that "field studies or data that assesses site-specific and species-specific factors" are needed. Intervention Petition at 9.

b. Board Contention Admissibility Discussion

The Board rejected the Joint Intervenors related issue statement EC1.1 that

a statement. *See* 10 C.F.R. § 2.710(a) ("All material facts set forth in the statement required to be served by the moving party will be considered to be admitted unless controverted by the statement required to be served by the opposing party").

alleged the aquatic baseline for the Vogtle ESP ER was wholly insufficient, finding that Joint Intervenors did not provide information to support such an allegation. *See* LBP-07-3, 65 NRC at 256. Noting that the Joint Petitioners counsel had told the Board "there is sufficient information about the river in general" in the ER and thus had asserted only that otherwise-required site-specific information was missing, *id.* at 257 (quoting Tr. at 18), the Board concluded that "it appears uncontested that the Applicant has adequately described the *general* aquatic resources of the Savannah River, including the river's important species and their habitats," *id.* at 256 (emphasis added). Additionally, rejecting the Joint Intervenors assertion that specific studies of the Vogtle site and rivershed were needed, the Board provided the following observation regarding the nature of the required baseline data:

Joint Petitioners have not demonstrated with any references — nor are we aware of any — that suggest site-specific studies are generally required. Rather, the appropriate scope of the baseline 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.

Id. at 257.

The Board, however, then went on to conclude that the EC 1.2 allegations of baseline deficiencies concerning the ER discussion assessing impingement, entrainment, and thermal impacts, as supported by the 2006 Young Declaration, could be litigated as part of issue statement EC 1.2. *See id.* at 258. In doing so, the Board indicated that adjudication regarding the merits of EC 1.2 thus could "include the question of the adequacy of the baseline information provided by SNC relative to the portion of the Savannah River that encompasses the project area associated with the intake/discharge structures for both the existing and proposed Vogtle facilities." *Id.* at 259.

c. SNC Summary Disposition Motion

In its motion, which is supported by a statement that sets forth twenty-four purported undisputed material factual statements, SNC argues that all the data needed to create a baseline are included in the DEIS and that Joint Intervenors are requesting "additional, original studies" not required by NEPA. *See* SNC 1.2 Dispositive Motion at 8. SNC declares that "a fundamental principle of NEPA is that 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." *Id.* at 10. For all other information Joint Intervenors claim the ER lacks, SNC asserts that "the DEIS addresses the very information alleged to be lacking." *Id.* at 17. SNC further characterizes the whole of EC 1.2 as a contention of omission

for which the information has now been supplied, so that the data provided in the DEIS makes the contention moot. *Id.* at 18.

d. Staff Answer

Supported by the joint affidavit of NRC Senior Hydrologist Dr. Christopher B. Cook and Battelle Pacific Northwest National Laboratory Senior Research Scientist Rebekah H. Krieg, in its response to the SNC dispositive motion the Staff argues that the DEIS now includes, as requested by Joint Intervenors, "a comprehensive discussion of all the aquatic species likely to occur in the Savannah River at different times of the year," thereby rendering moot the portion of the contention addressing the adequacy of the aquatic baseline information provided. Staff 1.2 Answer at 4. In support of this assertion, the Staff references the environmental standard review plan (ESRP), which formalizes the Staff's review criteria used to establish what would constitute an adequate NEPA analysis.¹⁰ Noting that the ESRP calls for an identification of "important" species in the area of the proposed facilities,¹¹ the Staff points to specific parts of the DEIS that it asserts do this, declaring that "Table 2-7 of the DEIS lists, by phylogenetic order, all known native, resident, diadromous, marine and upland species of fish of the Middle Savannah River. Using the methodology given in the [ESRP] Section 2.4.2, the NRC Staff determined which species listed in DEIS Table 2-7 are 'important'" Staff 1.2 Answer at 5-6 (citations omitted). The Staff concludes that this table and the accompanying discussion constitute a comprehensive discussion of all of the Savannah River's fish species. *See id.* at 6.

e. Joint Intervenors Answer

Joint Intervenors, who provide a statement of genuine material facts in dispute supported by the affidavits of Dr. Young, now a Purdue University Visiting Assistant Professor of Fisheries Biology, and environmental consultant Barry W.

¹⁰ Office of Nuclear Reactor Regulation, NRC, Standard Review Plans for Environmental Reviews for Nuclear Power Plants, NUREG-1555 (Oct. 1999) [hereinafter ESRP]. Although a standard review plan sets forth the criteria that the Staff uses to evaluate whether an application conforms to the agency's regulations, it nonetheless is considered nonbinding on the Staff, *see, e.g.*, 10 C.F.R. § 50.34(h)(3), and on a Licensing Board.

¹¹ *See, e.g.*, ESRP at 4.3.2-1. The Staff's ESRP defines "important species" as endangered or threatened species (as defined either federally or by the state where the proposed facility is located) or proposed for such a listing in the *Federal Register*, commercially or recreationally valuable species, "[s]pecies that are essential to the maintenance and survival of species that are rare and commercially or recreationally valuable," "[s]pecies that are critical to the structure and function of the local terrestrial ecosystem," or "[s]pecies that may serve as biological indicators to monitor the effects of the facilities on the terrestrial environment." *Id.* at 2.4.2-7 (Table 2.4.2-1).

Sulkin, argue relative to the baseline aquatic information matter that the DEIS has only a "general list of fish species" and is missing information key to assessing adequately the new units' impacts upon the fish in the vicinity of the VEGP. Joint Intervenors Answer at 11. In his affidavit supporting the Joint Intervenors response, Dr. Young states that Table 2-7 of the DEIS, rather than being a comprehensive discussion of the Savannah River's aquatic environment, "omits detailed fish species' life history stage information" and that such information "is of paramount importance in determining current and future impacts." Affidavit of Shawn Paul Young, Ph.D. (Nov. 13, 2007) at 3, 4 [hereinafter 2007 Young Affidavit].

Dr. Young also argues that Academy of Natural Sciences, Philadelphia (ANSP) studies used in the DEIS should not be relied upon to assess impacts because the studies (1) did not include some necessary information such as fish early life history stages, migration timing, distribution patterns, or population numbers; (2) utilized a "sampling protocol [that] is grossly insufficient to supply information needed to draw appropriate conclusions regarding the impact of the proposed Units 3 and 4 on fish species"; and (3) "were not intended or designed to be a systematic evaluation of the impacts of Plant Vogtle [Units 1 and 2], as they are being used in the DEIS." *Id.* at 5-7.

f. Board Ruling

Given our determination in section II.B, above, that this portion of EC 1.2 is not a contention of omission, the issue before us now is whether there is a dispute as to any material fact relative to this item as it challenges the adequacy of the ER/DEIS baseline information for cooling system impacts. *See* 10 C.F.R. § 2.710(d)(2). We conclude that, through Dr. Young's affidavit submitted in support of their motion,¹² Joint Intervenors have shown there is a dispute regarding genuine issues of material fact relating to baseline information for cooling system impacts. Thus, summary disposition is not appropriate.

One example of such disputed facts is the adequacy of the species' descriptions in the DEIS. While the Staff and SNC contend that the species information provided in the DEIS contains enough information and in sufficient detail to allow for an evaluation of cooling system impacts, *see* Staff 1.2 Answer at 6, SNC 1.2 Dispositive Motion at 7-8, the Joint Intervenors expert makes specific allegations about information missing from the descriptions, *see* 2007 Young Affidavit at 3.

¹² Bearing in mind that summary disposition is not the vehicle for untangling expert disputes so long as the experts are competent and the information they provide is adequately stated and explained, *see MOX*, LBP-05-4, 61 NRC at 80-81, in this instance we find that the parties' affiants and the information they provide are sufficient to establish disputed material facts as to this and two of the other three subject areas encompassed by EC 1.2, as we outline in more detail below.

We find these assertions sufficient to establish there is a genuine factual dispute about the material issue of the kind and detail of species information that should be in the ER/EIS such that the matter cannot be resolved on summary disposition.

Other genuine disputes as to material facts also are extant, including the adequacy of previous monitoring and studies as they relate to the current impacts of Plant Vogtle Units 1 and 2. As was noted in section II.D.1.e, above, Joint Intervenors make supported allegations regarding the adequacy of the ANSP studies in the DEIS, which are used extensively to assess the current aquatic population near the site and the impacts that Plant Vogtle Units 1 and 2 have had on that population. *See* 2007 Young Affidavit at 5-8.

Nor are we dissuaded from concluding these ANSP reports properly establish such disputes by the fact the reports were neither referenced in the admitted contention nor the information supplied to provide a basis supporting of the contention. To be sure, their status of newly introduced materials raises the question whether they can be relied upon as support for the Joint Intervenors challenge to the SNC summary disposition request absent an amended or new contention.¹³ In our estimation, however, the Joint Intervenors current assertions regarding the ANSP reports are part of the larger argument, made in Dr. Young's 2006 affidavit provided as part of the basis for EC 1.2, that the information utilized in the ER regarding Units 1 and 2 impacts, as outlined in the 1985 VEGP operating license-related FEIS, is inadequate and that new, properly conducted studies are needed. In Dr. Young's original affidavit, he argued the SNC ER lacked appropriate data to support its conclusion that Units 1 and 2 have had insignificant impacts upon aquatic species. *See* 2006 Young Declaration at 4. Based upon this alleged deficiency, Dr. Young asserted that "a study of entrainment and impingement associated with the existing intake structure is necessary to determine the cumulative withdrawal effects." *Id.* The Joint Intervenors

¹³ In general, in the face of a Staff DEIS or FEIS that includes additional probative information the Staff believes is relevant to the subject matter of an admitted contention initially footed in an applicant's ER, an intervenor would be wise to amend its contention (or submit a new contention) to reflect any relevant changes or additions, thereby avoiding any question about whether this additional information falls outside the scope of the admitted contention so as to preclude it from consideration as support for the contention. *See* 10 C.F.R. § 2.309(f)(2). By doing so, they avoid the fate of the intervenors in the *Seabrook* proceeding who asserted that a contention concerning "the prevention of the accumulation of mollusks, other aquatic organisms, and debris in cooling systems" allowed them to make arguments regarding "microbiologically-induced corrosion." *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-899, 28 NRC 93, 95 (1988). In that instance, the Appeal Board concluded they could not, noting that while the language of the contention mentioned neither blockage nor corrosion of the cooling system, the contention's heading ("Blockage of Coolant Flow to Safety-Related Systems and Components by Buildup of Biological Organisms") and its assigned basis, which relied solely on a May 1982 *Federal Register* notice about cooling system blockages, clearly showed that the contention "was intended to embrace only cooling system blockage." *Id.* at 97.

criticisms of the ANSP reports are a relatively straightforward elaboration of this argument, as Joint Intervenors continue to assert that insufficient information has been provided with which accurately to assess the impacts of the existing or new units.

In accord with 10 C.F.R. § 2.309(f)(1), the support for a contention, as reflected in its stated bases and any accompanying affidavits or documentary information, should be set forth with reasonable specificity so as "to put the other parties on notice as to what issues they will have to defend against or oppose." *Seabrook*, ALAB-899, 28 NRC at 97. Certainly, Dr. Young's affidavit put SNC and the Staff on notice that Joint Intervenors found such "baseline" data insufficient. Moreover, the Board specifically noted that litigation regarding the merits of EC 1.2 may "involve the question of the adequacy of the baseline information provided by SNC relative to the portion of the Savannah River that encompasses the project area associated with the intake/discharge structures for both the existing and proposed Vogtle facilities." LBP-07-3, 65 NRC at 257. We thus find the Joint Intervenors reliance on the ANSP reports as a basis for establishing the existence of material factual disputes is not violative of the scope of EC 1.2.

Having concluded the SNC attempt to establish there is no genuine material factual dispute regarding the adequacy of the baseline aquatic information to support the conclusions in the ER/DEIS has been forestalled by the information presented by Joint Intervenors, we deny the SNC summary disposition request relative to this item.

2. *Impingement and Entrainment*

a. *Joint Intervenors Initial Petition*

As set forth in the Joint Petitioners initial petition, EC 1.2 also alleged that the SNC ER did not adequately consider the direct, indirect, and cumulative impacts upon aquatic organisms of entrainment (i.e., when aquatic organisms are carried into the cooling system) and impingement (i.e., when aquatic organisms collide with cooling system components). *See* Intervention Petition at 10. Although SNC in its ER concluded that such impacts will be minor, *see* [SNC] [ESP] Application for the [VEGP], Part 3, [ER] at 5.3-3, 5.3-4 (rev. 1 Nov. 13, 2006) (ADAMS Accession No. ML063210565) [hereinafter ER], Joint Intervenors challenged this assertion, claiming that (1) not enough information was provided to come to any conclusion regarding impacts; and (2) the assumptions used in the applicant analysis were faulty.

More specifically with regard to the first concern, Joint Intervenors argued that the ER lacked enough information about the site's current species, particularly those with a high probability of entrainment, to assess whether entrainment and impingement present a danger to these species. *See* 2006 Young Declaration at

3. Joint Intervenors also asserted that the current units have never been properly monitored, with SNC instead choosing to rely upon a 1985 study to support the conclusion that the impacts of the new units will be minor, which Dr. Young called “unwarranted,” and “improper and misleading.” *Id.* at 4. To make up for these informational deficits, Dr. Young called for “a study of entrainment and impingement associated with the existing intake structure . . . to determine the cumulative withdrawal effects.” *Id.*

As to the latter claim, Joint Intervenors found fault with a number of assumptions used in the ER analysis. For instance, Dr. Young argued “[t]he assumption of a uniformly distributed drift community is invalid.” *Id.* at 4. Dr. Young was particularly critical of the assumptions about water levels made in the ER’s analysis, arguing the analyses should have used a lower minimum guaranteed river flow level and a higher maximum percentage for how much of the river is withdrawn by Units 1 and 2. *See id.* at 6.

b. Board Contention Admissibility Discussion

The Board admitted the entrainment/impingement aspects of the contention, along with those relating to thermal and chemical impacts. In doing so, the Board concluding that “[f]or each of the asserted deficiencies concerning the ER impact discussion regarding the intake/discharge structure for the two new proposed facilities — impingement/entrainment, chemical discharges, and thermal discharges, including cumulative impacts from these items associated with the existing Vogtle facilities — ” Dr. Young’s affidavit provided sufficient support. LBP-07-3, 65 NRC at 258.

c. SNC Motion for Summary Disposition

In support of its request for summary disposition of EC 1.2, SNC argues that the DEIS identifies and considers direct, indirect, and cumulative impingement/entrainment impacts. *See* SNC 1.2 Dispositive Motion at 13. In this regard, SNC specifically points to the Staff’s analysis of the proposed facilities’ intake structure design and scrutiny of the existing facilities’ intake screens, the Staff’s discussion of SNC’s ongoing obligation to report any unusual environmental events, and the Staff’s examination of “the percentage of water withdrawn, the planned low through-screen intake velocity, the design of the closed-cycle cooling system, the typically high fecundity of most species inhabiting rivers, the existence of multiple spawning sites within the river basin and the high natural mortality rates of eggs and larvae.” *Id.* at 14-15. SNC argues that the many existing studies, including many field studies, used to prepare the DEIS

in conjunction with the analysis of those studies done by the Staff constitute the “hard look” required in an EIS. *Id.* at 13-16.

d. Staff Answer

In its response to the SNC motion, the Staff also argues that the Joint Intervenors concerns have all been addressed in the DEIS in that “the DEIS analyzes the potential impacts of impingement/entrainment on the above-cited species (including, for all of the species, any life history phases of particular susceptibility to impingement/entrainment impacts, such as egg and larval).” Staff 1.2 Answer at 6. The Staff further asserts that the Joint Intervenors concerns regarding a uniformly distributed drift community assumption have been addressed and any alleged deficiency cured because “the DEIS considers the appropriateness of the assumption of a uniformly distributed drift community,” and found that it was a conservative assumption. *Id.* at 7. As to water levels, the Staff notes that the DEIS includes a full analysis of impingement and entrainment at the minimally measurable river level. *Id.* at 13.

e. Joint Intervenors Answer

Joint Intervenors declare there are still a number of material facts as to which there is a genuine issue. These include whether the DEIS was incorrect in assuming the distribution of fish eggs and larval fish is uniform, or “mistakenly assumes greater mobility of fish eggs and larval fish,” either of which would mean the DEIS underestimated the impacts from entrainment. Joint Intervenors 1.2 Answer at 11, 13. In his supporting affidavit, Dr. Young dismisses the SNC entrainment/impingement assessment efforts and the Staff’s site visit to assess those efforts that are discussed in the DEIS as insufficient. According to Dr. Young, the evidence gained from screened baskets several times a year “is a grossly inadequate method for analyzing impingement/entrainment from water withdrawal” while the Staff’s single site observation was “insufficient to make a definitive conclusion regarding impacts from entrainment.” 2007 Young Affidavit at 6.

Joint Intervenors also argue that a number of material facts remain in dispute regarding the Savannah River’s water level, including whether the Staff used the correct minimum low flow in the DEIS, *id.* at 15-16, and whether the cumulative impacts, water withdrawal analysis in the DEIS should have included, in addition to the existing Vogtle units, withdrawals by nearby sites and by current and known future sites upstream, *see* Joint Intervenors 1.2 Answer at 15-16, 18; *see also* Affidavit of Barry W. Sulkin at 4-6, 10-11 (Nov. 9, 2007).

f. *Board Ruling*

This portion of EC 1.2 having likewise been found not to be a contention of omission, *see supra* section II.B, it is apparent that material factual disputes still exist regarding the adequacy of the ER/DEIS assessment of aquatic organism impingement and entrainment, making a grant of summary disposition improper at this time. *See* 10 C.F.R. § 2.710(d)(2). For instance, while the Staff and SNC argue that the assumption of a uniformly distributed drift community is a conservatism, the Joint Intervenor expert Young declares there exists a potential for larger impacts than those shown by a model using a uniformly distributed drift assumption. *Compare* SNC 1.2 Dispositive Motion at 16 n.2 and Staff 1.2 Answer at 7 with 2007 Young Affidavit at 9. Additionally, we find the Joint Intervenor discussions regarding larval fish mobility and screen basket cleanings and the NRC Staff's visit regarding those cleanings information that reflects existing material factual disputes. While this is post-ER information, we do not think it falls outside the ambit of this portion of EC 1.2 given Joint Intervenor devoted a considerable portion in their original, ER-related pleadings discussing larval fish mobility. *See* 2006 Young Declaration at 5. That discussion, which certainly provided SNC and the Staff with sufficient notice of this argument, marks these matters both as within the boundaries of the original contention and bases and relevant to the Board's ongoing consideration of these issues.

For the entrainment (as well as the thermal impacts) portion of the contention, there also exists a clear dispute between the parties about whether the existing impact analyses were based upon the correct minimum river levels so as to estimate properly the maximum percentage of the river withdrawn by the proposed units. Based on the information provided in Mr. Sulkin's supporting affidavit, Joint Intervenor argue the minimum low flow used in the DEIS, Drought Level 3 or 3800 cubic feet per second (cfs), is not the true minimum flow and that the thermal impacts and entrainment analyses should be redone utilizing the Thurmond Dam's Drought Level 4 conditions and the minimum flow Jackson, South Carolina gauge, which is lower than the Thurmond Dam's Drought Level 3.¹⁴ *See* Joint Intervenor 1.2 Answer at 15-16. Moreover, the fact that this analysis was not part of the information provided by Dr. Young in support of the original contention does not necessarily make it irrelevant. In his 2006 affidavit, Dr. Young calculated a maximum percentage of the river withdrawn by the proposed units using an assumption of 3828 cfs, based on the worst 7-day

¹⁴The Board notes that as of Tuesday, October 23, 2007, the minimum daily discharge from Lake Thurmond was reduced from 3800 cfs to 3600 cfs. *See* Army Corps of Engineers (<http://water.sas.usace.army.mil/cf/KavaPlot/KPlot.cfm?project=Thurmond>) (last visited on Jan. 14, 2008).

flow over a 10-year period (the 7Q10 flow identified in the ER),¹⁵ rather than the ER's assumption of 5800 cfs. *See* 2006 Young Declaration at 6. This calculation was provided, however, in the context of Dr. Young's larger argument that low water levels increase species' vulnerability to entrainment and "[t]he ER does not calculate normal and worst case scenarios based upon species composition in the river channel at different flows." *Id.* Accordingly, with SNC and the Staff having had notice that arguments regarding the Savannah River's minimum water levels and the maximum percentage withdrawn from the river would be raised, we consider this argument regarding Drought Level 4 to be within the ambit of the 2006 concern proffered in support of EC 1.2 that water level "worst case scenarios" have not been calculated properly.¹⁶

Another portion of the Joint Intervenor 2007 argument regarding water levels will not be considered further by the Board, however. In their answer opposing summary disposition, Joint Intervenor claim:

[The DEIS] does not take into account significant withdrawals in the immediate vicinity of Plant Vogtle, such as the D-Area Powerhouse and the Savannah River Site. It also does not take into account any withdrawals upstream of Plant Vogtle, such as the Ughart Station, the Augusta Canal, the International Paper Mill at Augusta, or the City of Augusta. The DEIS does not take into account known future increases of withdrawals upstream from the Stevens Creek reservoir, which has recently applied to quadruple it[s] withdrawal.

Joint Intervenor 1.2 Answer at 18-19 (citations omitted). In contrast, in the Joint Intervenor original petition, as well as Dr. Young's supporting materials, the discussion of cumulative withdrawals includes only the existing Vogtle units. *See* Intervention Petition at 12-13 ("Thus, the ER fails to provide a meaningful basis to evaluate *the cumulative impacts of the new and existing intake structures on aquatic species*" (emphasis added)); 2006 Young Declaration at 4. Consequently, in their existing issue statement EC 1.2 and its supporting bases (which they

¹⁵In light of the region's current drought, if the FEIS were issued today, the 7Q10 would be significantly lower. *See id.*

¹⁶In this regard, we note it is clear from the 2006 Young Declaration that issues around minimum flows and the maximum percentage withdrawn would be some of the Joint Intervenor primary arguments. SNC and the Staff should not have been surprised by their inclusion in the Joint Intervenor answer, even if Joint Intervenor have updated the exact reasons why they believe that minimum flows have been miscalculated. We also note that in its statement of material facts not at issue, SNC uses the Staff's Drought Level 3 calculations as support for its summary disposition motion, referring to Drought Level 3 as utilized in the DEIS as "the maximum measurable drought." *See* SNC 1.2 Statement of Undisputed Facts at 3. This raises the concern whether, if Joint Intervenor are barred from questioning whether Drought Level 3 is indeed the "maximum measurable drought," would they also be barred from disputing a statement that, if undisputed, will be admitted as fact. *See supra* note 9.

choose not to amend), Joint Intervenors have failed to provide the other parties with notice that the issue of the impacts of cumulative withdrawals was intended to include anything other than the existing and proposed Vogtle units.¹⁷ Given, as we have previously recognized, *see supra* section II.D.1.f, that a purpose of the bases of a contention are “to put the other parties on notice as to what issues they will have to defend against or oppose,” *Seabrook*, ALAB-899, 28 NRC at 97, Joint Intervenors current argument that the DEIS must consider the cumulative impacts of water withdrawals by other facilities on the Savannah River (particularly as reflected in the last paragraph on page 18, continuing onto page 19, of Joint Intervenors answer and paragraphs 23 and 24 of the Sulkin affidavit) is outside the scope of EC 1.2 and will not be considered further by the Board.

3. Thermal Pollution

a. Joint Intervenors Petition

In their initial petition, Joint Intervenors argued that the ER lacked adequate information regarding both the probable attributes of the new units’ thermal plume and their likely effects upon the site’s species. *See* Intervention Petition at 13.

Regarding analysis of the plant’s plume, Dr. Young asserted that the thermal plume for the existing Vogtle facilities had never been measured and that the plumes from the existing plant may combine with the new plume, “resulting in an increased volume of the river affected by the thermal discharge.” 2006 Young Declaration at 7. Dr. Young also alleged relative to the effect of the plume upon the site’s ecology that there was no analysis of the plume or other thermal effects when water levels are low. *See id.* at 8. He further claimed that there are no data regarding thermal tolerances and species’ varying tolerances by life history stage and maintained that the ER only included discussions of fish that will not be affected much by the plume, rather than those that could be vulnerable, like larval and juvenile American shad. *See id.* at 7-8. Finally, Joint Intervenors declared that the cumulative thermal effects of all of the Vogtle units were inadequately analyzed. *See* Intervention Petition at 12-13.

¹⁷The only reference made to other facilities in either the intervention petition or the 2006 Young declaration relates to discharges: “the ER does not evaluate cumulative impacts from the new effluent discharge combined with the existing discharge and other sources of pollution in the area.” Intervention Petition at 13. What these other sources might be is never explained, and the sentences that follow only discuss “the existing discharge” and “the existing thermal plume.” *Id.* This is certainly not enough to give SNC and the Staff notice that Joint Intervenors meant anything other than the existing Vogtle units when discussing cumulative impacts and water withdrawals.

b. Board Contention Admissibility Discussion

Along with the entrainment/impingement and chemical impacts aspects of the contention, the Board admitted the Joint Intervenors thermal impacts concern, concluding that “[f]or each of the asserted deficiencies concerning the ER impact discussion regarding the intake/discharge structure for the two new proposed facilities — impingement/entrainment, chemical discharges, and thermal discharges, including cumulative impacts from these items associated with the existing Vogtle facilities —” Dr. Young’s affidavit provided sufficient support. LBP-07-3, 65 NRC at 258.

c. SNC Motion for Summary Disposition

SNC argues in its dispositive motion that the DEIS includes the analysis of thermal impacts required under NEPA. According to SNC, in the DEIS the Staff assumed conservative river conditions and determined the maximum size of the thermal plume. *See* SNC 1.2 Dispositive Motion at 19. According to SNC, “these efforts to assess conditions under maximum withdrawals, maximum temperatures and maximum droughts constitute the appropriate ‘worst-case’ analysis alleged to be missing, including analysis of 7Q10 flow conditions.” *Id.* at 19. In the alternative, SNC argues that “NEPA does not require a strictly worst case analysis.” *Id.* at 19 n.4. SNC also claims that the Staff adequately studied cumulative thermal impacts in the DEIS, asserting:

[T]he DEIS includes a discussion of NRC Staff’s thermal impact assessment using the CORMIX model to estimate the size and temperature of the thermal plume from the existing Units 1 and 2 as well as the proposed Units 3 and 4. The DEIS quantifies the size of the thermal plume, and based on their assessment of the size of the plume, the Staff concludes that “thermal impacts to aquatic ecosystems” would be minor. This includes impacts to American shad, which are specifically addressed as part of the aquatic ecosystem in section 2.7.2.1. The DEIS quantifies the maximum size of a thermal plume under worst case conditions.

Id. at 21-22.

d. Staff Answer

Citing the accompanying joint affidavit of Dr. Christopher King and Rebekah Krieg as support, the Staff declares that the DEIS includes an adequate analysis both of the proposed units and of the proposed and existing units cumulatively, making the thermal allegations in EC 1.2 moot. *See* Staff 1.2 Answer at 11; *see also* Joint Affidavit of Christopher B. Cook and Rebekah H. Krieg (Oct. 29, 2007) at 17-18. According to the Staff, it conducted an overly conservative analysis of

cumulative impacts in the DEIS, combining as one the new plume and the thermal plumes from the existing Vogtle units, as well as studying them separately. *See* Staff 1.2 Answer at 11. The Staff also declares that it studied the ability of fish to avoid the plume and the potential population impact, or lack thereof, to those organisms that cannot avoid the plume, like ichthyoplankton. *See id.*

In sum, the Staff claims that the thermal impacts conclusions in the DEIS, based on “calculations of the modeled plume size, duration, temperature and temperature differential (for different river flow levels and temperatures of the river at different times of the year),” are well founded such that “the DEIS cures the alleged deficiencies in the ER concerning the potential impacts of the thermal plume.” *Id.*

e. Joint Intervenors Answer

In their answer to the summary disposition motion, Joint Intervenors argue that material factual disputes remain regarding thermal impacts. As with the entrainment and impingement analyses, Joint Intervenors contend the Staff should have used lower minimal river flow numbers and higher VEGP maximum withdrawals, and thus a higher percentage of the river withdrawn into the cooling system. *See* Joint Intervenors Answer at 14-18. They also assert, as was noted above, *see supra* section II.D.2.e, that a uniformly distributed drift assumption is incorrect so that the impacts may be significantly higher. *See* Joint Intervenors Answer at 14.

f. Board Ruling

Relative to this portion of EC 1.2 that questions the adequacy of the information provided in the ER/DEIS regarding thermal pollution, *see supra* section II.B, a number of material factual disputes remain with regard to the potential thermal impacts of the proposed units’ cooling system upon aquatic organisms, making summary disposition inappropriate for this aspect of EC 1.2 as well. As was noted in section II.D.2.f, above, these disputes include what water levels should be used in models that estimate the size and impact of the thermal plume and whether the Staff is correct in assuming a uniformly distributed drift community in the DEIS analysis, both of which the Board also has found to be within the scope of the contention. This portion of the contention thus will be subject to further merits consideration by the Board.

4. Chemical Pollution

a. Joint Intervenors Petition

Joint Intervenors declared in their initial petition that in reaching the conclusion that impacts from the plant’s chemical discharges would be minor, the ER failed to “disclose whether chemical constituents in the liquid effluent will be discharged at harmful levels.” Intervention Petition at 12. Pointing to the chart in the ER that listed the possible water treatment chemicals with the disclaimer that “this list is representative, not definitive,” ER at 3.6-5 (Table 3.6-1 & n.1)), Joint Intervenors asserted the chart revealed only some of the constituents and did not provide the amounts of the chemicals involved. *See* Intervention Petition at 11-12. Joint Intervenors also argued that, as with thermal discharges, cumulative impacts of the new chemical discharges combined with those from existing discharges and other sources of pollution were not adequately considered, stating “[t]he ER does not disclose field monitoring data from the existing discharge structure [and] [t]here is no evaluation of the acute or chronic toxicity of the existing discharge.” *Id.* at 13.

b. Board Contention Admissibility Discussion

Admitting the Joint Intervenors chemical impacts concern along with the entrainment/impingement and thermal impacts aspects of the contention, the Board concluded that “[f]or each of the asserted deficiencies concerning the ER impact discussion regarding the intake/discharge structure for the two new proposed facilities — impingement/entrainment, chemical discharges, and thermal discharges, including cumulative impacts from these items associated with the existing Vogtle facilities —” Dr. Young’s affidavit provided sufficient support. LBP-07-3, 65 NRC at 258.

c. SNC Motion for Summary Disposition

SNC argues in its motion that the Joint Intervenors claims regarding the absence of information about chemical discharges are moot because “Table 5-4 of the DEIS provides a detailed list of the water treatment chemicals, their use, the concentration that is anticipated to be discharged from Units 3 and 4 and the toxicity data from the Material Safety Data Sheets for each of those chemicals.” SNC 1.2, Dispositive Motion at 23. SNC also maintains that “the DEIS does evaluate the cumulative impacts of acute or chronic toxicity of the existing discharge.” *Id.*

d. *Staff Answer*

Like SNC, the Staff points to Table 5-4 of the DEIS, arguing that, using the chart's new information, the Staff evaluated the impacts from the discharges and provided an analysis that effectively addresses the Joint Intervenor's complaint. The Staff concludes that "the Staff's DEIS has now addressed whether chemical discharge effluents would be discharged at harmful levels," so that the Joint Intervenor's allegation of an omission is now moot. Staff 1.2 Answer at 9-10.

e. *Joint Intervenor's Answer*

Joint Intervenor's acknowledge this portion of the contention is now moot, admitting that "[t]he claim that the impact of chemicals on aquatic life was not properly addressed in the ER has subsequently been addressed in the DEIS." Joint Intervenor's 1.2 Answer at 19.

f. *Board Ruling*

As Joint Intervenor's have conceded, relative to the purported omission that is at issue in this portion of EC 1.2, *see supra* section II.B, the DEIS has addressed the contention's allegation that "[t]he ER fails to identify and consider direct, indirect, and cumulative . . . chemical . . . effluent discharge impacts of the proposed cooling system intake and discharge structures on aquatic resources." LBP-07-3, 65 NRC at 280. In contrast to the chemical discharge information provided in the ER, which was a simple and not necessarily comprehensive list of chemicals, the DEIS provides the concentration of each chemical at the discharge point, with a comparison of those concentrations to the concentrations that would be lethal for 50% of a sample population. *See* DEIS at 5-28 (Table 5-4).

The portion of EC 1.2 addressing chemical discharges thus is dismissed as moot.

III. CONCLUSION

Because we have concluded that, in the circumstances here, the November 21, 2007 motion by the Staff to strike portions of the Joint Intervenor's 1.2 answer and the November 23, 2007 motion by SNC to strike portions of the Joint Intervenor's 1.2 answer or, in the alternative, to file a reply were improvidently submitted, we decline to provide further substantive consideration to either.

With regard to the SNC October 17, 2007 summary disposition request, we conclude that, as a contention claiming a material omission in the ER that has now been addressed in the DEIS, the portion of EC 1.2 concerning chemical discharges

should be dismissed as moot. Further, with the exception of the matter of the cumulative impacts of water withdrawals by other facilities on the Savannah River that is outside the scope of the admitted contention, we find relative to the other portions of the EC 1.2 regarding baseline information, impingement/entrainment, and thermal impacts that SNC has failed to establish that there are no disputes of material fact relating to genuine issues, and so deny the SNC motion for summary disposition with regard to those aspects of the contention.¹⁸

For the foregoing reasons, it is this 15th day of January 2008, ORDERED, that:

1. The October 17, 2007 motion of Applicant SNC for summary disposition regarding Joint Intervenor's issue statement EC 1.2 is *granted* as to that portion of the contention regarding chemical discharge impacts, which is dismissed as moot, and is *denied* as to the other aspects of the contention, consistent with the Board's ruling on the scope of the contention as it relates to the matter of the cumulative impacts of water withdrawals by other facilities on the Savannah River that is outlined in section II.D.2.f of this decision.

2. The November 21, 2007 NRC Staff motion to strike portions of the Joint Intervenor's EC 1.2 answer to the SNC summary disposition motion and the November 23, 2007 motion by SNC to strike portions of the Joint Intervenor's EC 1.2 answer to its dispositive motion or, in the alternative, to file a reply to that answer are *denied*.

3. Consistent with this opinion, EC 1.2 is *revised* to read as follows:

EC 1.2 — ER FAILS TO IDENTIFY AND ADEQUATELY CONSIDER COOLING SYSTEM IMPACTS ON AQUATIC RESOURCES

CONTENTION: The ER fails to identify and adequately consider direct, indirect, and cumulative impingement/entrainment and thermal effluent discharge

¹⁸The current general schedule for this proceeding provides another opportunity for the submission of amended or new contentions and summary disposition motions following the issuance of the Staff's final EIS, currently scheduled for early July 2008. *See* Initial Scheduling Order, App. A, at 1-2. The Board assumes that any party decisions to amend or file new contentions or to submit another dispositive motion will be informed by this ruling.

impacts of the proposed cooling system intake and discharge structures on aquatic resources.

Cite as 67 NRC 85 (2008)

LBP-08-3

THE ATOMIC SAFETY AND
LICENSING BOARD¹⁹

G. Paul Bollwerk, III, Chairman
ADMINISTRATIVE JUDGE

Nicholas G. Trikouros
ADMINISTRATIVE JUDGE

James F. Jackson (by E. Roy Hawkens)
ADMINISTRATIVE JUDGE

Rockville, Maryland
January 15, 2008

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before the Licensing Board:

G. Paul Bollwerk, III, Chairman
Nicholas G. Trikouros
Dr. James F. Jackson

In the Matter of

Docket No. 52-011-ESP
(ASLBP No. 07-850-01-ESP-BD01)

SOUTHERN NUCLEAR OPERATING
COMPANY
(Early Site Permit for Vogtle
ESP Site)

January 15, 2008

In this 10 C.F.R. Part 52 proceeding regarding the application of Southern Nuclear Operating Company (SNC) for an early site permit (ESP) for an additional two reactors at the Vogtle Electric Generating Plant site, ruling on an SNC motion seeking summary disposition regarding environmental contention (EC) 1.3, Environmental Report (ER) Dry Cooling System Alternatives Discussion Fails To Address Aquatic Species Impacts, the Licensing Board denies the motion, concluding that SNC failed to demonstrate there are no material factual disputes concerning genuine issues regarding the matter of the adequacy of the analysis of the appropriateness of a dry cooling system given the presence of extremely sensitive biological resources that is the focus of the contention.

RULES OF PRACTICE: SUMMARY DISPOSITION (STANDARDS)

For proceedings that are being conducted pursuant to the "informal" hearing procedures of 10 C.F.R. Part 2, Subpart L, summary disposition motions are to be resolved in accord with the standards for dispositive motions for "formal"

¹⁹ Copies of this Memorandum and Order were sent this date by the agency's e-filing system to counsel for (1) Applicant SNC; (2) the Joint Intervenors; and (3) the Staff.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before the Licensing Board:

G. Paul Bollwerk, III, Chairman
Nicholas G. Trikouros
Dr. James F. Jackson

In the Matter of

SOUTHERN NUCLEAR OPERATING CO.

(Early Site Permit for Vogtle ESP Site)

Docket No. 52-011-ESP

ASLBP No. 07-850-01-ESP-BD01

January 26, 2009

MEMORANDUM AND ORDER
(Ruling on In Limine Motions)

Pending before the Licensing Board are motions filed by applicant Southern Nuclear Operating Company (SNC) and the NRC staff seeking to strike portions of prefiled testimony and associated exhibits submitted by Joint Intervenors¹ relating to the three contentions — Environmental Contention (EC) 1.2, [Environmental Report (ER)] Fails to Identify and Consider Cooling System Impacts on Aquatic Resources; EC 1.3, ER Dry Cooling System Alternatives Discussion Fails to Address Aquatic Species Impacts; and EC 6.0, Final Environmental Impact Statement Fails to Provide Adequate Discussion of Impacts Associated with Dredging the Savannah River Federal Navigation Channel — that are scheduled to be the subject of an evidentiary hearing beginning on Monday, March 16, 2009. The Board's rulings on these motions are set forth below, as well as administrative directives regarding further party filings to address these determinations and other matters.

¹ 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 Environmental Defense League.

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I. In Limine Motion Rulings

- A. SNC and Staff Motions to Exclude Portions of Prefiled Direct Testimony of Barry W. Sulkin and Exhibits JTI000031, JTI000003, and JT000005 Regarding Contention EC 1.2

DISCUSSION: [SNC] Motion In Limine to Strike Testimony and Exhibits Filed by Joint Intervenors (Jan. 14, 2009) at 2 [hereinafter SNC Motion In Limine]; NRC Staff Motion In Limine to Exclude Portions of Testimony and Exhibits Filed by Joint Intervenors (Jan. 14, 2009) at 3-5 [hereinafter Staff Motion In Limine]; Joint Intervenors' Response to Motions In Limine to Exclude Portions of Testimony and Exhibits (Jan. 21, 2009) at 6-10.

RULING: SNC and the staff request that the Board exclude portions of the prefiled direct testimony of Barry W. Sulkin, as well as portions of Joint Intervenors exhibits JTI000003, JTI000005, and JTI000031 referring to cumulative water usage as it relates to water users other than SNC's two existing and two proposed Vogtle units. Joint Intervenors oppose the SNC and staff motions regarding portions of Mr. Sulkin's testimony, specifically the requests to exclude Questions 27 and 28 and their corresponding answers. Joint Intervenors do not oppose SNC and staff requests to strike references to municipal withdrawals in Answer 24 and Question 25.

As SNC and the staff note, the Board's January 15, 2008 memorandum and order ruling on SNC's November 2007 summary disposition motion regarding contention EC 1.2 defined the scope of the contention to exclude arguments regarding the degree to which the staff's draft environmental impact statement (DEIS) gave appropriate consideration to the cumulative impacts of water withdrawals by users other than the existing and proposed Vogtle units. See LBP-08-2, 67 NRC __, __ (slip op. at 25-26) (Jan. 15, 2008) . Joint Intervenors, however, assert that they are offering the contested portions of Mr. Sulkin's testimony to challenge the methodology used for calculating cumulative impacts from Vogtle Units 1-4 rather than to argue

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that the final environmental impact statement (FEIS) specifically should have considered water withdrawals by certain other users.

After reviewing the prefiled direct testimony and exhibits at issue, we conclude Joint Intervenors concerns about methodology are clear without the portions at issue, which, per our January 15, 2008 order, go into matters that are outside the scope of contention EC 1.2 as admitted. We therefore grant the SNC and staff motions in limine with respect to the testimony and exhibits related to contention EC 1.2 to the following extent:

1. Regarding Mr. Sulkin's prefiled direct testimony:
 - a. The last sentence of Answer 24 (beginning "Moreover, the flow at") is stricken.
 - b. In Question 25, the phrase "due to increasing municipal withdrawals" at the end of the question is stricken.
 - c. Questions 27 and 28 and their corresponding answers are stricken.
 - d. In Answer 29, the fourth and fifth sentences (beginning "The ESP FEIS reports the D-Area Powerhouse" and "Similarly, the ESR FEIS says the Urquhart Station") and the last sentence (beginning "Nor can I explain") are stricken.
2. Regarding Exhibit JTI000003, paragraph 28 is stricken.
3. Regarding Exhibit JTI000005, paragraph 17 is stricken.
4. Regarding Exhibit JTI000031,
 - a. Paragraphs 12, 22, 23, and 24 are stricken.
 - b. In paragraph 11, the fourth sentence (beginning "The DEIS fails to account for municipal") is stricken.

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B. SNC and Staff Motions to Exclude Portions of Prefiled Direct Testimony of William Powers and Exhibits JTI000031 and JTI000035 Regarding Contention EC 1.3

DISCUSSION: SNC Motion In Limine at 2-3; Staff Motion In Limine at 3-6; Joint Response to Licensing Board Request for Clarification Regarding In Limine Motions (Jan. 23, 2009) at 2 [hereinafter Clarification Request Response].²

RULING: With regard to contention EC 1.3, SNC and the staff seek to exclude references to parallel or hybrid wet/dry alternative cooling systems. As SNC and the staff note, the Board's January 15, 2008 memorandum and order ruling on SNC's November 2007 summary disposition motion regarding contention EC 1.3 limited the contention to the subject of dry cooling as an alternative to wet cooling and precluded further litigation on the subject of hybrid wet/dry cooling systems. See LBP-08-3, 67 NRC __, __ (slip op. at 19-20) (Jan. 15, 2008). Joint Intervenors do not contest the motions in limine relative to this contention. Accordingly, we grant the SNC and staff in limine motions regarding contention EC 1.3 relating to the portions of Mr. Powers' testimony and Joint Intervenors exhibits as follows:

1. Regarding Mr. Powers' prefiled direct testimony:
 - a. The portion of the last sentence of Answer 18 reading "a parallel dry-wet cooling system for reactor 3 and" is stricken.
 - b. The references in Answers 27 and 35 to a parallel wet-dry system are stricken such that the relevant portions of those answers read "there would be relatively little differential in the MW output of wet or dry AP 1000 alternatives."
 - c. Question 34 and its corresponding answer are stricken.

² After receiving the SNC and staff motions in limine and Joint Intervenors response to those motions, the Board issued a January 22, 2009 memorandum and order requesting clarification from the parties on certain items concerning contentions EC 1.3 and EC 6.0. See Licensing Board Memorandum and Order (Request for Clarification Regarding In Limine Motions) (Jan. 22, 2009) (unpublished). On January 23, 2009, the staff filed the parties' joint response to the Board's January 22 order.

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2. Regarding Exhibit JTI000031, paragraph 26, the phrase “or hybrid wet/dry” is stricken from the first sentence. In the second sentence, the words “either” and “or hybrid” are stricken.
3. Regarding Exhibit JTI000035:
 - a. In paragraph 9, the third sentence, beginning “For example, Dominion Resources is currently proposing” is stricken. Also, in the fifth sentence, the words “either” and “or parallel dry-wet cooling” are stricken.
 - b. In paragraph 20, the ninth sentence, beginning “This MW differential can be further reduced by utilizing” is stricken. Also, in the tenth sentence, the punctuation/words “, dry”, “parallel”, and “-wet” are stricken (so that the concluding portion of the sentence reads “output of the wet or dry AP1000 alternatives.”
 - b. In paragraph 22, the phrase “as well as several types of parallel dry-wet cooling system designs” at the end of the third sentence is stricken.

Additionally, the sentence containing the stricken portion of Exhibit JTI000035 refers to an “Attachment E,” which Joint Intervenors appear to have filed as Exhibit JTI000038. To the extent Exhibit JTI000038 addresses parallel wet/dry cooling system designs, that discussion is outside the scope of this proceeding. The exhibit, however, is also referenced in a portion of Exhibit JTI000035 that we find to be within the scope of this proceeding. Accordingly, consistent with the parties’ joint response, see Clarification Request Response at 2, we strike only pages 39 through 43 of Exhibit JTI000038.

- C. SNC and Staff Motions to Exclude Portions of Prefiled Direct Testimony of Donald F. Hayes and Shawn P. Young and Exhibits JTI000041 and JTI000005 Regarding Contention EC 6.0

DISCUSSION: SNC Motion In Limine at 3-4; Staff Motion In Limine at 6-9; Clarification Request Response at 2.

RULING: SNC and the staff requested that the Board exclude portions of the prefiled direct testimony of Donald F. Hayes and Shawn P. Young and certain of Joint Intervenors exhibits as being outside the scope of contention EC 6.0 as admitted. First, asserting the contention concerns the impacts of dredging, they seek to exclude references to the impacts of

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barge traffic or navigation. Second, they seek to exclude references to the impacts of dredging the barge slip and intake channel for proposed Vogtle Units 3 and 4. Finally, the staff asks the Board to recognize a joint stipulation concerning portions of Dr. Hayes's and Dr. Young's testimony, as well as exhibits JTI000005 and JTI000041,³ in which the parties agree that those portions refer only to dredging of the Savannah River federal navigation channel (FNC) and not to dredging of the barge slip or intake channel. Joint Intervenors do not contest the in limine motions for this contention.

As admitted, contention EC 6.0 concerns the cumulative impacts of dredging the Savannah River FNC to accommodate barge shipments for construction of proposed Vogtle Units 3 and 4. See Licensing Board Memorandum and Order (Ruling on Motion to Admit New Contention) (Oct. 24, 2008) at 16 (unpublished). The contention as admitted does not cover the impacts of barge traffic or navigation separate from the FNC dredging. Additionally, as the Board noted in its October 24, 2008 memorandum and order, any challenge to the SNC and staff analyses of the impacts of dredging the barge slip and intake channel is outside the scope of contention EC 6.0 as admitted. See id. at 9-10.

The Board therefore grants the SNC and staff in limine motions regarding contention EC 6.0 to the extent described below:

1. Regarding Answer 16 in Dr. Hayes's prefiled direct testimony, the balance of the answer after the first sentence is stricken.
2. Regarding Dr. Young's prefiled direct testimony:
 - a. The second paragraph of Answer 32 (beginning "Further, beyond the dredging") is stricken.

³ The staff in limine motion actually refers to paragraphs 7 and 10 of exhibit JTI000045. As the parties stated in their joint response to the Board's January 22 request for clarification regarding the in limine motions, the references to JTI000045 should have been to JTI000041. See Clarification Request Response at 2.

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- b. In Questions 29 and 30, the phrase “of the federal navigation channel” should be inserted after “proposed dredging.”
 - c. In Question 32, the phrase “regarding the dredging impacts” should be modified to read “regarding the federal navigation channel dredging impacts.”
3. Regarding Exhibit JTI000041:
- a. All of paragraph 8, except for the first sentence, is stricken. Thus, as modified, paragraph 8 should read: The extent of dredging impacts set forth in paragraph 7 of this declaration depends partially on the size and duration of the dredging operations and the areas of benthic habitat that will be disturbed.
 - b. The first sentence of paragraph 9 is stricken.
 - c. References to dredging other than FNC dredging are stricken from paragraph 10. In the first sentence, the phrase “these dredging projects, particularly” is stricken. In the second sentence, the phrase “and the on-site impacts as SMALL” is stricken. In the last sentence, the phrase “or the SMALL ranking suggested for the on-site activities” is stricken.
4. Regarding Exhibit JTI000005, paragraph 11, the phrase “for construction of the New Units (including dredging required” is stricken, along with the “)” after the word “channel”, so that the beginning of the sentence as modified reads “Although the proposed dredging required to re-open the shipping channel will likely have”.

Additionally, in his response to Question 16 in his prefiled direct testimony, Dr. Hayes references an email, which Joint Intervenors have filed as Exhibit JTI000039, that is not referenced in either the remainder of Dr. Hayes’s testimony or any other testimony Joint Intervenors have filed. Similarly, in response to Question 32 of his prefiled direct testimony, Dr. Young references Exhibit JTI000030, which is not referenced in either the remainder of his testimony or any other testimony Joint Intervenors have filed. As a consequence, Exhibits JTI000039 and JTI000030 are stricken as well.

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II. Administrative Matters

With the rulings above, certain revisions to and exclusions from Joint Intervenors prefiled direct testimony and exhibits are required.⁴ Accordingly, the Board requests that on or before Monday, February 2, 2009, Joint Intervenors submit revised versions of their prefiled direct testimony and any applicable exhibits that omit all of the text that we have stricken by the above rulings.⁵ The Board notes that this is not an opportunity to rephrase, add to, or otherwise alter previously submitted prefiled direct testimony, but should only be used to eliminate stricken testimony. The revised prefiled direct testimony should be designated as "Revised Prefiled Direct Testimony" in the heading. Revised exhibits should be re-designated with a letter R in place of the first zero in the exhibit number, such that, for example, a revised version of Joint Intervenors exhibit JTI000001 would be designated JTIR000001. Joint Intervenors also should provide Board law clerk Wen Bu (e-mail address: wen.bu@nrc.gov) with a revised electronic copy (preferably in Word format) of their prefiled exhibit list reflecting these changes (including the deletion of any prefiled exhibits that have been stricken).

The Board also requests that by that same date, Joint Intervenors re-file the testimony of Shawn P. Young and Barry W. Sulkin as separate documents associated with the separate contentions they address. Thus, Dr. Young's testimony should be filed as two documents, one

⁴ The parties should be aware that the original versions of the various items at issue from which information is to be stricken in accordance with this order remain in the record of this proceeding for the purpose of any subsequent appeal.

⁵ A "clean" version of the revised prefiled testimony should be provided, with the questions and answers renumbered in any instance in which a preceding question was deleted. For those exhibits (e.g., Exhibit JTI000035) for which particular words, phrases, or paragraphs have been stricken, the refiled "clean" version should be in "redline," showing the particular portions of the exhibit that have been stricken. For those exhibits (e.g., Exhibit JTI000038) for which whole pages have been stricken, the refiled "clean" version may be either a "redline" version or a version that has the stricken pages eliminated.

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addressing contention EC 1.2 and the other addressing contention EC 6.0, while Mr. Sulkin's testimony should be filed as two documents, one addressing contention EC 1.2 and the other addressing contention EC 1.3.⁶ The re-filed testimony of Dr. Young, as well as the revised testimony of Mr. Powers (reflecting the above rulings on the SNC and staff in limine motions), should incorporate the revisions brought to the Board's attention in Joint Intervenors January 21, 2009 filing.⁷ See Joint Intervenors' Revised Exhibit List, Initial Position Statement and Prefiled Direct Testimony and Corrected Exhibit JT1000025 (Jan. 21, 2009) at 4-5.

Additionally, the Board requests that on or before Monday, February 2, 2009, the staff re-file its prefiled direct testimony as separate files without a cover page. The Board also prefers that any additional prefiled evidentiary exhibits that are submitted not include a cover page, but simply provide the prefiled exhibit number on the first page of the exhibit.

Finally, in accord with the Board's November 13, 2008 memorandum and order, the parties' prefiled rebuttal testimony should be submitted on or before Friday, February 6, 2009. The parties are reminded that the purpose of rebuttal testimony is to respond to the prefiled direct testimony propounded by the other parties to the proceeding, not for witnesses to put forth new testimony of their own or to reintroduce testimony or exhibits that the Board in this or any of its previous rulings has indicated should not be submitted. In limine motions, if any, regarding the prefiled rebuttal testimony shall be filed on or before Wednesday, February 11, 2009, with any responses filed on or before Tuesday, February 17, 2009. In such motions, the parties should be as specific as possible regarding the particular wording, sentences, or

⁶ To the degree necessary to provide appropriate context and make the prefiled testimony a self-contained submission, Joint Intervenors can repeat background and qualification information in both sets of prefiled testimony.

⁷ Any revisions to prefiled testimony require that the testimony, as corrected, be refiled in toto. See Licensing Board Memorandum and Order (Contested Evidentiary Hearing Administrative Matters) (Dec. 15, 2008) at 6 (unpublished).

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing LB MEMORANDUM AND ORDER (RULING ON IN LIMINE MOTIONS) have been served upon the following persons by Electronic Information Exchange.

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Docket No. 52-011-ESP
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Docket No. 52-011-ESP
LB MEMORANDUM AND ORDER (RULING ON IN LIMINE MOTIONS)

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Office of the Secretary of the Commission

Dated at Rockville, Maryland
this 26th day of January 2009

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before the Licensing Board:

G. Paul Bollwerk, III, Chairman
Nicholas G. Trikouros
Dr. James F. Jackson

In the Matter of

SOUTHERN NUCLEAR OPERATING CO.

(Early Site Permit for Vogtle ESP Site)

Docket No. 52-011-ESP

ASLBP No. 07-850-01-ESP-BD01

February 23, 2009

MEMORANDUM AND ORDER
(Ruling on In Limine Motions)

Pending before the Licensing Board are February 11, 2009 motions filed by applicant Southern Nuclear Operating Company (SNC) and the NRC staff seeking to strike portions of the prefiled rebuttal testimony and associated exhibits submitted by Joint Intervenors¹ relating to the three contentions -- Environmental Contention (EC) 1.2, [Environmental Report (ER)] Fails to Identify and Consider Cooling System Impacts on Aquatic Resources; EC 1.3, ER Dry Cooling System Alternatives Discussion Fails to Address Aquatic Species Impacts; and EC 6.0, Final Environmental Impact Statement Fails to Provide Adequate Discussion of Impacts Associated with Dredging and Use of the Savannah River Federal Navigation Channel -- that are scheduled to be the subjects of an evidentiary hearing beginning on Monday, March 16, 2009. The Board's rulings on these motions are set forth below, as well as administrative directives regarding further party filings to address these determinations and other matters.

¹ 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 Environmental Defense League.

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I. In Limine Motion Rulings

- A. SNC and Staff Motions to Exclude Portions of Prefiled Rebuttal Testimony of Barry W. Sulkin and Shawn P. Young Regarding Contention EC 1.2

DISCUSSION: [SNC]'s Motion In Limine (Feb. 11, 2009) at 2 [hereinafter SNC Motion In Limine]; NRC Staff Motion In Limine to Exclude Portions of Rebuttal Testimony and Exhibits Filed by Joint Intervenors (Feb. 11, 2009) at 3-4 [hereinafter Staff Motion In Limine]; Joint Intervenors' Response to [SNC]'s and NRC Staff's Motions In Limine to Exclude Portions of Rebuttal Testimony and Exhibits Filed by Joint Intervenors (Feb. 18, 2009) at 4-7 [hereinafter Joint Intervenors Reply].

RULING: SNC and the staff request that the Board exclude portions of the prefiled rebuttal testimony of Barry W. Sulkin referring to cumulative impacts of water withdrawals by users other than SNC's two existing and two proposed Vogtle units as being outside the scope of contention EC 1.2 as admitted. Additionally, SNC requests that the Board exclude question and answer 14 from the prefiled rebuttal testimony of Shawn P. Young as "not 'directed to the initial statements and testimony' as required by 10 C.F.R. § 2.1207(a)(2)." SNC Motion in Limine at 2. Joint Intervenors oppose the in limine motions with regard to Mr. Sulkin's testimony, but do not oppose SNC's in limine motion with regard to Dr. Young's testimony.

As we noted in our ruling on in limine motions concerning Joint Intervenors prefiled direct testimony, arguments regarding the adequacy of the analysis of cumulative impacts from water users other than the existing and proposed Vogtle units are outside the scope of contention EC 1.2 as admitted. See Licensing Board Memorandum and Order (Ruling on In Limine Motions) (Jan. 26, 2009) at 2 (unpublished) [hereinafter Direct Testimony In Limine Ruling]. Joint Intervenors, however, assert that the staff opened the door to rebuttal testimony concerning the cumulative impacts of upstream withdrawals through its discussion of using

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Thurmond Dam discharges as a surrogate for flow rates at the Vogtle site and its discussion of earlier impingement and entrainment studies at the Department of Energy's Savannah River Site (SRS).

Joint Intervenors can adequately rebut the staff's testimony regarding the SRS studies without the sentence in answer 9 at issue in SNC's and the staff's in limine motions, as the current withdrawal rates at the D-Area Powerhouse and "other major withdrawals in the Savannah River Basin," do not affect Joint Intervenors argument concerning current aquatic baselines versus aquatic baselines at the time of the SRS studies. Regarding the Thurmond Dam discharge rates, the appropriateness of assuming a flow rate at the Vogtle site equal to the discharge rate from the Thurmond Dam appears to be a separate question from the cumulative impingement and entrainment impacts of water withdrawals between the two locations, and therefore staff direct testimony on the former would not necessarily open the door to rebuttal testimony on the latter. We therefore grant the SNC and staff motions in limine with respect to Mr. Sulkin's contention EC 1.2 rebuttal testimony to the following extent:

1. In answer A9, the first sentence of the last paragraph (beginning "In addition, it is impossible to say anything definitive") is stricken.
2. In answer A11, the second paragraph and the last sentence of the third paragraph (beginning "To determine the cumulative impact") are stricken.²
3. Question 14 and its corresponding answer are stricken.

² Although SNC and the staff only requested that the last sentence of this paragraph be stricken, it appears to the Board that, at a minimum, for syntactic purposes the preceding sentence should be removed as well. Indeed, it is arguable that the whole paragraph could be removed in light of the impact of the Board's ruling striking the final sentence and the preceding paragraph. Given that the SNC and staff in limine requests went only to the final sentence of the paragraph, the Board will strike only what was requested. Nonetheless, in providing their revised rebuttal testimony, Joint Intervenors may wish to consider whether the balance of the third paragraph continues to have any probative value so that it should be retained.

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Additionally, the unopposed request in the SNC in limine motion regarding Dr. Young's rebuttal testimony is granted, as the discussion of aquatic impacts from dam construction is irrelevant to both contention EC 1.2 as admitted and SNC's and the staff's prefiled direct testimony. Accordingly, with respect to Dr. Young's contention EC 1.2 rebuttal testimony, question 14 and its corresponding answer are stricken.

B. SNC and Staff Motions to Exclude Portions of Prefiled Rebuttal Testimony of William Powers and Exhibits JTI000049, JTI000050, and JTI000051 Regarding Contention EC 1.3

DISCUSSION: SNC Motion In Limine at 3-4; Staff Motion In Limine at 4-9; Joint Intervenors Reply at 7-9.

RULING: SNC and the staff seek to exclude references in Joint Intervenors rebuttal testimony and exhibits to parallel or hybrid wet/dry alternative cooling systems, particularly the system proposed for Dominion's North Anna Unit 3. In our ruling on the SNC and staff in limine motions regarding Joint Intervenors prefiled direct testimony and exhibits, we noted that litigation on the subject of hybrid wet/dry cooling as an alternative cooling system for proposed Vogtle Units 3 and 4 would be outside the scope of contention EC 1.3 as admitted. As Joint Intervenors point out, however, the references to North Anna Unit 3 in Mr. Powers' testimony do not hold out that unit's hybrid cooling system as an alternative; instead, Mr. Powers cites information on North Anna Unit 3 to rebut SNC's argument that dry cooling would be infeasible. While the validity of Joint Intervenors reliance on North Anna Unit 3 data to support their dry cooling arguments is a question the Board may need to explore further through its own questioning of the witnesses, that question goes to the merits and not to whether Mr. Powers' references to North Anna Unit 3 are within the scope of contention EC 1.3. We therefore deny the SNC and staff in limine motions regarding Mr. Powers' testimony and the associated exhibits, with the understanding that those portions of the testimony and the associated exhibits

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are being offered, and will be considered, only to support Joint Intervenors arguments concerning the dry cooling alternative.

Nonetheless, Joint Intervenors have agreed that certain portions of the exhibits referenced in Mr. Powers' rebuttal testimony do go beyond the scope of contention EC 1.3 as admitted. Accordingly, we grant the SNC and staff in limine motions regarding exhibits JTI000049 and JTI000050 and strike the following:

1. In exhibit JTI000049,
 - a. Slide 1 on page 2: The title.
 - b. Slide 2 on page 2: The bullet "What is a hybrid cooling system?"
 - c. Slide 2 on page 4: The bullet "Unit 3 cooling system changed in 2005 from open to closed cycle due to agency and public concerns."
 - d. Slide 3 on page 6: Entire slide.
 - e. Page 7: All three slides in their entirety.
 - f. Slide 3 on page 8: Entire slide.
 - g. Slide 1 on page 9: Entire slide.
2. In exhibit JTI000050,³
 - a. On page 3-3: First partial sentence on page.
 - b. On page 3-12: The first paragraph under the heading "Heat Dissipation Systems".

³ Relative to certain provisions specified on pages 3-9 and 3-10 of Exhibit JTI000050, in its in limine motion the staff indicated that "[t]he Joint Intervernors do not object to this portion of the motion in part. The Joint Intervenors assert that the portions of this section that discuss situations in which Unit 3 is only utilizing the dry portion of its parallel wet-dry cooling system should not be struck." Staff Motion In Limine at 8. Although we do not strike any of the requested portions of these provisions, they remain with the understanding that they are being offered, and will be considered, only to support Joint Intervenors arguments concerning the dry cooling alternative.

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C. SNC Motion to Exclude Portions of Prefiled Rebuttal Testimony of Donald F. Hayes Regarding Contention EC 6.0

DISCUSSION: SNC Motion In Limine at 5-6; Joint Intervenors Reply at 10-12.

RULING: SNC seeks to exclude two categories of information from the rebuttal testimony of Dr. Donald Hayes. The first is his opinions provided “outside the area of his expertise,” SNC Motion In Limine at 5, and the second is an opinion concerning potential additional dredging to facilitate dredge spoil disposal. SNC reads portions of answers A12, A13, A14, and A15 of Dr. Hayes’s testimony as opinions on biological impacts outside his area of expertise. We, however, find no indication that Dr. Hayes’s answers include any opinions on biological impacts that are outside his area of expertise. We therefore deny the SNC in limine motion with regard to answers 12-15.

Regarding the discussion of the sediment barge dock and potential additional dredging to accommodate a sediment scow, we find that SNC opened the door to such testimony. As Joint Intervenors point out, at least two of SNC’s witnesses discussed dredge spoil disposal and its environmental impacts in their direct testimony, with Mr. Moorer specifically mentioning loading the material into barges and transporting it to disposal areas or other sites. If SNC offers such testimony, it stands to reason that Joint Intervenors would attempt to rebut it by showing that SNC’s proposed disposal method would have greater environmental impacts than SNC’s witnesses suggest. As with Joint Intervenors dry cooling arguments based on North Anna Unit 3, see section I.B above, the Board may need to explore the merits of this argument further during its questioning of the witnesses. But the argument itself would constitute rebuttal under 10 C.F.R. § 2.1207(a)(2) and is within the scope of contention EC 6.0. We therefore deny the SNC in limine motion with regard to answer 16 of Dr. Hayes’s rebuttal testimony.

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II. Administrative Matters

With the rulings above, certain revisions to and exclusions from Joint Intervenors prefiled rebuttal testimony and exhibits are required.⁴ Accordingly, the Board requests that on or before Monday, March 2, 2009, Joint Intervenors submit revised versions of their prefiled rebuttal testimony and any applicable exhibits that omit all of the text that we have stricken by the above rulings.⁵ The revised prefiled rebuttal testimony should be designated as “Revised Prefiled Rebuttal Testimony” in the heading. Revised exhibits should be re-designated with a letter R in place of the first zero in the exhibit number or an R2, R3, etc., in place of the first two zeros to reflect the current version of the exhibit.⁶ Joint Intervenors should provide Board law clerk Wen Bu (e-mail address: wen.bu@nrc.gov) with a revised electronic copy (preferably in Word format) of their prefiled exhibit list reflecting these changes.

Additionally, the Board wishes to clarify that any revised exhibits that the parties file, whether as a result of the Board’s rulings on in limine motions or otherwise, should be re-named to reflect the most recent revision (e.g., SNCR00001, NRRCR20001, JTIR30001). To that end,

⁴ The parties should be aware that information stricken in accordance with this order remains in the record of this proceeding for the purpose of any subsequent appeal.

⁵ A “clean” version of the revised prefiled testimony should be provided, with the questions and answers renumbered in any instance in which a preceding question was deleted. For exhibits, the refiled version should be in “redline,” showing the particular portions of the exhibit that have been stricken.

⁶ The parties are reminded that they are responsible for ensuring that documentary materials cited or discussed in their prefiled testimony have the proper evidentiary record support. See Licensing Board Memorandum and Order (Contested Evidentiary Hearing Administrative Matters) (Dec. 15, 2008) at 3 n.4 (unpublished).

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing LB MEMORANDUM AND ORDER (RULING ON IN LIMINE MOTIONS) have been served upon the following persons by Electronic Information Exchange.

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Dated at Rockville, Maryland
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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

LBP-09-07

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before the Licensing Board:

G. Paul Bollwerk, III, Chairman
Nicholas G. Trikouros
Dr. James F. Jackson

In the Matter of

SOUTHERN NUCLEAR OPERATING CO.

(Early Site Permit for Vogtle ESP Site)

Docket No. 52-011-ESP

ASLBP No. 07-850-01-ESP-BD01

June 22, 2009

FIRST PARTIAL INITIAL DECISION
(Contested Proceeding)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

LBP-09-07

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before the Licensing Board:

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In the Matter of

SOUTHERN NUCLEAR OPERATING CO.

(Early Site Permit for Vogtle ESP Site)

Docket No. 52-011-ESP

ASLBP No. 07-850-01-ESP-BD01

June 22, 2009

FIRST PARTIAL INITIAL DECISION
(Contested Proceeding)

I. INTRODUCTION

1.1 On August 15, 2006, Southern Nuclear Operating Company (SNC) filed an application with the Nuclear Regulatory Commission (NRC) for an early site permit (ESP) under 10 C.F.R. Part 52 for two additional reactors utilizing the Westinghouse Electric Company AP1000 certified design at the existing Vogtle Electric Generating Plant (VEGP) site near Waynesboro, Georgia. This Partial Initial Decision presents the Licensing Board's findings of fact and conclusions of law relative to three admitted environmental contentions (ECs) proffered by Joint Intervenors¹ -- EC 1.2, Environmental Report Fails to Identify and Consider Cooling System Impacts on Aquatic Resources; EC 1.3, Environmental Report Dry Cooling System Alternatives Discussion Fails to Address Aquatic Species Impacts; and EC 6.0, Final

¹ 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 Environmental Defense League.

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Environmental Impact Statement Fails to Provide Adequate Discussion of Impacts Associated with Dredging the Savannah River Federal Navigation Channel -- challenging the adequacy of the environmental report (ER) contained in the SNC ESP application and/or the draft or final environmental impact statement (DEIS or FEIS) prepared by the NRC staff.

1.2 For the reasons set forth below, in the face of Joint Intervenors challenges to the ER, DEIS, and FEIS as reflected in contentions EC 1.2, EC 1.3, and EC 6.0, the Board finds that the staff and/or SNC have carried their respective burdens of proof to demonstrate the adequacy of the ER, DEIS, and FEIS in accordance with 10 C.F.R. Part 51. The Board thus concludes that Joint Intervenors three contentions cannot be sustained and enters a ruling on the merits of each contention in favor of the staff and SNC.

II. PROCEDURAL BACKGROUND

A. Contentions EC 1.2 and EC 1.3

2.1 Following the August 2006 submission of SNC's Vogtle ESP application and in response to the Commission's October 5, 2006 notice of hearing and opportunity to petition for leave to intervene, 71 Fed. Reg. 60,195 (Oct. 12, 2006), on December 11, 2006, Joint Intervenors (then Joint Petitioners) filed a request for hearing and petition to intervene. See Petition for Intervention (Dec. 11, 2006) [hereinafter Intervention Petition]. Thereafter, on December 15, 2006, this Atomic Safety and Licensing Board was established to adjudicate the Vogtle ESP proceeding. See 71 Fed. Reg. 77,071 (Dec. 22, 2006).

2.2 In its December 18, 2006 initial prehearing order, among other things, the Board indicated that it would treat the three designated subparts of the first of Joint Intervenors contentions as three separate contentions. The Board also requested that Joint Intervenors designate each of their contentions as being in one or more of the following subject matter

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categories: (1) Administrative, (2) Site Safety Analysis, (3) Environmental, (4) Site Redress, (5) Emergency Planning, or (6) Miscellaneous. See Licensing Board Memorandum and Order (Initial Prehearing Order) (Dec. 18, 2006) at 1-2 (unpublished). Joint Intervenors filed a supplemental pleading designating all of their then-seven contentions as environmental contentions.² See J[oi]nt Supplement to Petition for Intervention (Dec. 27, 2006).

2.3 As set forth in these initial pleadings, the second and third portions of Joint Intervenors original contention 1, re-designated as contentions EC 1.2 and EC 1.3 pursuant to the Board's initial prehearing order, read as follows:

EC 1.2: The ER fails to identify and consider direct, indirect, and cumulative impacts of the proposed cooling system intake and discharge structures on aquatic resources.

EC 1.3: The ER fails to satisfy 10 C.F.R. § 51.45(b)(3) because it fails to address impacts to aquatic species in its discussion of alternatives. In particular, the ER's discussion of the no-action alternative and of alternative cooling technologies fails to consider environmental and economic benefits of avoiding construction of the proposed cooling system.

LBP-07-3, 65 NRC 237, 258-59 (2007).

2.4 After a one-day prehearing conference held on February 13, 2007, in Waynesboro, Georgia, during which Joint Intervenors, SNC, and the staff presented oral argument concerning the admissibility of each of Joint Intervenors initially-proffered contentions, including National Environmental Policy Act (NEPA)-associated contentions EC 1.2 and EC 1.3 at issue here, the Board issued a March 12, 2007 memorandum and order ruling on Joint Intervenors standing and the admissibility of their contentions. See id. at 237. The Board concluded that each of the Joint Intervenors had established its standing, and admitted narrower versions of contentions EC 1.2 and EC 1.3 that specified the impacts relevant to

² As will be discussed in section II.B *infra*, Joint Intervenors contention EC 6.0 was not one of Joint Intervenors initially proffered contentions.

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EC 1.2, i.e., the impacts of the to-be-built intake/discharge structures for proposed Vogtle Units 3 and 4, as they relate to possible impingement/entrainment, chemical discharges, and thermal discharges, and omitted the portion of EC 1.3, as proffered by Joint Intervenors, that challenged the SNC discussion of the no-action alternative. As admitted, the contentions stated:

ENVIRONMENTAL CONTENTION (EC) 1.2 - ER FAILS TO IDENTIFY AND CONSIDER COOLING SYSTEM IMPACTS ON AQUATIC RESOURCES

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.

EC 1.3 - ER DRY COOLING SYSTEM ALTERNATIVES DISCUSSION FAILS TO ADDRESS AQUATIC SPECIES IMPACTS

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.

Id. at 280. Additionally, the Board noted that although contention EC 1.1 concerning the adequacy of the ER relative to aquatic baseline information was not admissible, litigation regarding the merits of contention EC 1.2 might involve “the question of the adequacy of the baseline information provided by SNC relative to the portion of the Savannah River that encompasses the project area associated with the intake/discharge structures for both the existing and proposed Vogtle facilities.” Id. at 259.

2.5 In accord with an initial schedule established by the Board permitting the submission of summary disposition motions after both the issuance of the staff draft and final EISs, see Licensing Board Memorandum and Order (Prehearing Conference and Initial Scheduling Order) (May 5, 2007) app. A, at 1-2 (unpublished), with the September 10, 2007

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issuance of the DEIS, SNC filed seeking summary disposition of EC 1.2 and EC 1.3 in its favor on the merits, a request that the staff endorsed. See LBP-08-2, 67 NRC 54, 61 (2008); LBP-08-3, 67 NRC 85, 92 (2008). Moreover, in the face of Joint Interveners response asserting that summary disposition was inappropriate, SNC and the staff responded with motions to strike, in part, Joint Interveners responses, on the grounds the responses sought improperly to expand the scope of the contentions. Joint Interveners opposed these motions. See LBP-08-2, 67 NRC at 62; LBP-08-3, 67 NRC at 93.

2.6 On January 15, 2008, the Board issued separate decisions regarding each of the summary disposition motions. In ruling on the motions, the Board found that the contentions at issue, which had not been amended following the DEIS, were contentions of inadequacy rather than omission, so that Joint Interveners failure to amend their contentions was not dispositive of the issue. See LBP-08-2, 67 NRC at 63-65; LBP-08-3, 67 NRC at 94-96. Additionally, the Board found that the motions to strike were really mislabeled reply pleadings regarding the scope of the contentions that the applicant and the staff should have sought leave to file. The Board indicated, however, that it would consider whether the information provided by the parties was within the scope of EC 1.2 and EC 1.3 as part of its consideration of the SNC dispositive motions. See LBP-08-2, 67 NRC at 66-67; LBP-08-3, 67 NRC at 96-98.

2.7 With regard to contention EC 1.2, the Board was called upon to assess whether a genuine issue as to any material fact still existed on the subjects of (1) the adequacy of the aquatic baseline discussion in the vicinity of the Vogtle facility; (2) impingement and entrainment impacts; (3) thermal impacts; and (4) chemical impacts. Although the Board had rejected EC 1.1, which asserted that the baseline aquatic population for the area around the Vogtle facility had not been adequately assessed because of a lack of site-specific field studies or data, it also noted that the scope of the baseline for a particular project is a functional concept and

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could, in the context of the purported deficiencies in the environmental impact analysis associated with contention EC 1.2, be litigated in the proceeding relative to the portion of the Savannah River that encompasses both the existing and proposed Vogtle facilities. See LBP-08-2, 67 NRC at 68-69. In connection with the summary disposition request, applicant SNC and the staff both asserted that the DEIS provided information on aquatic species that was sufficient to address any concern that the SNC ER discussion of the baseline aquatic environment was inadequate. See id. at 69-70. The Board concluded that Joint Intervenors, via the affidavit of Dr. Shawn Young, had established that there was still a dispute as to genuine issues of material fact regarding the adequacy of the baseline information relating to cooling system impacts. See id. at 71-73.

2.8 SNC and the staff also claimed that the DEIS analysis of impingement/entrainment was adequate to address concerns about the potential impacts, including minimum expected river water flow conditions, while Joint Intervenors declared this was inadequate as evidenced by the staff's use of a uniform drift distribution assumption in evaluating fish eggs and larval fish, the checking of screening baskets only several times a year, and the failure to include water withdrawals by current and projected future upstream sites relative to the flow of the river. See id. at 73-75. The Board found that material factual disputes still existed relative to larval fish mobility, screen basket cleanings, and the appropriate minimum river level flow figures. See id. at 76-77. The Board also found, however, that it would not consider further the issue raised by Joint Intervenors regarding the impacts of cumulative withdrawals other than those relating to the existing and proposed Vogtle facilities. See id. at 78.

2.9 Regarding thermal impacts, SNC and the staff claimed that the DEIS analysis was adequate to the degree it made conservative assumptions about river flow conditions and

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provided a cumulative impact analysis that combined the existing and proposed thermal plumes. See id. at 79-80. Joint Intervenors disagreed, citing concerns about minimal river flow numbers, higher facility maximum withdrawals, and use of the uniform drift distribution assumption. See id. at 80. The Board found that genuine factual disputes regarding water flow rates and the use of the uniform drift distribution assumption existed such that summary disposition was inappropriate. See id. With regard to chemical impacts, however, Joint Intervenors having conceded that the DEIS discussion of the impact of chemicals on aquatic life was adequate, the Board granted the SNC motion and dismissed this aspect of the contention as moot. See id. at 81-82.

2.10 Concerning contention EC 1.3, in denying SNC's summary disposition motion, the Board found that a number of disputed material factual issues remained, including

the type of turbines that can be used; the adequacy of current dry cooling system design for use in facilities like the proposed Vogtle plants; the impact of the climate in the vicinity of the VEGP on the efficacy of wet and dry system cooling; and the potential financial, environmental, and/or performance impacts upon facility design, construction, and/or operation of using a dry rather than a wet cooling system.

LBP-08-3, 67 NRC at 101. Additionally, the Board rejected as outside the scope of contention EC 1.3 Joint Intervenors claims regarding a wet-dry hybrid cooling system alternative, which the Board found they first raised in response to the summary disposition motion. See id. at 102-03.

2.11 Subsequently, in August 2008, the staff issued its FEIS. Although the Board's July 2008 revised general schedule provided for submission of another summary disposition motion regarding any admitted contentions following issuance of the FEIS, see Licensing Board Memorandum and Order (Revised General Schedule) (July 14, 2008) app. A, at 3 n.2 (unpublished) [hereinafter July 14, 2008 Scheduling Order], none of the parties chose to file such a motion.

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B. Contention EC 6.0

2.12 Pursuant to the Board's July 2008 revised general schedule that also permitted new contentions to be filed after issuance of the staff's FEIS, see July 14, 2008 Scheduling Order app. A, at 2, on September 23, 2008, Joint Intervenors filed a motion to admit a new contention,³ see Joint Intervenors' Motion to Admit New Contention (Sept. 23, 2008). The new contention, EC 6.0, read as follows:

The discussion of potential impacts associated with dredging and use of the Savannah River Federal navigation channel is inadequate and fails to comply with NEPA because it relies on the Army Corps of Engineers (the "Corps") to analyze these impacts in the future. As a result, the staff's conclusion that impacts would be moderate runs counter to the evidence in the hearing record. Additionally, the FEIS wholly fails to address impacts of navigation on the Corps' upstream reservoir operations, an important aspect of the problem.

See Licensing Board Memorandum and Order (Ruling on Motion to Admit New Contention) (Oct. 24, 2008) at 3 (unpublished). Additionally, the motion contained eight items of foundational support for the contention:

1. The FEIS contains substantially different data and conclusions from the SNC ER or the staff's DEIS.
2. Using the federal navigation channel to barge components to the VEGP site is necessary for construction of Units 3 and 4.
3. Environmental impacts stemming from the use of the federal navigation channel are direct impacts of the proposed construction of Units 3 and 4 that must be addressed in the FEIS.
4. The staff's conclusion, as set forth in the "Cumulative Impacts" chapter of the FEIS, that the large-scale dredging from Savannah Harbor to the VEGP site could have moderate impacts is inadequately supported.

³ The deadline provided in the July 2008 revised general schedule was actually September 22, but due to technical difficulties later excused by the Board, Joint Intervenors did not successfully file their motion until September 23. See Licensing Board Memorandum and Order (Ruling on Motion to Admit New Contention) (Oct. 24, 2008) at 4, 8-9 (unpublished).

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5. Dredging the federal navigation channel has potentially significant impacts on the environment.
6. The staff abdicated its duty independently to assess potential impacts of dredging in the FEIS.
7. Navigation requires release of significant amounts of water from upstream reservoirs, which is not addressed in the FEIS.
8. The NRC staff failed to consult with the United States Army Corps of Engineers (USACE), as required by NEPA.

See id. at 3-4.

2.13 In an October 24, 2008 memorandum and order, the Board admitted contention EC 6.0 as supported by foundational support items 4, 5, and 7. See id. at 16-17. The contention as admitted states:

EC 6.0 - FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)
FAILS TO PROVIDE ADEQUATE DISCUSSION OF IMPACTS
ASSOCIATED WITH DREDGING THE SAVANNAH RIVER
FEDERAL NAVIGATION CHANNEL

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 20.

C. Evidentiary Hearing on Contentions EC 1.2, EC 1.3, and EC 6.0

2.14 Thereafter, in preparation for the 10 C.F.R. Part 2, Subpart L informal evidentiary hearing on these three environmental contentions, Joint Intervenors, SNC, and the staff filed initial position statements and prefiled direct testimony on January 9, 2009. In response to Joint Intervenors prefiled direct testimony, SNC and the staff filed motions in limine seeking to strike parts of the prefiled testimony of certain witnesses and associated exhibits. See Licensing

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Board Memorandum and Order (Ruling on In Limine Motions) (Jan. 26, 2009) (unpublished).

The Board granted the in limine motions in part and struck portions of Joint Intervenors prefiled direct testimony and exhibits as being outside the scope of the contentions as admitted. See id. at 2-7.

2.15 On February 6, 2009, the parties filed their response statements and prefiled rebuttal testimony regarding the three contentions. On February 11, 2009, SNC and the staff filed in limine motions seeking to exclude portions of Joint Intervenors prefiled rebuttal testimony and associated exhibits. See Licensing Board Memorandum and Order (Ruling on In Limine Motions) (Feb. 23, 2009) (unpublished). The Board ruled on this second round of in limine motions in a February 23, 2009 memorandum and order, striking certain portions of Joint Intervenors rebuttal testimony and exhibits, but declining to strike portions of the EC 1.3 testimony concerning North Anna Unit 3 (a proposed wet-dry hybrid nuclear unit cooling system) to the extent it was used to support Joint Intervenors claim that dry cooling is feasible, as well as declining to strike portions of the EC 6.0 testimony concerning dredge spoil disposal. See id. at 3-6. In accordance with the Board's rulings on the motions in limine, Board administrative directives for the hearing, and on the parties' own initiative, the parties submitted revised testimony and both revised and new exhibits. See, e.g., NRC Staff Resubmission of Prefiled Direct Testimony and Corrected Exhibit NRC000009 (Feb. 2, 2009); Joint Intervenors' Re-revised Initial Position Statement, Pre-filed Direct Testimony, Exhibits and Exhibit List (Feb. 13, 2009); Notice of Revised Testimony and Exhibit (Mar. 6, 2009); [SNC] Submission of Revised Testimony and Exhibits (Mar. 11, 2009). The final versions of the parties' pre-filed testimony were bound into the transcript as if read. See, e.g., Tr. at 577, 610-11.

2.16 Finally, in accordance with a March 6, 2009 memorandum and order in which the Board instructed the parties to file any remaining corrections to prefiled testimony and exhibits

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no later than March 11, 2009, see Licensing Board Memorandum and Order (Additional Matters Related to Contested and Mandatory Hearings) (Mar. 6, 2009) at 1-2 (unpublished), on March 11, 2009, SNC filed revised versions of the testimony of two of its witnesses as well as a number of exhibits. See [SNC]'s Submission of Revised Testimony and Exhibits (Mar. 11, 2009). However, additional revisions to testimony and exhibits were made shortly before and during the evidentiary hearing. See Tr. at 633.

2.17 Pursuant to the general schedule set forth in a November 13, 2008 memorandum and order, see Licensing Board Memorandum and Order (Revised General Schedule) (Nov. 13, 2008) (unpublished), on March 16-19, 2009, the Board held evidentiary hearings in Augusta, Georgia, on contentions EC 1.2, EC 1.3, and EC 6.0. See Tr. at 506-1660. Subsequent to the hearing, in a March 30, 2009 memorandum and order, the Board granted an unopposed motion by SNC to admit a new exhibit, SNC000098, that had been identified for the record at the evidentiary hearing but had not been entered into evidence. See Licensing Board Memorandum and Order (Post-Hearing Administrative Items) (Mar. 30, 2009) at 1 (unpublished). Additionally, in an April 8, 2009 memorandum and order adopting certain corrections to the March 2009 hearing transcripts, the Board closed the evidentiary record for the contested portion of this proceeding as of that date. See Licensing Board Memorandum and Order (Transcript Corrections; Closing the Record of Contested Proceeding) (Apr. 8, 2009) at 1-2 (unpublished).

2.18 Pursuant to 10 C.F.R. § 2.1209 and the general schedule set forth in Appendix A to the Board's November 13 order, on April 24, 2009, Joint Intervenors, SNC, and the staff filed with the Board their proposed findings of fact and conclusions of law regarding those environmental contentions. See Joint Intervenor's Proposed Findings of Fact and Conclusions of Law (Apr. 24, 2009) [hereinafter Joint Intervenor Proposed Findings]; [SNC] Proposed

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Findings of Fact and Conclusions of Law Regarding Environmental Contentions (Apr. 24, 2009) [hereinafter SNC Proposed Findings]; NRC Staff's Proposed Findings of Fact and Conclusions of Law Concerning Contested Environmental Matters (Apr. 24, 2009) [hereinafter Staff Proposed Findings]. Each party similarly filed reply findings of fact and conclusions of law on May 8, 2009. See Joint Intervenors' Reply to NRC Staff's and [SNC] Proposed Findings of Fact and Conclusions of Law Concerning Contested Matters (May 8, 2009) [hereinafter Joint Intervenors Reply Findings]; [SNC] Reply Findings of Fact and Conclusions of Law Regarding Environmental Contentions (May 8, 2009) [hereinafter SNC Reply Findings]; NRC Staff's Reply Findings of Fact and Conclusions of Law Concerning Contested Environmental Matters (May 8, 2009) [hereinafter Staff Reply Findings].

III. APPLICABLE LEGAL STANDARDS

3.1 The contentions at issue here -- EC 1.2, EC 1.3, and EC 6.0 -- arise under the National Environmental Policy Act of 1969 and the NRC regulations implementing the agency's responsibilities pursuant to the Act. See 42 U.S.C. § 4321 et seq.; 10 C.F.R. Part 51. Together, this statute and the corresponding agency regulations govern the applicant's and the staff's roles in considering the environmental effects of a proposed ESP licensing action under 10 C.F.R. Part 52, Subpart A. Additionally, the Council on Environmental Quality (CEQ) has implemented regulations that provide guidance on agency compliance with NEPA, see 40 C.F.R. Part 1500, that, while not binding on the NRC when the agency has not expressly adopted them, are entitled to considerable deference. See Limerick Ecology Action, Inc. v. NRC, 869 F.2d 719, 725, 743 (3d Cir. 1989).

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A. NEPA Requirements

3.2 NEPA requires federal agencies to take a “hard look” at the environmental impacts of a proposed action, as well as reasonable alternatives to that action. See Louisiana Energy Servs., L.P. (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 87-88 (1998). This “hard look” is, however, subject to a “rule of reason” in that consideration of environmental impacts need not address every impact that could possibly result, but rather only those that are reasonably foreseeable or have some likelihood of occurring. See, e.g., Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1), ALAB-156, 6 AEC 831, 836 (1973). Agencies are given broad discretion in determining how thoroughly to analyze a particular subject, see Claiborne, CLI-98-3, 47 NRC at 103, and may decline to examine issues the agency in good faith considers “remote and speculative” or “inconsequentially small,” Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), ALAB-919, 30 NRC 29, 44 (1989) (citing Limerick Ecology Action, 869 F.2d at 739). To that end, when reviewing a license application filed by a private applicant, as opposed to a federally-sponsored project, an agency may give substantial weight to the stated preferences of the applicant with regard to issues such as site selection and facility design. See Claiborne, CLI-98-3, 47 NRC at 104; Hydro Resources, Inc. (P.O. Box 15910, Rio Rancho, NM 87174), CLI-01-4, 53 NRC 31, 55 (2001).

3.3 Additionally, CEQ regulations state that an EIS must address both direct and indirect effects of an action. See 40 C.F.R. §§ 1502.16, 1508.8. Direct effects are those caused by the federal action, and occurring at the same time and place as that action, while indirect effects are those caused by the action at a later time or more distant place, yet are still reasonably foreseeable. See id. § 1508.8. But if effects are remote or speculative, the EIS need not discuss them. See Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 551 (1978).

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3.4 Finally, in the context of an NRC adjudicatory proceeding, even if an EIS prepared by the staff is found to be inadequate in certain respects, the Board's findings, as well as the adjudicatory record, "become, in effect, part of the FEIS." Hydro Resources, CLI-01-4, 53 NRC at 53. Thus, the Board's ultimate NEPA judgments can be made on the basis of the entire adjudicatory record in addition to the staff's FEIS. See Louisiana Energy Servs., L.P., LBP-05-13, 61 NRC 385, 404 (2005), aff'd, CLI-06-22, 64 NRC 37 (2006), petition for review denied sub nom., Nuclear Infor. & Res. Serv. v. NRC, 509 F.3d 562 (D.C. Cir. 2007).

B. 10 C.F.R. Part 51 Requirements

3.5 Under the NRC's Part 51 regulations, an applicant for an early site permit must submit with its application an ER. See 10 C.F.R. § 51.50(b). The ER must "contain a description of the proposed action, a statement of its purposes, [and] a description of the environment affected," id. at § 51.45(b), and it must discuss:

- (1) The impact[s] of the proposed action on the environment . . . in proportion to their significance;
- (2) Any adverse environmental effects which cannot be avoided should the proposal be implemented;
- (3) Alternatives to the proposed action . . . ;
- (4) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and
- (5) Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Id. § 51.45(b)(1)-(5).

3.6 Relative to item 3 above, NEPA requires an agency to provide a detailed statement of reasonable alternatives to a proposed action. 42 U.S.C. § 4332(2)(C)(iii); see also Claiborne, CLI-98-3, 47 NRC at 104. The alternatives discussion, however, need not include "every possible alternative, but every reasonable alternative." Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1), CLI-91-2, 33 NRC 61, 71 (1999). Reasonable

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alternatives do not include alternatives that are “impractical[;] . . . that present unique problems; or that cause extraordinary costs.” Private Fuel Storage, LLC (Independent Spent Fuel Storage Installation), LBP-03-30, 58 NRC 454, 479 (2003) (citing Airport Neighbors Alliance v. United States, 90 F.3d 426, 432 (10th Cir. 1996), Communities, Inc. v. Busey, 956 F.2d 619, 627 (6th Cir. 1992)). Alternatives that need not be considered include those that are technologically unproven, see Kelley v. Selin, 42 F.3d 1501, 1521 (6th Cir.) (upholding NRC decision not to consider additional alternative spent fuel storage technologies that were “neither sufficiently demonstrated nor practicable for use” for the application in question), cert. denied, 515 U.S. 1159 (1995); NRDC v. Morton, 458 F.2d 827, 837 (D.C. Cir. 1972) (approving exclusion from alternatives discussion of alternative energy sources that “will be dependent on [future] environmental safeguards and [technological] developments”); Busey, 956 F.2d at 627 (upholding rejection of alternatives that “presented severe engineering requirements” or were “imprudent for reasons including their high cost, safety hazards, [and] operational difficulties”).

3.7 The agency’s NEPA regulations also require that the NRC staff prepare an environmental impact statement in connection with the issuance of an ESP. See 10 C.F.R. § 51.20(b)(1). The staff must first prepare a DEIS, see id. § 51.70, which addresses, among other topics, “the matters specified in [section] 51.45.” Id. § 51.71(a). Though the DEIS may rely in part on the ER, the regulations require the staff to “independently evaluate and be responsible for the reliability of all information used in the [DEIS].” Id. § 51.70(b). The DEIS is then distributed for public comment and, based on the comments received, a review of information provided by the applicant, and supplemental independent information and analysis, the staff prepares and issues an FEIS. See id. §§ 51.73, 51.91.

3.8 When the staff makes its conclusions in the DEIS and FEIS regarding the environmental impacts of a proposed action or alternative actions, the staff uses as guidance a

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standard scheme to categorize or quantify the impacts. See, e.g., 10 C.F.R. Part 51, app. B, Table B-1 n.3. This standard was created using the approach outlined in section 1508.27 of the CEQ regulations, which requires agencies to consider both the context and intensity of impacts. See 40 C.F.R. § 1508.27. The NRC has established three levels of impacts -- SMALL, MODERATE, and LARGE -- that are defined as follows:

SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE - Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE - Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

See Exh. NRC00001A, at 1-4 ([NRO, NRC], NUREG-1872, [FEIS for an [ESP] at the Vogtle Electric Generating Plant Site (Aug. 2008) (Sections 1.0-4.0)) [hereinafter FEIS 1A]; see also Exh. NRC000010, at 4.7-1 (Office of Nuclear Regulatory Research, NRC, NUREG-1555, Environmental Standard Review Plan (2007)) (stating with regard to cumulative impacts that "[t]he information should include a characterization of cumulative impacts using NRC's SMALL, MODERATE, LARGE terminology (see the Introduction)") [hereinafter 2007 ESRP].

3.9 In addition, although the staff is generally required independently to evaluate and substantiate all information contained in the DEIS, an agency may rely on an EIS prepared by another federal agency if such reliance will aid in the presentation of issues, eliminate repetition, or reduce the length of an EIS. See 10 C.F.R. Part 51, app. A, § 1(b). This principle may extend to conclusions by other agencies set forth in other contexts in which they have analyzed an issue extensively. See New England Coalition on Nuclear Pollution v. NRC, 582 F.2d 87, 98 (1st Cir. 1978) (NRC can accept as conclusive Environmental Protection Agency (EPA) adjudicatory findings concerning thermal discharge aquatic impacts). Thus, the staff is able to

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adopt the underlying scientific data and inferences from the other agency's analysis without independent review, so long as it exercises independent judgment with respect to conclusions about the environmental impacts of the current proposed agency action. See id.; Philadelphia Elec. Co. (Limerick Generating Station, Units 1 and 2), LBP-82-43A, 15 NRC 1423, 1467-68 (1982).

3.10 Finally, in the context of licensing board adjudication of NEPA-related contentions, intervenors are required to file contentions in the first instance based on the applicant's ER. See 10 C.F.R. § 2.309(f)(2). Where, however, as is the case here, the staff has prepared a DEIS or FEIS by the time the contentions come before a licensing board on the merits, such contentions are appropriately treated as challenges to the EIS. See Claiborne, CLI-98-3, 47 NRC at 84 (approving Board decision to treat intervenor contentions addressing ER as challenges to FEIS).

C. Burden of Proof in NEPA Context

3.11 Although, as the proponent of the agency action at issue, an applicant generally has the burden of proof in a licensing proceeding, see 10 C.F.R. § 2.325, when NEPA contentions are involved, the burden shifts to the staff, because the NRC, not an applicant, has the burden of complying with NEPA. See, e.g., Duke Power Co. (Catawba Nuclear Station, Units 1 and 2), CLI-83-19, 17 NRC 1041, 1049 (1983). Nonetheless, because "the Staff, as a practical matter, relies heavily upon the Applicant's ER in preparing the EIS, should the Applicant become 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." Louisiana Energy Servs., L.P. (Claiborne Enrichment Center), LBP-96-25, 44 NRC 331, 339 (1996) (citing Pub. Serv. Co. of New Hampshire (Seabrook Station, Units 1 and 2), ALAB-471, 7 NRC 477, 489 n.8 (1978)), rev'd on other grounds, CLI-97-15, 46 NRC 294 (1997).

IV. FACTUAL FINDINGS AND LEGAL CONCLUSIONS

A. Contention EC 1.2

1. Witnesses and Evidence Presented

4.1 SNC, the staff, and Joint Intervenors each presented witnesses in connection with EC 1.2 during the March 2009 evidentiary hearing in support of their respective positions on the adequacy of the FEIS discussion and analysis of the direct, indirect, and cumulative impingement/entrainment and thermal effluent discharge impacts of the proposed Vogtle Units 3 and 4 cooling system intake and discharge structures on aquatic resources. Each of these witnesses presented written direct and rebuttal testimony, with supporting exhibits, and gave oral testimony at the evidentiary hearing. See Tr. at 582-947; see also [SNC] Testimony of Anthony Dodd and Matt Montz Concerning EC 1.2 (fol. Tr. at 587) [hereinafter Dodd/Montz EC 1.2 Direct Testimony]; [SNC] Rebuttal Testimony of Tony Dodd and Matt Montz Concerning EC 1.2 (fol. Tr. at 589) [hereinafter Dodd/Montz EC 1.2 Rebuttal Testimony]; [SNC] Testimony of Dr. Charles Coutant Concerning EC 1.2 (fol. Tr. at 604) [hereinafter Coutant EC 1.2 Direct Testimony]; [SNC] Rebuttal Testimony of Dr. Charles C. Coutant on [EC] 1.2 (fol. Tr. at 605) [hereinafter Coutant EC 1.2 Rebuttal Testimony]; [SNC] Testimony of Thomas Moorer Concerning EC 1.2 (fol. Tr. at 610) [hereinafter Moorer EC 1.2 Direct Testimony]; [SNC] Rebuttal Testimony of Tom Moorer Concerning EC 1.2 (fol. Tr. at 612) [hereinafter Moorer EC 1.2 Rebuttal Testimony]; NRC Staff Testimony of Dr. Michael T. Masnik, Anne R. Kuntzleman, Rebekah H. Krieg, Dr. Christopher B. Cook, and Lance W. Vail Concerning Environmental Contention EC 1.2 (fol. Tr. at 743) [hereinafter Staff EC 1.2 Direct Testimony]; NRC Staff Rebuttal Testimony of Dr. Michael T. Masnik, Anne R. Kuntzleman, Rebekah H. Krieg, Dr. Christopher B. Cook, and Lance W. Vail Concerning Environmental Contention EC 1.2 (fol. Tr.

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at 744) [hereinafter Staff EC 1.2 Rebuttal Testimony]; Re-revised Pre-filed Direct Testimony of Shawn P. Young in Support of EC 1.2 (fol. Tr. at 814) [hereinafter Young EC 1.2 Direct Testimony]; Revised Prefiled Rebuttal Testimony of Dr. Shawn Young Concerning Contention EC 1.2 (fol. Tr. at 815) [hereinafter Young EC 1.2 Rebuttal Testimony]; Revised Prefiled Direct Testimony of Barry W. Sulkin in Support of EC 1.2 (fol. Tr. at 816) [hereinafter Sulkin EC 1.2 Direct Testimony]; Revised Prefiled Rebuttal Testimony of Barry W. Sulkin Concerning Contention EC 1.2 (fol. Tr. at 817) [hereinafter Sulkin EC 1.2 Rebuttal Testimony].

a. SNC

4.2 For its part, SNC presented four witnesses regarding EC 1.2: (1) Anthony R. Dodd, Georgia Power Company Environmental Specialist; (2) Matthew T. Montz, SNC Environmental Specialist, (3) Dr. Charles C. Coutant, a private consultant to SNC on aquatic ecology and fisheries biology matters; and (4) Thomas C. Moorner, SNC Project Manager-Environmental. See Tr. at 583-738.

4.3 Mr. Dodd received a Bachelor of Science degree in Marine Biology from Troy University and has over twenty-five years of experience in the environmental field, specializing in aquatic biology. Prior to joining Georgia Power Company, he worked for seven years as a Senior Biologist for Geosyntec Consultants, Inc., during which he conducted and supervised fisheries-related investigations in freshwater and estuarine environments throughout various parts of the southeastern United States. Mr. Dodd is a licensed state and federal permit holder for the collection of protected freshwater fish species, and has experience in fish collection methodologies, including hydroacoustics sampling, species identification, and quality control

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and quality assurance measures. See Dodd/Montz EC 1.2 Direct Testimony at 2; Exh. SNC000002 (Anthony R. Dodd Curriculum Vitae (CV)).⁴

4.4 Mr. Montz earned a Bachelor of Science degree in Biology and a Master of Science degree in Environmental Management from Samford University. He has over twelve years of experience in the field of environmental biology. Prior to joining SNC, Mr. Montz worked for seven years as an environmental specialist for Southern Company Services, Earth Science and Environmental Engineering, managing aquatic environmental monitoring programs and working in the areas of water chemistry, benthic macro invertebrate studies, and effluent toxicity testing. He also has conducted assessments of water quality conditions of southern estuaries and rivers to determine the impacts associated with the withdrawal and discharge of cooling water at seven electric generating facilities in Mississippi and Florida, and has participated in field collection of air, water, and soil samples, as well as the evaluation of those samples for possible environmental impacts. See Dodd/Montz EC 1.2 Direct Testimony at 3; Exh. SNC000003 (Matthew T. Montz CV).

4.5 Dr. Coutant obtained undergraduate and Master's degrees in biology, as well as a Ph.D. in biology (with a focus on ecology), from Lehigh University. He is a retired Distinguished Research Staff Member of the Oak Ridge National Laboratory, where his

⁴ As entered into the record and reflected in the agency's ADAMS-associated electronic hearing docket, the official exhibit number for each evidentiary item reflects a three-alpha character identifier (i.e, SNC, NRC, JTI), followed by six alpha and/or numeric characters to reflect its number and whether it was revised subsequent to its original submission as a prefiled exhibit (e.g., admitted exhibit SNCR00005 is a revised version of prefiled exhibit SNC000005); followed by a two-character alpha or numeric identifier that will be used in this case to distinguish between an exhibit utilized in the contested portion of this proceeding (i.e., 00) as opposed to the mandatory/uncontested portion of the proceed (i.e. MA); followed by the designation BD01, which indicates that this Licensing Board (i.e., BD01) was involved in its identification and/or admission. Accordingly, the official designation for this exhibit is SNC000002-00-BD01. For the sake of simplicity, however, we will refer to all exhibits admitted in the contested portion of this proceeding by their initial nine character designation only.

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activities included conducting research on thermal effects and entrainment and impingement effects on aquatic life, preparing NEPA EISs for nuclear power plants, and serving on task forces to develop biological criteria for environmentally benign siting, design, and operation of power station cooling-water facilities. Dr. Coutant currently serves as a private consultant in the areas of aquatic ecology and fisheries biology. See Coutant EC 1.2 Direct Testimony at 1-4; Exh. SNC000012 (Dr. Charles C. Coutant CV).

4.6 Mr. Moorer has a Bachelor of Science degree in Environmental Science from Auburn University and a Bachelor of Science degree in Civil/Environmental Engineering from the University of Alabama. He has over thirty years experience in utility environmental management, including over eighteen years in the nuclear area and fifteen years experience regarding NEPA matters. As Project Manager-Environmental for SNC, Mr. Moorer was responsible for developing the ER and all supporting activities for SNC's ESP application for Vogtle Units 3 and 4. See Moorer EC 1.2 Direct Testimony at 1-2; Exh. SNC000014 (Thomas C. Moorer CV).

b. NRC Staff

4.7 The NRC staff presented five witnesses in support of its position regarding EC 1.2: (1) Dr. Michael T. Masnik, Senior Aquatic Biologist in the NRC's Division of Site and Environmental Reviews/NRC Office of New Reactors (DSER/NRO/NRC); (2) Anne R. Kuntzleman, DSER/NRO/NRC Aquatic Biologist; (3) Rebekah H. Krieg, Senior Research Scientist, Ecology Group, Environmental Sustainability Division/Energy and Environment Directorate of the Pacific Northwest National Laboratory ((ESD/EED/PNNL); (4) Dr. Christopher B. Cook, Senior Hydrologist, DSER/NRO/NRC; and (5) Lance W. Vail, Senior Research Engineer in the Hydrology Group, ESD/EED/PNNL. See Tr. at 738-810.

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4.8 Dr. Masnik has a Bachelor of Science degree in Conservation from Cornell University and a Master of Science degree and Ph.D. in Zoology from Virginia Polytechnic Institute and State University. He has over thirty years of experience with NRC and its predecessor, the Atomic Energy Commission, in the environmental aspects of nuclear power plant operation and decommissioning, including participating in NEPA reviews for the construction and operation of new reactors. His specialty early in his agency tenure was in evaluating the impacts of cooling water system designs and intake structures on fish and shellfish. As a NRO Senior Aquatic Biologist, Dr. Masnik was the lead technical reviewer for the NRC on aquatic resource issues associated with the Vogtle ESP application. See Staff EC 1.2 Direct Testimony at 1 & unnumbered attach. 3 (Michael T. Masnik Statement of Professional Qualifications (SPQ)).

4.9 Ms. Kuntzleman received a Bachelor of Science degree in Biology from Pennsylvania State University, a Master of Science degree in Education from Temple University, and a Master of Science in Biology from the University of Michigan. Her professional experience includes more than ten years as an aquatic ecologist for environmental consulting firms, and more than eighteen years as a senior biologist with the Department of the Navy, Engineering Field Activity Northeast (EFANE). She was an NRC technical reviewer for the aquatic and terrestrial resources issues associated with the SNC ESP application for Vogtle Units 3 and 4 and provided technical oversight to the PNNL reviewers during the preparation of FEIS sections 2.7.2 (Aquatic Ecology), 4.4 (Ecological Impacts from Construction), 5.4 (Ecological Impacts from Operation), and 7.5 (Cumulative Impacts - Aquatic Ecosystem). See Staff EC 1.2 Direct Testimony at 1, 3 & unnumbered attach. 1 (Anne R. Kuntzleman SPQ).

4.10 Ms. Krieg has a Bachelor of Science degree in Biology from Washington State University and a Master of Science in Fisheries and Oceanographic Sciences from the

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University of Washington. At PNNL, she has been involved in technical reviews of the environmental aspects of new nuclear plant applications and license renewals. Ms. Krieg, who was a technical reviewer for PNNL's contract with NRC on aquatic resource issues associated with the Vogtle ESP application, prepared the descriptive information contained in FEIS section 2.7.2 and performed the review of the impact to aquatic organisms due to interactions with the proposed station intake and discharge structures as presented in FEIS sections 4.4.2 (Aquatic Impacts), 5.4, and 7.5. See Staff EC 1.2 Direct Testimony at 2-3 & unnumbered attach. 4 (Rebekah H. Krieg Resume).

4.11 Dr. Cook has a Bachelor of Science in Civil Engineering from Colorado State University and a Master of Science and Ph.D. in Civil and Environmental Engineering from the University of California at Davis. His experience over the past two years at NRC and for seven years at PNNL includes conducting hydrologic safety and environmental reviews for new plant applications. As a Senior Research Engineer at PNNL, Dr. Cook was the lead technical reviewer for PNNL's contract with the NRC on hydrological alterations, water use, and water quality issues associated with the DEIS for the Vogtle ESP application. Likewise, while at NRC he has been a technical reviewer on these same issues relative to the Vogtle ESP. See Staff EC 1.2 Direct Testimony at 2-3 & unnumbered attach. 5 (Dr. Christopher B. Cook SPQ).

4.12 Mr. Vail obtained a Bachelor of Science in Environmental Resources Engineering from Humboldt State University and a Master of Science in Civil Engineering from Montana State University. He has done research in a number of areas related to water resources and is currently involved in water-related safety and environmental reviews for nuclear power plant ESPs. As a Senior Research Engineer at PNNL, Mr. Vail was a technical reviewer for PNNL's contract with NRC on hydrological alterations, water use, and water quality issues associated

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with the Vogtle ESP application. See Staff EC 1.2 Direct Testimony at 2, 4 & unnumbered attach. 2 (Lance W. Vail SPQ).

c. Joint Intervenors

4.13 Finally, in connection with EC 1.2, Joint Intervenors provided the testimony of two witnesses: (1) Dr. Shawn P. Young, Research Faculty of Fisheries Biology at the University of Idaho, Moscow, Idaho, and a member of the Adjunct Faculty at Clemson University; and (2) Barry W. Sulkin, a private consultant to Joint Intervenors on water-related environmental matters. See Tr. at 810-947.

4.14 Dr. Young has a Bachelor of Science in Environmental Studies from Northland College and a Master of Science in Aquaculture, Fisheries, and Wildlife Biology and a Ph.D. in Fisheries and Wildlife Biology from Clemson University. He has eleven years of research experience in the effects of human activities on fisheries and aquatic ecosystems, including six years of experience studying fisheries in the Savannah River Basin. See Young EC 1.2 Direct Testimony at 1-2; Exh. JTI000042 (Shawn P. Young CV).

4.15 Mr. Sulkin has a Bachelor of Arts in Environmental Science from the University of Virginia and a Master of Science in Environmental Engineering from Vanderbilt University. He has more than thirty years experience in water quality monitoring and permit compliance, first serving with the Tennessee Department of Environment and Conservation and then, for the last eighteen years, as a private consultant on water quality issues, regulatory assistance, National Pollutant Discharge Elimination System (NPDES) permits, stream surveys, and environmental investigations. See Sulkin EC 1.2 Direct Testimony at 1-3; Exh. JTI000043 (Barry W. Sulkin CV).

4.16 Based on the foregoing, and the respective background and experience of the proffered witnesses, the Board finds that each of these witnesses is qualified to testify as an

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expert witness relative to the subject of the adequacy of the FEIS discussion and analysis of the direct, indirect, and cumulative impingement/entrainment/thermal discharge impacts of the proposed Vogtle Units 3 and 4 cooling system intake and discharge structures on aquatic resources.

2. Wet Cooling System for Vogtle Units 3 and 4

4.17 The focus of this contention (as well as EC 1.3) is on the aquatic impacts associated with the cooling water system for proposed Vogtle Units 3 and 4. In that regard, to dissipate the waste heat that is a byproduct of normal nuclear power plant operation, each of the proposed Vogtle units would need to dispel up to 7.55×10^9 Btu/hr (british thermal units per hour) of waste heat. To do so, these units (as is the case with existing Vogtle Units 1 and 2) would employ a closed-cycle wet cooling water system to transfer heat from the main condenser, the turbine building closed-cycle cooling water heat exchangers, and the condenser vacuum pump seal water heat exchangers by utilizing one natural draft cooling tower per unit. In contrast to the mechanical draft cooling towers used for the service water system, in which fans are used to facilitate heat transfer, in a natural draft cooling tower, excess heat in the cooling water is transferred to the atmosphere by evaporative and conductive cooling. The cooled water is collected at the bottom of the cooling tower and returned to the condenser. After passing through the condenser, the heated water is pumped back to the cooling tower to begin another cycle. See Exh. NRC00001A, at 3-5 to -7 ([NRO, NRC], NUREG-1872, [FEIS for an [ESP] at the Vogtle Electric Generating Plant Site (Aug. 2008) (Sections 1.0-4.0)] [hereinafter FEIS 1A].⁵

⁵ In accord with 10 C.F.R. § 2.337(g)(2)(iv), the staff introduced its FEIS into evidence in its entirety as exhibits NRC00001A through NRC00001E. See Prefiled Direct Testimony of Mark D. Notich Sponsoring NUREG-1872 into Hearing Record (fol. Tr. at 577).

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4.18 Notwithstanding the “closed-cycle” nature of this arrangement, some water is lost from the system through evaporation, and a much lesser amount is lost by a process called drift. Drift is the result of small droplets of water being carried from the tower by the convecting air. Moreover, to limit the increased concentration of dissolved solids in the cooling water system caused by the heat dissipation evaporation process, a portion of the water in the otherwise closed system would be continuously discharged from the system as “blowdown.” This blowdown, after being retained for a brief period in a sump to allow dechlorination, would be discharged back into the Savannah River through an outlet common to both new units. As a consequence, “makeup” water would be pumped from the Savannah River into the cooling water system for Vogtle Units 3 and 4 by means of a common intake structure to replace the water lost via evaporation, blowdown, and drift.⁶ See id. at 3-6 to -7.

4.19 It is the extent of the impact upon Savannah River aquatic resources, via entrainment/impingement when makeup water is withdrawn from the river to replace this lost water, along with the potential impact of the thermal discharge associated with returning system blowdown to the river, that are at the heart of this contention (as well as EC 1.3).

⁶ According to the FEIS, assuming two operating reactor units utilizing revision 15 to the AP1000 certified design, for normal operation the make-up water rate flow would be 2348.47 liters per second (L/s) (37,224 gallons per minute (gpm)), the consumptive water use rate (evaporation and drift) would be 1761.73 L/s (27,924 gpm), and the blowdown rate would be 586.74 L/s (9300 gpm). See FEIS 1A, at 3-6 to -7. The FEIS also noted that the bounding or maximum make-up water flow rate would be 3645.60 L/s (57,784 gpm), the maximum consumptive water use rate would be 1823.56 L/s (28,904 gpm), and the maximum blowdown rate would be 1822.04 L/s (28,880 gpm), and that these figures would change somewhat under pending revision 16 to the AP1000 certified design, for which the staff provided an impacts analysis in FEIS sections 5.3.3.1 and 7.3.1.1. See id. at 3-7; see also supra section IV.A.4.b.

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3. FEIS Discussion Relative to Contention EC 1.2

4.20 The discussion in the Vogtle FEIS that is relevant to the aquatic impact matters that are the focus of EC 1.2 is found in section 2.7.2.1 (Aquatic Ecology/Communities of the VEGP Site), which discusses the communities on and near the VEGP site and includes the species composition of molluscs and fish in the Savannah River. Noting that the VEGP site is at river mile (RM) 150.9, the FEIS also includes a short description of the habitat types in the middle reach of the Savannah River (defined as occurring from the Fall Line at RM 220 downstream to the mouth of Brier Creek (RM 97)). The FEIS discusses the results of studies related to diatoms, aquatic insects, molluscs, and fish, including threatened and endangered species. See FEIS 1A, at 2-18, 2-74 to -93.

4.21 In FEIS section 5.4.2.2 (Aquatic Impacts/Savannah River), the staff evaluated the impacts to aquatic resources from impingement and entrainment from the proposed Vogtle Units 3 and 4 operations and determined that (1) impingement caused by operation of the proposed Units 3 and 4 would have a minor impact on fish populations inhabiting the Savannah River; and (2) the impacts to the fish populations of the Savannah River from entrainment due to the operation of the proposed Units 3 and 4 would be minor. See Exh. NRC00001B, at 5-29 to -33 ([NRO, NRC], NUREG-1872, [FEIS for an [ESP] at the Vogtle Electric Generating Plant Site (Aug. 2008) (Sections 5.0-11.0)) [hereinafter FEIS 1B]; Staff EC 1.2 Direct Testimony at 37. Also, in FEIS section 7.5.2 (Aquatic Ecosystems/Operations) the staff evaluated the cumulative impacts to aquatic resources from impingement and entrainment from existing Vogtle Units 1 and 2 in combination with Units 3 and 4. The staff concluded that the cumulative impacts from entrainment would be minor, and that the cumulative losses from impingement are unlikely to impact Savannah River fish populations adversely. See FEIS 1B, at 7-21 to -25.

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4.22 Finally, the staff evaluated the thermal impacts to aquatic resources from the operation of proposed Vogtle Units 3 and 4, as well as the cumulative impacts of Units 1 and 2 in combination with Units 3 and 4, in FEIS sections 5.4.2.3 (Aquatic Thermal Impacts), 5.4.2.9 (Summary of Aquatic Impacts), and 7.5.2 (Operations). The staff concluded that the thermal impacts would be minor and the cumulative thermal impacts would not negatively impact aquatic organisms. See id. at 5-33 to -34, 5-38 to -39, 7-23.

4. Overarching Legal/Technical Issues Relating to Contention EC 1.2

4.23 Although the adequacy of the FEIS analyses of the impingement/entrainment/thermal discharge impacts arising from proposed Vogtle Units 3 and 4 are the central controversy before the Board in connection with EC 1.2, as framed by Joint Intervenors and litigated by the parties, additional issues came to the forefront that became part and parcel of Joint Intervenors challenge under this issue statement. As we discuss in more detail below, these included (1) how the aquatic environment in the Vogtle environs should be characterized in terms of the fish and other creatures that inhabit the Savannah River; (2) what river flows should be used in assessing the impingement/entrainment/thermal discharge impacts at issue; and (3) the degree to which there is what Joint Intervenors have labeled a "lower baseline" for certain of the aquatic creatures in the VEGP environs such that they should be accorded "special creature status."

a. Characterization of the Aquatic Environment

4.24 As was noted above, see supra p. 4, in ruling on Joint Intervenors contention EC 1.1, the Board rejected their assertion that they had framed a litigable contention by challenging the SNC ER on the basis of the applicant's failure to include

a site-specific description of the Plant Vogtle aquatic environs that is based on recent field studies or a quantitative analysis of the circumstances regarding aquatic species assemblage, migration by anadromous (i.e., moving from the sea to rivers to breed) and

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diadromous (i.e., migrating between salt and freshwater) species, or habitat utilization within the proposed intake and discharge sites and/or the project area,

finding that they had failed to demonstrate with any references to any relevant agency rule, regulatory guide, or standard licensing review plan, “that suggest site specific studies are generally required.” LBP-07-3, 65 NRC at 255-57. At the same time, in admitting contention EC 1.2, the Board indicated that “its merits may involve the question of the adequacy of the baseline information provided by SNC relative to the portion of the Savannah River that encompasses the project area associated with the intake/discharge structures for both the existing and proposed Vogtle facilities.” Id. at 259. In the context of this contention, relative to the subsequent staff issuance of its FEIS, Joint Intervenors have continued to press their concern about the adequacy of the environmental analysis information base utilized to make the impingement/entrainment/thermal discharge impact determinations found in that staff environmental impacts report, both generally and more specifically with respect to what Joint Intervenors now label “Special Status Species.” See Joint Intervenor Proposed Findings at 10-11; Joint Intervenors Reply Findings at 3-4.

i. NRC Regulations and Regulatory Guidance

4.25 Section 51.70 of Title 10 of the Code of Federal Regulations indicates that in analyzing alternatives and impacts, an agency NEPA statement “will identify any methodologies used and sources relied upon, and will be supported by evidence that the necessary environmental analyses have been made.” Relative to the question of the information needed to fulfill this requirement, the guidance provided in chapter 2, section 2.2 of Regulatory Guide 4.2 identifies the information needed by the staff in the preparation of its assessment of the potential environmental effects of the proposed nuclear facility, stating that “the applicant should describe the flora and fauna in the vicinity of the site, their habitats, and their distribution.

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This initial inventory will reveal certain organisms which, because of their importance to the community, should be given special attention.” Exh. NRC000007 at 2-3 (NRC, NUREG-0099, Regulatory Guide 4.2, Preparation of Environmental Reports for Nuclear Power Stations (rev. 2 1976)).

4.26 Guidance in this regard also is provided in section 2.4.2 of NUREG-1555, the staff’s ESRP, that “directs the staff’s description of the aquatic environment and biota at and in the vicinity of the site and other areas likely to be impacted by the construction, maintenance, or operation of the proposed project.” Exh. NRCR00009, at 2.4.2-1 (Office of Nuclear Reactor Regulation, NRC, NUREG-1555, Environmental Standard Review Plan (1999)) [hereinafter 1999 ESRP]. According to the ESRP, the scope of the staff’s review

should include the spatial and temporal distribution, abundance, and other structural and functional attributes of biotic assemblages on which the proposed action could have an impact. The review should also identify any “important” . . . or irreplaceable aquatic natural resources and the location of sanctuaries and preserves that might be impacted by the proposed actions.

Id. The ESRP also explains that “[t]he depth and extent of the input to the EIS should be governed by the kinds of aquatic ecological resources that could be affected by plant construction or operation and by the nature and magnitude of the expected impacts to these resources.” Id. at 2.4.2-6. Furthermore, the ESRP states that:

[t]he input should be brief and should contain the following information:

- [T]he principal aquatic ecological features of the site and vicinity . . . with emphasis on the communities of the ecosystem that will be potentially affected by project construction, operation, or maintenance. This information should be based on an analysis of at least one full year of data to reflect seasonal variations in aquatic populations. Thus, the extent of discussion of various biotic components should be in proportion to the estimated severity of impacts and should be adequate to support the assessment of ESRP Chapters 4.0 [(Environmental

Impacts of Construction)] and 5.0 [(Environmental Impacts of Station Operation)].

- [D]escriptions of environmental or man-induced stresses to aquatic biota at the existing site and vicinity.

* * * * *

- [A] discussion of “important” aquatic species that may be affected by plant or transmission corridor construction or operation. Estimates of their abundance should be provided where appropriate. Special habitat and forage needs should be emphasized, if the proposed project would potentially disrupt these.
- [A] summary of consultations with appropriate Federal, State, regional, local, and affected Native American tribal agencies, including the U.S. Fish and Wildlife Service (through the regional director), and the director of the State fish and wildlife agency.

Id. at 2.4.2-6 to -7; see also 2007 ESRP, at 5.3.1.2-1 (in assessing potential plant intake system impacts on aquatic ecosystems, per ESRP section 2.4.2, obtain description of aquatic ecology in vicinity of the site, especially resources potentially affected by cooling-water intake system). Additionally, the staff defines “important” species as species that are (1) “rare” species that are federally listed or proposed/candidates to be listed as threatened or endangered; (2) state listed as threatened, endangered, or of concern; (3) commercially or recreationally valuable or essential to the maintenance and survival of species that are rare and commercially or recreationally valuable; (4) critical to the structure and function of the aquatic ecosystem;⁷ or (5) biological indicators of the aquatic environment. See 1999 ESRP at 2.4.2-7 (Table 2.4.2-1).

⁷ Although Table 2.4.2-1 refers to the “terrestrial” ecosystem and environment (apparently having been copied from section 2.4.1, Terrestrial Ecology), in the context of the aquatic ecology section in which it is located (i.e., section 2.4.2), it clearly seems intended to encompass the aquatic ecosystem and environment.

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ii. Documents Staff Used to Characterize Environment

4.27 Previously, in ruling on the admissibility of EC 1.1, we indicated that in the context of the agency's existing regulatory framework "the appropriate scope of the baseline 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." LBP-07-3, 65 NRC at 257. This approach is wholly consistent with the staff guidance set forth above, which indicates that the FEIS discussion should be proportional to the estimated severity of impacts and be adequate to support the impact assessments needed. As a consequence, we cannot endorse Joint Intervenors continuing assertion that an extensive assessment of the aquatic community in the vicinity of the facility, including additional detailed field studies, designed specifically to evaluate the impacts of the new intake and discharge structures is the only way to provide the necessary NEPA evaluation data, see Joint Intervenors Reply Findings at 2-3, at least in the absence of a showing that the information upon which the staff did rely was deficient in some material way.

4.28 Relative to the information that was used by the staff, the staff testified that it relied upon a range of sources of information to characterize the Savannah River in the vicinity of the site, which it asserts was both adequate and appropriately comprehensive to enable the staff's evaluation of environmental impacts. These included five major information sources or source groupings, as well as specific reports that addressed individual species.

4.29 The staff relied on the 2005 publication "Fishes of the Middle Savannah River Basin," authored by Barton C. Marcy, Jr., and four others, as the basis for a general description of the environment, and specifically to identify the fish species that are present in the stretch of the Savannah River adjacent to the site as given in FEIS section 2.7.2.1. Although not prepared as an impact assessment study, this volume does contain habitat characterizations, family descriptions, species accounts, habitat and species photographs, and a taxonomic identification

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key, based on data obtained from an area from RM 97 to RM 221, for which the VEGP site, located at RM 150 to RM 152, is roughly in the midpoint. Also, the authors of this book based their records of distribution in the Middle Savannah River Basin (MSRB) and species life history information on more than 120 years of data collection from the MSRB and fifty years from the Department of Energy's Savannah River Site (SRS), which is just across the river from the VEGP site. See Staff EC 1.2 Direct Testimony at 14-15; see also NRC Exh. NRC000006 (excerpts from Barton C. Marcy, Jr., et al., Fishes of the Middle Savannah River Basin (2005)) [hereinafter Marcy Savannah River Fishes].

4.30 Also utilized by the Staff as a source of information for the FEIS to describe the aquatic species composition and habitat in the Savannah River was a series of reports that were developed by the Academy of Natural Sciences in Philadelphia (ANSP). The three reports referred to in the FEIS, which were published in 2001, 2003, and 2005, were based on ANSP efforts going back to 1951 to conduct biological and water quality studies in the Savannah River between RM 122 and RM 160 for the purpose of assessing potential effects of SRS contaminants and warm-water discharges on the aquatic communities in the river. Components of the ANSP study included basic water chemistry, diatoms, other attached algae, aquatic macrophytes (mosses and rooted aquatic plants), protozoa, aquatic insects, non-insect macroinvertebrates, and fish. Until 1997, the ANSP conducted two types of surveys, quadrennial comprehensive surveys, which included all the components mentioned above, and annual cursory surveys, which included a reduced component set, typically attached algae, insects and fish, and were carried out annually with four sampling periods per year. During years with comprehensive surveys, the comprehensive surveys substituted for two of the usual cursory sampling periods. Moreover, as part of the ANSP studies, sampling stations were added at RM 151.2 and 149.8 in 1985 to assess and distinguish the potential impacts of the

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VEGP site. Cursory-type surveys occurred at the VEGP site until 1997. From 1997-2000, the ANSP conducted an annual survey in the early fall at four sampling stations. For this period, aspects of the VEGP site surveys were combined into a single, comprehensive study that included fish species. Sampling at one of the original Vogtle stations continued through 2001, although those particular samples were archived and not analyzed. See Staff EC 1.2 Direct Testimony at 15-16; Exh. NRC000003, at ii, 199 (The Academy of Natural Sciences, Report No. 03-08F, 2001 Savannah River Biological Surveys for Westinghouse Savannah River Company (Aug. 2003)) [hereinafter 2001 ANSP Study].

4.31 According to the staff, it used the ANSP studies, which demonstrate that the Savannah River has been studied extensively upstream and downstream of the VEGP site and at different seasons throughout the year, to provide an understanding of the river ecology and the current species of fish and molluscs present in the vicinity of the VEGP site. And in that regard, the staff noted in FEIS section 2.7.2.1 that the ANSP 2001 study data indicated that (1) species richness for fish was significantly higher at the sampling location farthest downstream (Station 6, which would be in the direction of the VEGP) than at the farthest sampling location upstream of the SRS (Station 1); and (2) neither species diversity, nor densities of common species of fish, differed significantly between stations. See id. at 16-17; see also FEIS 1A, at 2-81; 2001 ANSP Study at i, ii, v, x, xi, 2-3, 12-16, 199-200. In this regard, the ANSP characterized its sampling program as being “one of the most comprehensive ecological datasets available for any of the world’s rivers.” 2001 ANSP Study at v.

4.32 A third source of information for staff EIS preparation was two overlapping studies conducted by the SRS describing the ichthyoplankton distribution, which were discussed in FEIS section 2.7.2.1. See Vogtle FEIS 1A, at 2-81; see also Exh. NRC000011, at V-241 to -335 & V-454 to -536 (5 W.L. Specht, Comprehensive Cooling Water Study (Oct.

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1987)); Exh. NRC000012, at xii to xvii & 3-1 to 5-9 (Michael H. Paller, et al., Distribution and Abundance of Ichthyoplankton in the Mid-Reaches of the Savannah River and Selected Tributaries (Mar. 1986)) [hereinafter Paller Ichthyoplankton Distribution]. Although twenty or more years old, these studies, which involved a stretch of the river along the southwestern edge of the SRS directly across the river from the VEGP site, were included in the FEIS because they occurred at the same location and showed similar species distributions. See Staff EC 1.2 Direct Testimony at 17.

4.33 A fourth source of information used by the staff became available only after the DEIS was published, when the staff received notice from the United States Fish and Wildlife Service (USFWS) that a study had been performed for USFWS based on data collected in a late 2006 survey of freshwater mussels in the Savannah River between RM 22.8 and RM 203. See Exh. NRC000005, at 2 (The Catena Group, Freshwater Mussel Surveys, The Savannah River from Augusta to Savannah: South Carolina & Georgia (2007)) [hereinafter Catena Group Mussel Surveys]. As the most recent study of the freshwater mussels in the river that has been conducted, the staff used this study to update information in FEIS section 2.7.2.1, including the number of important species identified during the survey and their locations. See Staff EC 1.2 Direct Testimony at 18; Vogtle FEIS 1A, at 2-76, 2-87, & 2-88.

4.34 A fifth set of information was used to provide general background or used in the development of descriptions of specific species and their life histories. This set included the 1985 final environmental statement (FES) for the operating license for Vogtle Units 1 and 2 and a variety of comprehensive studies on specific topics, which were used for developing Vogtle Units 3 and 4 FEIS descriptions of aquatic species and their life history. See Vogtle FEIS 1A, at 2-88, 2-89; see also Exh. NRC000013 (David H. Bennett and Robert W. McFarlane, The Fishes of the Savannah River Plant: National Environmental Research Park (Aug. 1983));

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Exh. NRC000014 (Office of Nuclear Reactor Regulation, [NRC], Final Environmental Statement Related to the Operation of [VEGP], Units 1 and 2 (Mar. 1985));⁸ Exh. NRC000015 (3 A. S. Hendricks, The Conservation and Restoration of the Robust Redhorse, *Moxostoma robustum* (May 2002)); Exh. NRC000016 (Mike Nichols, Conservation Strategy for Robust Redhorse (*Moxostoma robustum*) (2003)) [hereinafter Robust Redhorse Conservation Strategy]; Exh. NRC000017 (Timothy B. Grabowski & J. Jeffery Isely, Seasonal and Diel Movements and Habitat Use of Robust Redhorses in the Lower Savannah River, Georgia and South Carolina (2006)). According to the staff, these sources and studies were among the most recent, reliable, and authoritative studies of which the staff was aware. See Staff EC 1.2 Direct Testimony at 18.

iii. Adequacy of Staff Information Used in Characterizing the Aquatic Environment Generally

4.35 In accord with its own guidance on fulfilling its EIS-preparation responsibilities, the staff must have information sufficient to allow it to describe accurately the principal aquatic ecological features of the VEGP site and its environs, as well as the ecosystem communities that potentially will be affected by construction, operation, or maintenance of the proposed Vogtle facilities, with detail that is both proportional to the estimated severity of the impacts and adequate to support the required impacts assessment. It also must have sufficient information to permit it to identify and discuss "important" aquatic species that may be affected by the project. Joint Intervenors challenges to the adequacy of the information used by the staff in establishing the baseline for such an assessment of impingement/entrainment/thermal impacts in this instance mirror these two categories. One concern relates to the sufficiency of the information available to the staff to assess generally the Savannah River aquatic environment

⁸ See infra note 53 and accompanying text regarding the admission of this exhibit.

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as it is relevant to the staff's impacts determination. The other involves the sufficiency of that information in connection with what the staff refers to as "important" species, and what Joint Intervenors now call "special status species." We look first to their claim regarding the general sufficiency of the information.

4.36 Of particular concern to Joint Intervenors are the Marcy, et al., and ANSP studies referenced above. Acknowledging that these studies "are not irrelevant," Joint Intervenors Reply Findings at 2, Joint Intervenors nonetheless find them wanting. With respect to the Marcy, et al., study, Joint Intervenors focus on the staff's recognition that this study was "not developed to provide an impact assessment." Joint Intervenors Reply Findings at 3 n.4 (quoting Staff EC 1.2 Direct Testimony at 15); see Young EC 1.2 Rebuttal Testimony at 7. The ANSP studies, on the other hand, are questioned because they employed sampling techniques over several days in the fall of each year, thereby purportedly "miss[ing] a dominant portion of the fish-population moving through the vicinity and then also their early life history" to the degree that larval and juvenile fish are most likely to be detected in the spring and early summer following spawning season. Joint Intervenors Reply Findings at 3 (quoting Tr. at 877 (Young)).

4.37 We, however, are unable to agree with the claim that these studies, and the staff's reliance upon them, are lacking as a basis for an adequate NEPA assessment. Relative to the ANSP studies, as the staff pointed out, they were used to furnish an overall understanding of the Savannah River ecology and the current fish and mollusc species present in the general vicinity of the VEGP site,⁹ as well as an overall indication of the past SRS and

⁹ Citing the "highly variable" habitat conditions on the river, Dr. Young also expresses concern about the ANSP studies relative to the river locations that were the subject of the sampling effort, i.e., at a distance some ten miles from the VEGP site, and the fact that the most recent ANSP study is from 2001. Young EC 1.2 Rebuttal Testimony at 5-6; see also Young EC 1.2 Direct Testimony at 5. This, however, is simply a variation on Dr. Young's overarching concern that only a contemporary, long-term, site-specific study can be adequate for

(continued...)

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VEGP site impacts on the river, not as the source for life history, migration timing, or population numbers, which was garnered from other sources as the information was relevant to the “important species” the staff found merited extended EIS discussion.¹⁰ See Staff EC 1.2 Rebuttal Testimony at 11. Nor do we find disqualifying the fact that Marcy, et al., (or other studies utilized by the staff) were not prepared to support a NEPA assessment. Looking to the applicable provisions of the staff FEIS cited above, see supra section II.A.4.a.ii, we see nothing on its face, and Joint Intervenors have provided us with nothing specific, that indicates the staff’s reliance on this existing written information, in lieu of a site-specific study, has resulted in a factually inaccurate discussion of the Savannah River aquatic environment. To be sure, we have statements by Dr. Young on behalf of Joint Intervenors questioning, as a general matter, whether these materials have “the level of specificity needed for an impacts analysis.” Young EC 1.2 Rebuttal Testimony at 7. We also have statements from Dr. Coutant on behalf of SNC indicating that the information utilized by the staff contains “an abundance of information” that provides “an adequate basis in my opinion to estimate what is out there or what should be out there with which to do an analysis.” Tr. at 677-78.

4.38 We are not unsympathetic that, as an aquatic ecologist, Dr. Young would want the utmost site-specific information available to aid him when he is assessing the nature of a

⁹(...continued)
environmental impact assessment purposes.

¹⁰ So too, Dr. Young in the context of his concerns about the ANSP study, suggests that the FEIS discussion includes “only the most abundant and common species,” without sufficient attention to “the uncommon and rare,” Young EC 1.2 Rebuttal Testimony at 5-6, albeit without acknowledging that the staff’s “important” species approach to EIS analysis clearly is intended to encompass both. See FEIS 1A, at 2-81. Moreover, Dr. Young provides no insight into what those neglected species might be. Acknowledging that the FEIS provides information regarding the six “most imperiled and/or most important” Savannah River fisheries, he also suggests that the FEIS lacks a discussion of other “at risk” fish species, albeit without identifying what those might be. Young EC 1.2 Direct Testimony at 4.

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particular aquatic environment. See Tr. at 882. Nonetheless, the materials relied upon by the staff in this proceeding in defining the aquatic environment associated with the Savannah River in the vicinity of the VEGP site have been shown by a preponderance of the evidence not to be materially deficient to the extent that it would adversely impact the staff's impingement/entrainment/thermal impacts analysis. As a result, whatever might be the case in some other instance relative to the age and sufficiency/relevance of the baseline reference materials involved, we find no basis here for entering a ruling that NEPA required the preparation of a contemporaneous, site-specific aquatic impacts field survey as support for this ESP application.¹¹

iv. Adequacy of Staff Determinations Regarding Listing/Discussing "Important/Protected" Species

4.39 In addition to their concern about the adequacy of the information available to provide an overall assessment of the Savannah River aquatic environment, Joint Intervenors have articulated a similar concern relative to the "important" species that the staff must, consistent with its NEPA guidance, assess in the context of making an impacts determination

¹¹ This is not to say that the simple citation of existing studies and other information materials will, in all instances, establish the sufficiency of an ER or EIS in the face of a sufficiently supported challenge beyond one that merely asserts any discussion about the relevant aquatic environment has been omitted. Nor should this determination be considered as a basis for discounting the usefulness of contemporaneous aquatic studies such as were done by SNC in this instance, which can provide material aid to the staff in completing its NEPA responsibilities (and useful background for the public in reviewing the staff's efforts), particularly in the face of an information database that is less recent or incomplete.

We also think it is worth noting in this regard that, as this litigation illustrates, one of the results of the approach, however reasonable, under which "[t]he depth and extent of the input to the EIS should be governed by the kinds of aquatic ecological resources that could be affected by plant construction or operation and by the nature and magnitude of the expected impacts to these resources," 1999 ESPR at 2.4.2-6, is that saying less about SMALL impacts, in the face of a concerted challenge by a dedicated intervenor with qualified experts, may result in having to provide extensive supporting detail to defend both the input to, and the sufficiency of, the analysis.

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regarding impingement/entrainment/thermal discharge. In particular, Joint Intervenor question the adequacy of the information baseline relative to the robust redhorse and various mussel species.¹²

4.40 In connection with the robust redhorse, a Georgia state-listed endangered species, see FEIS 1A, at 2-88, a principal concern of Joint Intervenor is the lack of a larval or juvenile life history, with the exception of its reported swimming speed of 0.25 to 0.4 feet per second (fps). See Joint Intervenor Proposed Findings at 16. This may well reflect, as Dr. Masnik noted for the staff, that “the early life history of this species is not well-known,” Tr. at 778, but in any event hardly seems critical given the staff’s presumption that because they are incapable of overcoming an intake velocity of 1.0 fps, 100 percent of such early forms will be entrained if they transit the intake structure. See Staff EC 1.2 Rebuttal Testimony at 13.

¹² Albeit not raised in Joint Intervenor findings of fact, during the hearing Dr. Young suggested that there were several other deficiencies indicating that the FEIS informational baseline is inadequate. In particular, he cited the failure to refer to certain reference materials regarding the striped bass and the American shad, see Tr. at 944-46 (referencing Exh. JTI000015 (U.S. Fish and Wildlife Service, U.S. Department of the Interior ([FWS/DOI]) & Coastal Ecology Group, USACE, Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Mid-Atlantic) Striped Bass (Oct. 1983)); Exh. JTI000011 (FWS/DOI, Habitat Suitability Index Models and Instream Flow Suitability Curves: American Shad (June 1985)), which were designated in the FEIS as recreationally and commercially important species, respectively. In addition to the procedural problem, given the direction in 10 C.F.R. Part 2, Subpart L to file proposed findings, see 10 C.F.R. § 2.1209 (each party “shall” file written post-hearing proposed findings of fact and conclusions of law on the contentions addressed in an oral hearing), that this failure to raise the matter in their findings submissions (notwithstanding any discussion in their section 2.1207 initial or responsive written statements of position) seemingly waives these items as grounds for their EC 1.2 challenge to the FEIS, see Statement of Policy on Conduct of Licensing Proceedings, CLI-81-8, 13 NRC 452, 457 (1981), we find these matters without substance as well. In both instances, given the discussions in the FEIS regarding these species, see FEIS 1A, at 2-82 to -85, we do not perceive the failure to include these documents (which are of the same age as some of the FEIS reference materials criticized by Joint Intervenor as not being current) among the reference materials cited by the staff as having any substantive impact on the FEIS impacts analysis.

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4.41 Also evidencing a failure to provide sufficient baseline information, according to Joint Intervenors, was the FEIS discussion of mussels. While noting that no mussel survey was conducted in connection with the SNC application, Joint Intervenors do recognize that the FEIS included a discussion of Georgia state-listed mussels as identified in a 2007 survey by The Catena Group on behalf of the federal Fish and Wildlife Service. They also assert, however, that the failure of the FEIS to identify the host fish species to which larval mussels attach is a deficiency that both establishes the need for further baseline information and is fatal to any finding that the impingement/entrainment/thermal impacts will be SMALL given there is no specific finding of the impacts that would be visited on those host fish and, concomitantly, upon the mussel larvae that they host. See Joint Intervenors Findings of Fact at 18-20. At first blush, this point seems to have some merit, particularly given that some mussel host fish apparently have yet to be identified. See Catena Group Mussel Surveys, at 27 (several Savannah River Basin mussel species fish hosts still unknown; laboratory and field research needed as understanding life cycles critical component of species conservation). Ultimately, however, we find this argument unpersuasive in the context of this FEIS. The staff FEIS assessment was that the impingement/entrainment/thermal impacts on all affected fish species would be minor or SMALL. See FEIS 1B, at 5-29 to -34; Staff EC 1.2 Direct Testimony at 37, 46, 58; Staff EC 1.2 Rebuttal Testimony at 37 (using the terms minor and small). Assuming that assessment is true, which we discuss in more detail below, it is not apparent, at least in the absence of some specific showing that Joint Intervenors have not made in this instance, how impingement/entrainment/thermal impacts on host fish that will be small can have a significantly different impact upon that fish's ability to perform its usual biological functions, whether that is hosting a mussel larva or being a food chain predator or nutrition source. Consequently, we

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cannot find this purported host fish information deficiency to be one that compels either additional information gathering efforts or a revision to the staff's FEIS impact assessment.

b. Use of River Flows in Assessing Impingement/Entrainment/Thermal Impacts

4.42 Although not the subject of any of Joint Intervenors proposed legal/factual findings, see supra note 12, in the prefiled testimony of both Dr. Young and Mr. Sulkin, see Young EC 1.2 Direct Testimony at 9-10; Sulkin EC 1.2 Direct Testimony at 4-15; Sulkin Rebuttal Testimony at 1-7, they do take issue with what they describe as the failure of the staff in the FEIS to consider an appropriate range of Savannah River flows in evaluating the aquatic resource impacts from the Vogtle Units 3 and 4 intake and discharge structures. At issue are possible low flow conditions, which at very reduced levels persisting over a long period of time potentially could have adverse impacts with respect to impingement/entrainment losses and thermal pollution. See Staff EC 1.2 Direct Testimony at 66-67, 87-88. In questioning this staff assessment, Joint Intervenors challenged the two staff assessment benchmarks associated with river flow: river flow level/discharge, as measured in cubic feet per second (cfs), and reactor unit water use withdrawal as a percentage of the river flow/discharge.

4.43 Acknowledging that (1) the intake of cooling system makeup water during the operation of the proposed Units 3 and 4 will result in a reduction of the amount of water downstream from the VEGP site; and (2) the reduction would be proportionally greater in low flow circumstances, such as the drought of record that the Savannah River Basin has been experiencing since 2006, in the FEIS the staff assessed the impact of low-flow conditions. As the basis for this analysis, the staff chose to rely upon the level of releases from the J. Strom Thurmond Dam reservoir, located some seventy miles north of the VEPG site, as they are tied to the drought levels -- from 1, the least severe, to 4, the most severe -- at which that reservoir's pool is maintained consistent with the existing draft USACE Drought Contingency

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Plan under which, as the drought level increases, pool preservation requires a reduction in the dam discharge flow resulting in a lower flow downstream. See Staff EC 1.2 Direct Testimony at 61-62; FEIS 1B, at 5-7 to -8. Using these reservoir discharge flow rates, as well as figures computed to reflect the river water withdrawals that would occur during normal and maximum operation of proposed Vogtle Units 3 and 4 and normal operation of existing units 1 and 2, the staff then calculated the percentage of river flow that would be withdrawn (i.e., the amount taken out of the river as makeup water) and consumptively used (i.e., the amount withdrawn offset by what is returned to the river as blowdown) by the proposed new units both alone and in combination with existing Units 1 and 2. See FEIS 1B, at 5-7 to -9, 7-6 to -7. This percentage, in turn, was assessed in comparison to the figure of five percent of annual average flow used by EPA as a threshold under 40 C.F.R. § 125.84(b)(3)(i) for riverine system withdrawals. See Staff EC 1.2 Direct Testimony at 77.

4.44 In connection with the issue of river flow discharge, notwithstanding Dr. Young's protestations that flows lower than 3800 cfs were not considered, see Young EC 1.2 Direct Testimony at 11, the FEIS does consider flows of 3000 and 2000 cfs, as well as 8830, 4200, 4000, and 3800 cfs, the last of which is considered the Drought Level 3 condition under the existing draft USACE Drought Contingency Plan. See FEIS 1B, at 5-9 to -10, 7-4 to -7. Although at the lowest flow rate of 2000 cfs or less, withdrawals would exceed the EPA five percent withdrawal figure, in the FEIS the staff concluded that there will be a SMALL impact from normal operation of Units 3 and 4 alone, or in combination with Units 1 and 2, at all the aforementioned flow levels, finding with respect to the very low-flow scenarios

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of 3000 and 2000 cfs that they are likely to be so rare and temporary as to not destabilize the water supply.¹³ See FEIS at 5-10, 7-7.

4.45 In their prefiled and trial testimony, Joint Intervenors witnesses posit a series of concerns regarding this river flow information. Initially, Mr. Sulkin challenges the relevance of what he refers to as the staff's "surrogate method" of referencing the EPA five percent standard as part of its FEIS assessment, asserting the figure is a performance standard relative to what is technologically achievable that says nothing about the potential impacts of withdrawals less than five percent. Additionally, he questions the staff's figures used to represent withdrawals and consumptive use in relation to both existing Units 1 and 2 as well as proposed Units 3 and 4, asserting that they failed to account for higher withdrawal figures used in conjunction with the recent staff FEIS regarding the operating license renewal for Vogtle Units 1 and 2, as well as higher withdrawal and consumption figures for Units 3 and 4 based on the pending revision 16 to the design certification document (DCD) for the AP1000 certified design. Once properly calculated, he contends, they showed that the EPA five percent figure had been exceeded in several instances. Also in this regard, noting that recent weather has brought Drought Level 3 to pass, both Dr. Young and Mr. Sulkin assert there should be an impacts assessment of Drought Level 4, which Mr. Sulkin indicates, based on figures used in the Units 1 and 2 license renewal FEIS, would be at a flow level of 957 cfs. See Sulkin EC 1.2 Direct Testimony at 4-15; Sulkin EC 1.2 Rebuttal Testimony at 1-7; Young EC 1.2 Direct Testimony at 10-11; Tr. at 918-40; Exh. JTI000021 (Savannah River Discharge Tables) [hereinafter Joint Intervenors Discharge Tables].

¹³ Furthermore, the 3000 and 2000 cfs low-flow scenarios represent "snap-shots" of low flow periods, while the EPA five percent withdrawal figure is referenced to the average flow over the course of a year. See infra nn. 14-15 and accompanying text.

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4.46 The staff has posed various defenses to these claims. In connection with the use of the EPA five percent standard, noting that the figure was used in the context of a percentage of annual mean flow, the staff asserts that the record of the rulemaking associated with that figure indicates that, rather than providing a demarcation threshold for NEPA impact level changes, this percentage reflects an EPA judgment about one of a combination of requirements, including intake design and construction technologies intended to reduce impingement and entrainment, that will provide adequate protection to aquatic biota in a waterbody. In the case of the Vogtle Units 3 and 4 assessment, the staff declares, this five percent figure was not the controlling factor in its NEPA impacts assessment, but rather one among a number of factors, including design, location, and planned operation of the intake structure; the site location and uniqueness of the site vicinity habitat; site hydrology; applicable important species life history data; and past and recent field studies in the vicinity of the VEGP site. Moreover, in response to Mr. Sulkin's concerns about the accuracy of the figures provided in the FEIS, the staff provided revised figures they assert account for both the license renewal FEIS information and the DCD revision 16 data cited by Mr. Sulkin. See Staff EC 1.2 Rebuttal Testimony at 2-7, 31-36; Exh. NRC000052, at unnumbered page 1 (Tables Showing Cumulative Withdrawals of All Four Vogtle Units as Percentage of River Flow) [hereinafter Staff Revised Withdrawal Tables]. They also argue that Joint Intervenors concerns about withdrawal percentages exceeding the five percent threshold for the two existing and two proposed units at the VEGP site in combination relative to (1) the maximum, rather than normal operation, withdrawal rate for the four units; or (2) river flows below Drought Level 3 fail to recognize the infrequent, short-term nature of the former and the unrepresentative nature of the latter in terms of likely conditions. See Staff EC 1.2 Rebuttal Testimony at 31-36.

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4.47 While putting somewhat more stock in the non-EPA flow percentage elements of the staff's impact assessment, which are discussed in sections IV.A.5.c, IV.A.6.c, IV.A.7.b below, as a decisional basis for that NEPA determination, we nonetheless find nothing in the staff's river flow analysis that renders this an element fatal to the staff's impacts analysis. Certainly, if the five percent mark is utilized, as EPA seemed to contemplate, in conjunction with mean annual flow, which in the case of the VEGP site is in the neighborhood of either 6991 cfs, per a recently installed Waynesboro gauge located near the facility,¹⁴ see id. at 4, or the 8830 cfs figure from the FEIS, see FEIS at 5-8 to -9, 7-4 to -5, the normal cumulative withdrawals of all four plants under the staff's revised figures fall well below the five percent figure,¹⁵ see Staff Revised Withdrawal Tables at unnumbered page 1. Even when considered relative to the Thurmond Dam release figures utilized in the FEIS, which appear to be conservative relative to what likely is actually flowing past the VEGP site, see supra note 14, the cumulative withdrawals associated with normal operations, which we consider the appropriate

¹⁴ Although there was some dispute regarding the utility of the information from this gauge because it was not utilized by staff in its FEIS analysis given it had been in place only since January 2005, see Staff EC 1.2 Direct Testimony at 65; Sulkin EC 1.2 Rebuttal Testimony at 3, see also Exh. NRC000026 (Waynesboro-Thurmond Discharge Graph); Exh. NRC000041 (Table Comparing Thurmond Dam Discharge with Waynesboro, Georgia United States Geological Survey Gauge), we consider it persuasive evidence that the flows at the VEGP site generally are higher than those at Thurmond Dam, a likely consequence of inflow from tributaries and groundwater between the dam and the Waynesboro gauge location. See Tr. at 800-01.

¹⁵ At the hearing, Joint Intervenors witness Mr. Sulkin agreed that the EPA five percent guideline is indeed properly referenced to the annual average flow, and not to postulated lower flows such as 3100 cfs. See Tr. at 920-24. So while both the staff and Joint Intervenors calculated withdrawal percentages for a range of postulated flow rates, the record supports the conclusion that based on the annual average flow, even under recent drought conditions, the withdrawal fraction projected for Vogtle Units 3 and 4 would not exceed the EPA five percent guideline. See FEIS 1A, at 5-8 to -9.

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reference point for this purpose,¹⁶ exceed the five percent figure only below Drought Level 3. This, however, is low-flow territory that is likely to be entered very infrequently,¹⁷ and then only under the watchful eye of Georgia State environmental resources officials with authority, as exists currently relative to Units 1 and 2, to order water withdrawal rates (along with power production) to be significantly reduced or curtailed entirely to protect aquatic biota in appropriate circumstances, see Staff EC 1.2 Direct Testimony at 79; Tr. at 797; Exh. NRC00001C, at H-12 ([NRO, NRC], NUREG-1872, [FEIS for an [ESP] at the [VEGP] Plant Site (Aug. 2008) (Apps. A-J) (prior to operating authorization, SNC required to obtain revision of existing Georgia Department of Natural Resources (GDNR) permit authorizing Savannah River water withdrawal for cooling makeup and in-plant use) [hereinafter FEIS 1C]. Consequently, on the record before us, we are unable to conclude that any aspect of the staff's flow analysis provides a basis for overturning or substantially revising the staff's impact assessment findings.¹⁸

¹⁶ The possibility exists for "maximum" withdrawals by the existing and the proposed units, either singularly or in combination with any or all of the other units, so as to produce withdrawals in excess of what is generated by normal operation and so possibly exceed the five percent EPA threshold in pre-Drought Level 3 conditions. See Joint Intervenors Discharge Tables, at 2 (Table 4). Nonetheless, as was noted by the staff, because these maximum withdrawal events generally are associated with cooling tower water chemistry control activities rather than changes in consumptive water use, maximum withdrawals (as well as maximum blowdowns that return larger volumes of water to the river) are likely to be rare, one-unit events that would not provide the basis for an increase in the staff's impact assessment of SMALL. See Staff EC 1.2 Direct Testimony at 79.

¹⁷ Certainly this is the case relative to Drought Level 4, a scenario that Mr. Sulkin suggested needed to be assessed, as well as the absolute "worst case" scenario in which the water level in the reservoir pool is so low that USACE is unable to allow any Thurmond Dam discharge, see Tr. at 938-39.

¹⁸ On the matter of water flows, while not mentioned in Joint Intervenors proposed findings, see supra note 12, in his testimony Dr. Young also raised an issue about the degree to which the FEIS dealt adequately with the question of aquatic species pre-adaption to large variations in flows, given it did not distinguish between the impacts of natural and human-induced variability. In support of this proposition, Dr. Young cited several scientific articles he asserted establish that human-induced variability, combined with related

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c. "Lower Baseline" for "Special Status Species"

4.48 In their proposed factual findings and legal conclusions, Joint Intervenors also suggest that in the context of this contention it should be recognized that what they refer to as "special status species," i.e., species that are threatened, endangered, or of concern under state or federal law, "are considered 'rare' and therefore vulnerable to unacceptable impacts from construction and operation of nuclear power plants. In other words, special status species have a low baseline, whether caused by natural occurrences or human activities." Joint

¹⁸(...continued)

anthropogenic stressors such as entrainment mortality, is a primary cause of decreased freshwater biodiversity, and declared that the Thurmond Reservoir is one cause of the native species decline because it eliminates extremely low flows. See Young EC 1.2 Direct Testimony at 9; Young EC 1.2 Rebuttal Testimony at 7. Although it seems apparent that flow variability is an important factor in maintaining a healthy and diverse aquatic riverine ecology, see Staff EC 1.3 Rebuttal Testimony at 23-24, the articles cited by Dr. Young, which concern either the impacts of impoundments and other large-scale aquatic environment modifications, see Exh. JTI000016, at 912 (Caryn C. Vaughn & Christopher M. Taylor, Impoundments and the Decline of Freshwater Mussels: A Case Study of an Extinction Gradient, 13 Conservation Biology 912 (Aug. 1999)); Exh. JTI000018, at 183 (P.J. Cosgrove & L.C. Hastie, Conservation of Threatened Freshwater Pearl Mussel Populations: River Management, Mussel Translocation and Conflict Resolution, 99 Biological Conservation 183 (2001)); Exh. JTI000019, at 475 (James B. Layzer & Edwin M. Scott, Jr., Restoration and Colonization of Freshwater Mussels and Fish in a Southeastern United States Tailwater, 22 River Res. & Applications 475 (2006)), or a hypothetical aquatic species extinction rate based on general habitat deterioration, see Exh. JTI000017, at 1220 (Anthony Ricciardi & Joseph B. Rasmussen, Extinction Rates of North American Freshwater Fauna, 13 Conservation Biology 1220 (Oct. 1999)), provide no basis for concluding that these events, in combination with entrainment/impingement/thermal impacts such as those involved for Vogtle Units 3 and 4, create a situation in which species cannot adapt so as to constitute a primary cause of decreased Savannah River biodiversity. This is particularly so in light of the existing daily flow fluctuations in the VEGP facility vicinity, including recent drought-related low-flow conditions and periodic high-flow releases per a USACE-initiated river management program; the relatively minor impact the Vogtle 3 and 4 units will have on the overall river level; and a staff-cited study that concluded very large flow reductions, far in excess of those expected for the additional Vogtle facilities, need to occur in a river the size of the Savannah River before fish populations will be affected. See Staff EC 1.2 Rebuttal Testimony at 22-25 (citing Exh. NRC000054, at 13 (Brian D. Richter & Gregory A. Thomas, Restoring Environmental Flows by Modifying Dam Operations, 12 Ecology & Soc'y 12 (2007)); Exh. NRC000027, at 447 (Mary C. Freeman & Paula A. Marcinek, Fish Assemblage Responses to Water Withdrawals and Water Supply Reservoirs in Piedmont Streams, 38 Env'tl. Mgmt. 435 (2006)).

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Intervenors Proposed Findings at 11. Both SNC and the staff contest this approach, asserting that Joint Intervenors have not shown how the purported “rarity” or “low baseline” attributed to these species has any relevance vis a vis the adequacy of the staff’s impingement/entrainment/thermal impact assessments. See SNC Reply Findings at 4-6; Staff Reply Findings at 7.

4.49 We find that we cannot accept these “special status species” or “low baseline” characterizations either. Initially, we note that we are unaware of any case law that indicates the mere existence of an endangered/threatened species in the area of a proposed project necessarily mandates a finding that the species is, by reason of its protected status, automatically “vulnerable” to that project. To be sure, the presence of what the staff denotes as “important” creatures in the vicinity of a proposed project merits close scrutiny (1) to identify any potential interactions between the project and those species, as well as the potential impacts of those interactions relative to the species; and (2) if impacts can occur, to assess whether those impacts will be SMALL, MODERATE, or LARGE by reason of measures that can, or cannot, mitigate or eliminate those impacts. Clearly, this is not the same as a declaring such a species per se “vulnerable” to a proposed project.

4.50 It should be added that the process that occurred in this proceeding reflects this approach. We explore in the sections that follow below the details of how the staff carried out its analysis relative to the potential impacts of impingement/entrainment/thermal discharge on important species, but note here one example of the assessment process, as it was properly undertaken in this instance, that seems to belie, if not run directly counter to, the Joint Intervenors attempt necessarily to equate “rare” with “vulnerable.” Relative to one of the important species implicated here -- the shortnose sturgeon -- the staff, acting in accord with its NEPA/Endangered Species Act (ESA) consultation responsibilities, requested and obtained

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from the National Marine Fisheries Service (NMFS), as the designated authority for the shortnose sturgeon, see Testimony of Dr. Charles C. Coutant on Behalf of [SNC] Concerning [EC] 1.3 (fol. Tr. at 951) at 10 [hereinafter Coutant EC 1.3 Direct Testimony],¹⁹ that organization's assessment of the impact of the proposed action of issuing an ESP for Vogtle Units 3 and 4 upon that species.²⁰ That letter states "[t]here is no designated critical habitat in or near the project area" and "this proposed action is not likely to adversely affect shortnose sturgeon." Exh. SNC000022, at 3-4 (Letter to William Burton, NRC, from Roy E. Crabtree, Ph.D., Regional Administrator, NMFS (Aug. 11, 2008)) [hereinafter NMFS Consultation Letter]. Thus, while the status of a species as "important" because of its relative rarity wins it particular scrutiny in the context of an impacts assessment associated with a project, that does not mean that species vulnerability to that project must be assumed in assessing the NEPA implications of the project, regardless of the factual circumstances involved.²¹ See also Tr. at 1048-49 (Dr.

¹⁹ In citing this testimony relating to contention EC 1.3, we note, as is apparent from our discussion in section IV.B.5.a below, that the matter of the "special status species" at issue under contention EC 1.2 is not dissimilar from the matter of the "extremely sensitive biological resource" that is at issue relative to contention EC 1.3.

²⁰ Such an assessment was not sought for the robust redhorse, the other fish species whose previously assumed extinction makes it of interest here, because the redhorse is a state-designated species that has not been named as endangered under the federal ESA. See Countant EC 1.3 Direct Testimony at 10.

²¹ By the same token, although Dr. Young in his testimony maintains that the staff's FEIS is deficient because it has failed to document the causes of population decline in the Savannah River for at least six fish species that have resulted in this low baseline, see Young EC 1.2 Direct Testimony at 4, we are unable to find this concern to be meritorious. Putting aside his ostensible failure specifically to identify all the species, it is not apparent how the potential impingement/entrainment/thermal impacts of implementing a to-be-built closed-cycle cooling system would depend generally on the past cause or causes of the population decline of a particular species. Nor, given our conclusion for the reasons discussed in this section, that the preponderance of the evidence supports the staff's impacts assessment of SMALL, can we conclude that the facility would contribute a significant added source of mortality so as to make such an analysis potentially relevant. Moreover, as the staff pointed out, in the FEIS it provided information regarding the causes of decline for several important species, specifically eels

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Coutant testifies that operation of federal hydropower system and commercial fishing is permitted in areas occupied by endangered salmon).

4.51 With the foregoing general items in mind, we look next to the adequacy of the staff's NEPA assessment of the impacts of impingement/entrainment/thermal discharge in the context of Joint Intervenors challenges to the staff's findings, beginning with impingement.

5. Impingement Impacts

a. Impingement Defined

4.52 Relative to the sufficiency of the staff's impingement impacts analysis that is at issue under this contention, we note initially that, as was discussed in section IV.A.2 above, proposed Vogtle Units 3 and 4 would employ a closed-cycle wet cooling system to dissipate the waste heat that is a byproduct of normal power generation. Notwithstanding the "closed-cycle" nature of this system, some water is lost via evaporation, blowdown, and drift. To replace this water loss, makeup water would be pumped from the Savannah River into the cooling water system for Units 3 and 4 through an intake structure common to both units. See FEIS 1A, at 3-6, 3-8; Staff EC 1.2 Direct Testimony at 33. Traveling screens, typically of 3/8 inch mesh, would be located in the intake structure to prevent debris and large organisms from entering the intake pumps. See FEIS 1A, at 3-8 to 3-9; Staff EC 1.2 Direct Testimony at 32. "Impingement"

²¹(...continued)

(overfishing, seaweed harvesting, loss of adult habitat because of dams, dredging and wetland destruction, and migration past dams and water intakes), and striped bass (Savannah River harbor modifications), and noted recruitment problems with juvenile shortnose sturgeon associated with nursery habitat water quality degradation. See Staff EC 1.2 Rebuttal Testimony at 9-10. We also fail to see the relevance of this concern relative to the robust redhorse, given that the apparent reasons for that species survival challenges, including water quality degradation, overharvesting in the late 1800s, introduction of non-native species, sedimentation from poor land use practices, development of hydropower facilities, and the presumed low number of wild individuals as opposed to introduced individuals, see Robust Redhorse Conservation Strategy at 8-10, bear no relationship to the impacts of a closed-cycle cooling system.

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occurs when aquatic organisms, most typically fish, macroinvertebrates, shellfish, and aquatic macrophytes, collide with and are trapped against these cooling system intake screens by the force of the water drawn into the system. This ultimately can result in the starvation, exhaustion, asphyxiation, and descaling of an aquatic species. See FEIS 1B, at 5-29 to 5-30; Staff EC 1.2 Direct Testimony at 32.

b. RG/ESRP Guidance re Assessment of Impingement Impacts

4.53 Regulatory guidance associated with the staff's NEPA assessment of the potential impacts of any impingement that may be attendant to a license application for a proposed facility is found in ESRP Section 5.3.1.2, Aquatic Ecosystems. This ESRP provision states that the scope of the review should include an analysis of the effects of impingement in sufficient detail to allow the reviewer to predict potential impacts on "important species" and to evaluate the potential significance of such impacts. 1999 ESRP at 5.3.1.2-1. According to this guidance, this determination involves the evaluation both of station-related factors that influence impingement loss rates as well as life history data for the various species present that would provide information indicating their susceptibility to impingement. The reviewer is to determine, based on the cooling system being employed (e.g., closed-cycle or once-through), the system intake design, and the life history data if the effects of impingement on "important species" would be destabilizing or noticeably alter population levels. See id. at 5.3.1.2-5 to -7. The ESRP directs that the reviewer also draw on the experience of comparable, currently operating power stations to assist in the impact prediction. See id. at 5.3.1.2-6. The ESRP further states that "[i]n the most practical terms, the reviewer's final evaluation is determined through professional judgment based on the pertinent data and analyses." Id. at 5.3.1.2-5. If, according to the staff, "the reviewer determines that the effects of impingement would not be detectable or

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noticeably alter population levels, then the reviewer is to state that conclusion and the review is completed.” See Staff EC 1.2 Direct Testimony at 36.

c. Adequacy of Staff Impingement Assessment and Conclusions

4.54 According to the staff, its conclusion in section 5.4.2.9 of the FEIS that impacts due to impingement on the intake screens to fish and shellfish populations in the vicinity of the site would be minor was based on six factors: (1) the planned low through-screen intake velocity of less than 0.5 fps at the minimum river water level of seventy-eight feet; (2) the applicant’s use of closed-cycle cooling, which reduces river water withdrawal substantially; (3) a calculated intake canal flow velocity toward the intake screens of about 0.1 feet per second; (4) an evaluation of life history, distribution, and abundance data of aquatic species, including “important species” inhabiting the Middle Savannah River; (5) the past absence of significant impingement episodes at the existing intake of Vogtle Units 1 and 2 and information collected during NRC site visits; and (6) the results of the SRS impingement study. See id. at 35.

4.55 With one exception, Joint Intervenors have mounted no challenge to the staff’s FEIS impingement findings in their proposed legal and factual findings. The exception relates to statements in the 1998 NMFS recovery plan for the shortnose sturgeon that make mention of impingement events involving the sturgeon and power plants, including the Salem nuclear power plant in New Jersey. See Joint Intervenors Proposed Findings at 12-13 & nn.53-54 (citing Exh. JTI000026, at 53, 55 (NMFS, U.S. Dep’t of Commerce, Final Recovery Plan for the Shortnose Sturgeon *Acipenser brevirostrum* (Dec. 1998) [hereinafter NMFS Recovery Plan]); see also Young EC 1.2 Rebuttal Testimony at 8. While the NMFS plan cited by Joint Intervenors does reference impingement episodes involving the sturgeon, it says nothing about any shortnose sturgeon impingement situation at the Vogtle facility. Indeed, these Joint Intervenor-framed NMFS concerns about sturgeon impingement are entirely gainsayed by that

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agency's stated assessment that Vogtle Units 3 and 4 will have no significant impact relative to the shortnose sturgeon. See supra section IV.A.4.c. We thus are unable to find that the NMFS recovery plan provides any basis for revising the staff's impingement impact assessment finding.

4.56 In addition, Joint Intervenors witness Dr. Young raised questions, although not reiterated in their proposed findings, see supra note 12, regarding the adequacy of the baseline data and the range of river flows supporting the staff's assessment, see Young EC 1.2 Direct Testimony at 4, 9. We previously have addressed these items in sections IV.A.4.a, IV.A.4.b above, and find they provide no basis for modifying the staff's finding of minor impacts from impingement.

d. Role/Adequacy of SNC Impingement Study

i. Description of SNC Impingement Study

4.57 Separate from the staff's impingement impact assessment efforts, beginning in March 2008 SNC began a study of the impingement associated with the operation of its existing Vogtle Units 1 and 2, with the intent to infer an impingement rate for the similarly designed intake structure for proposed Units 3 and 4. See Exh. SNCR00004, at 3, 5 (Interim Report of Fish Impingement at the Plant Vogtle Electric Generating Plant (Jan. 2009)) [hereinafter SNC Impingement Study]. The impingement study, conducted at SNC's request and under its direction by Georgia Power Company, "was designed as a 12-month study encompassing twice per month sampling" of the material collected from the traveling screen screen-wash system for Vogtle Units 1 and 2. Id. at 3. The traveling screens, which continually rotate at a rate of approximately five feet per minute, collect debris that is then washed by water spray into the trash basket. The screen wash water is then returned to the intake structure. See id. at 7-8.

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4.58 Each sampling event consisted of a twenty-four-hour period divided equally into two twelve-hour samples: a day sample and a night sample. Prior to a sampling event, the screens were rotated for a full rotation cycle. Then an insert net was positioned in the system to catch material washed off the screens. After each of the traveling screens was rotated and washed over the course of the twelve-hour sample, the net was manually removed. See id. at 9-10.

4.59 Fish and shellfish were separated from other debris and then sorted by species. Samples either were preserved in formalin and transported to an offsite laboratory or were processed onsite. The weight and length of each organism was recorded during processing. From this data, the estimated impingement rate for a time period was calculated by multiplying the average impingement rate per day times the number of days within that time period (approximately two weeks). The study participants also collected data on the sampling events for quality control purposes in accordance with Georgia Power Environmental Laboratory procedures, as well as data on intake water flow rates, ambient water temperature, ambient air temperatures, river stage and discharge, and precipitation. See id. at 10-12.

4.60 Prior to the March 2009 evidentiary hearing in this proceeding, SNC submitted the interim report of its impingement study, which represented data from twenty out of twenty-four collection periods (i.e., a ten-month interval). See id. at 10, 13. The study was expected to be completed at the end of February 2009. See id. at 3. From March 2008 to December 2008, a total of 157 organisms representing twenty-one species had been collected, none of which were protected species. See id. at 13. The total impinged biomass collected in the sampling process was 865.2 grams (1.9 pounds). See id. at 14. SNC witness Mr. Dodd, who participated in the design, implementation, and analysis of the study, see Dodd/Montz EC 1.2 Direct Testimony at 5, used this information to extrapolate the ten-month data to a total

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365-day impingement rate of 2421 fish at an approximate weight of 30.1 pounds of biomass, see Tr. at 633. SNC thus concluded that “Plant Vogtle's Unit 1 & 2 ten-month impingement mortality effect on the fish population of the Savannah River is likely[] highly insignificant even when considering the addition of a second similar intake structure for Vogtle Units 3 & 4.”

Dodd/Montz EC 1.2 Direct Testimony at 8; see also SNC Impingement Study at 17.

ii. Adequacy of SNC Impingement Study

4.61 Joint Intervenors raised no specific concerns about the SNC impingement study in their proposed findings and conclusions, see supra note 12, but in his prefiled testimony, Dr. Young noted that the study did not include a full year's worth of data. See Young EC 1.2 Rebuttal at 8. While this point is certainly worthy of consideration given the staff's ESRP guidance, see 1999 ESRP at 2.4.2-6, as we review the matter in this particular instance, given the study by all appearances was well-planned and executed, we do not find that its ten-month duration at the time it was submitted for the record constitutes a material deficiency significant enough to lead us to discount it in its entirety.²² Certainly, nothing on the record contradicts the results of the Units 1 and 2 impingement study, which fully supports the staff finding that the aquatic environment impacts of impingement from Vogtle Units 3 and 4, both alone and in concert with Units 1 and 2, are likely to be minor.

²² Our determination in this regard should not be taken as downplaying or questioning the importance of the staff's ESRP guidance indicating that a study such as that conducted by SNC needs to include one year's worth of data to reflect seasonal variations in aquatic populations. An applicant that submits a study that does not meet this guidance does so at its peril, creating the real risk that it may expend considerable monetary and personnel resources without purpose.

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6. Entrainment Impacts

a. Entrainment Defined

4.62 Also at issue under this contention is the sufficiency of the staff's findings that entrainment of aquatic species via the common makeup water intake for proposed Vogtle Units 3 and 4 would have only minor impacts on the aquatic environment. "Entrainment" occurs when aquatic organisms are carried into the cooling system. In contrast to impinged aquatic organisms, aquatic organisms that become entrained are normally relatively small benthic (bottom organisms), planktonic (surface organisms), and nektonic (water column organisms) forms, including the early life stages of fish and shellfish that often serve as prey for larger organisms. Because of their small size, these organisms generally are not impeded by the intake screens that result in species impingement, but entrainment nonetheless is most often lethal due to the mechanical, thermal, and toxic stresses that the organisms are exposed to as they pass through the cooling system. See FEIS 1B, at 5-30; Staff EC 1.2 Direct Testimony at 33.

b. RG/ESRP Guidance re Assessment of Entrainment Impacts

4.63 In assessing entrainment impacts, in addition to the guidance described in section IV.A.5.b above relative to impingement, as it is pertinent here the ESRP indicates that the reviewer is to determine initially if the facility "is being located at a site close to an existing nuclear facility." 2007 ESRP at 5.3.1.2-6. If it is, then the ESRP specifies that the reviewer should "[d]etermine whether the applicant has a current [National Pollutant Discharge Elimination System (NPDES)] permit with a Clean Water Act Section 316(b) determination, if appropriate, or equivalent State permits and supporting documentation." Id. If no section 316(b) determination is available, the ESRP instructs the reviewer to "[i]dentify the 'important' aquatic organisms and their life stages susceptible to . . . entrainment." Id.

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at 5.3.1.2-6 to -7. Following the determination that “important” aquatic species are present and susceptible to entrainment, the reviewer is instructed to “[e]stimate the levels of susceptibility in either qualitative or quantitative terms, or both” and to “estimate the survival rates for those species entrapped, impinged or entrained by relying on experience at other stations.” Id. at 5.3.1.2-7. ESRP section 5.3.1.2 also instructs the reviewer to “[a]ssume 100% mortality for all entrained biota.” Id. at 5.3.1.2-8.

c. Adequacy of Staff Entrainment Assessment and Conclusions

4.64 Although the proposed Vogtle Units 3 and 4 are adjacent to the existing Units 1 and 2 that are closed-cycle cooling systems and have an NPDES permit, the existing units do not have a Clean Water Act section 316(b) determination. Because there was no specific entrainment data available from the adjacent VEGP Units 1 and 2 at the time of preparation of the FEIS and because those units did not have a section 316(b) determination, in accord with the ESRP guidance the Staff estimated the levels of susceptibility to entrainment of aquatic organisms that would be impacted. See Staff EC 1.2 Direct Testimony at 48; FEIS 1B, at 5-30 to -32. As was the case with its impingement analysis, having identified “important” species present that would be susceptible to entrainment, including the shortnose sturgeon and the robust redhorse by reason of their respective federal and state endangered species designations, the staff continued with its analysis under ESRP section 5.3.1.2, ultimately concluding that, even assuming 100 percent of the organisms entrained in the cooling water

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system for proposed Units 3 and 4 (as well as existing Units 1 and 2) would not survive,²³ the impacts from entrainment would be minor. See FEIS 1B, at 5-32.

4.65 A number of factors are cited by the staff as the basis for this determination. Noting that the amount of water withdrawn from the source waterbody greatly influences the degree to which entrainment affects aquatic biota, factors cited by the staff as important support for its conclusion included SNC's use of a closed-cycle cooling system, the design and location of the cooling intake canal and structure, including its placement along a straighter portion of the river (as opposed to near an oxbow where larval densities are significantly greater), and the use of a weir wall and skimmer wall at the mouth of the intake. See Staff EC 1.2 Direct Testimony at 46, 48-55; Staff EC 1.2 Rebuttal Testimony at 18. The staff also considered previous sampling data, the high fertility of most species inhabiting rivers, and the high natural mortality rates of eggs and larvae. See Staff EC 1.2 Direct Testimony at 46. Also of significance to the staff are previous sampling relating to SRS operations, which it concluded indicated that historic operations of the SRS intake did not have a discernable impact on fish species in the Savannah River despite water withdrawals much greater than those anticipated for Vogtle Units 3 and 4, and the 1985 FES associated with the licensing of Vogtle Units 1 and 2, which assumed a uniform distribution of drift organisms and found entrainment would have an insignificant effect on drift organisms. See id. at 50-52. Moreover, with respect to important species, as described

²³ Notwithstanding this presumption of 100 percent mortality, in his testimony Dr. Young challenges the adequacy of the FEIS regarding entrainment on the basis that there is not enough life histories information to identify which species would be entrained. See Young EC 1.2 Direct Testimony at 5. From our perspective, the FEIS discussion described in the staff's testimony, see Staff EC 1.2 Direct Testimony at 56-58, resolves this concern. The 100 percent mortality presumption also appears to resolve Dr. Young's related concern about the inability of some larval fish to overcome the predicted water intake velocity. See Young EC 1.2 Direct Testimony at 6. Of course, as the staff points out, see Staff EC 1.2 Rebuttal Testimony at 6, the relevance of this concern is not apparent since it provides nothing, in the context of Joint Intervenors challenge to the adequacy of the staff's entrainment impact analysis, that addresses the central issue of the number of larval fish that might be entrained.

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in section IV.A.4.c above, of import to the staff is the NMFS concurrence with the staff's conclusions regarding impacts to the shortnose sturgeon, including the staff's assumptions related to the potential loss of shortnose sturgeon eggs and larvae. See id. at 59.

4.66 Also of importance to the staff, as was discussed in section IV.A.4.b above, is the question of the impact of river flow rates on entrainment and the EPA five percent withdrawal factor. While observing that entrainment impacts (and possibly impingement impacts) could increase under very-low-flow conditions, the staff determined that such flows and subsequent losses would be temporary and are unlikely to have any persistent long-term impacts on populations of aquatic organisms in the Savannah River. See id. at 73-74.

4.67 The staff also testified that the SNC 2008 study concerning the hydraulic zone of influence (HZI) at Vogtle Units 1 and 2 further confirmed the staff entrainment analysis. That study indicated that at a river flow of 4482 cfs and a water withdrawal rate of 110 cfs for Units 1 and 2, the Units 1 and 2 intake structure had an area of hydraulic influence of 1.10 acres, of which 0.14 acres extended into the Savannah River and only about 1/6th of the way across the river in the vicinity of the VEGP site. See Staff EC 1.2 Direct Testimony at 60; Exh. NRC000031, encl. 1, at 2 (Letter from J. A. "Buzz" Miller, Senior Vice President, SNC Nuclear Development to NRC Document Control Desk encl. 1 (May 27, 2008) (Impingement and Entrainment Monitoring Update at Plant Vogtle)) [hereinafter Attachment to May 27, 2008 Letter]. As was reflected in the SNC testimony regarding this study, the river flow at the time of the study was representative of average river flows past the site even during a period of drought in the Savannah River, both units were operating at or near 100 percent of their generating capacity, and the cooling water intake structure was operating in its normal pumping configuration. See Dodd/Montz EC 1.2 Direct Testimony at 14-16; Dodd/Montz EC 1.2 Rebuttal Testimony at 3-4. The staff likewise testified that the SNC study was conducted on a day when

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the water withdrawal rate for Units 1 and 2 was significantly greater than the typical daily withdrawal rate, or even the maximum observed average monthly withdrawal rate for 2006, so that the conditions under which the study was conducted were conservative for assessing the hydraulic zone of influence. See Staff EC 1.2 Rebuttal Testimony at 20-21. The staff concluded that this study provided additional support for the staff's FEIS conclusion that the proposed Vogtle Units 3 and 4 intake structure would affect only a fraction of the river, comparable to that of Units 1 and 2, so that the vast majority of organisms moving up or down the river would not be adversely affected by the influence of the intake structures. See Staff EC 1.2 Direct Testimony at 60-61.

4.68 Finally, the staff testified that it had become aware of relevant additional sampling data available since the FEIS was issued, one source of which was the SNC entrainment study discussed in section IV.A.6.d below. As the staff noted, the study provided an estimate of an average daily entrainment rate of 1230 organisms (eggs and larva),²⁴ whereas the estimated daily source water drift abundance was 312,039 organisms. See Staff EC 1.2 Direct Testimony at 59; Exh. SNCR00005, at 23 (Entrainment Assessment at the Plant Vogtle Electric Generating Plant (Oct. 2008)) [hereinafter SNC Entrainment Study]. This suggests that only about one-third of one percent of the organisms in the river's drift community were being entrained. According to the staff, this SNC study information demonstrates that eggs and larvae are several times more numerous in samples from the Savannah River than in samples from the Units 1 and 2 intake canal. The staff also pointed out that the projected entrainment rate

²⁴ In its direct testimony, the staff cites to SNC's interim report that listed the daily rate as 1302 organisms. See Staff EC 1.2 Direct Testimony at 25 (citing Exh. NRC000030 at 25 (Draft Interim Report of Fish Impingement and Entrainment Assessment at the Plant Vogtle Electric Generating Plant) (Sept. 2008)). On March 6, 2009, SNC notified the Board that it was specifically revising this number from 1302 to 1230. See Notice of Revised Testimony and Exhibit (Mar. 6, 2009) at 1-2.

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of 1230 organisms per day was very small compared to the projected entrainment rates of 64,000 organisms per day in 1984, and 71,000 organisms per day in 1985, when the SRS was operating three nuclear production reactors with once-through cooling, as well as a coal plant, that nonetheless did not appear to have an impact on the fishery despite being a much higher rate than has been projected for Vogtle. See Staff EC 1.2 Direct Testimony at 59-60. All this information, according to the staff, supports its conclusion that the impacts of entrainment for Vogtle Units 3 and 4 would be minor. See id. at 60.

4.69 In contesting this staff determination that the entrainment impacts of proposed Vogtle Units 3 and 4 would be minor, Joint Intervenors have made a variety of arguments, some that are outlined in their proposed findings of fact and conclusions of law, and some that are found only in the testimony of their supporting witness Dr. Young. We examine their concerns below.

i. Adequacy of Entrainment Assessment Regarding Shortnose Sturgeon

4.70 In their proposed findings and conclusions, relative to the shortnose sturgeon, a federally designated endangered species, Joint Intervenors assert that, based on (1) the NMFS sturgeon recovery plan that indicates shortnose sturgeon fish and larvae are sometimes impinged/entrained in the various areas they inhabit in the Eastern United States, including the Savannah River; and (2) a 1980s SRS study indicating that shortnose sturgeon larvae were found near the Vogtle Units 1 and 2 facility,²⁵ it must be assumed there will be some entrainment of these sturgeon by Units 3 and 4. See Joint Intervenors Proposed Findings

²⁵ Although Joint Intervenors proposed findings suggest that the authors of these surveys “concluded that some sturgeon could be entrained by the [SRS] cooling water intake,” Joint Intervenors Proposed Findings at 13, we think a fair reading of the cited pages of the survey supports only a finding that probably two of the seven larval sturgeon found were shortnose sturgeon and they were taken in the river as part of a source water survey in locations that might have brought them into contact with the SRS intake.

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at 12-14 (citing NMFS Recovery Plan at 53, 55; Paller Ichthyoplankton Distribution, at 3-112 to -113). Further, notwithstanding the fact that the SRS production reactors have not operated since the early 1990s,²⁶ Joint Intervenors contend that the effects of the high entrainment rates from the SRS facility's cooling water intake over the years, in combination with the continued operation of Vogtle Units 1 and 2, are still being felt to the extent that the shortnose sturgeon population in the river, for which "the adult population is increasing, but juveniles are still rare," is suffering from a "depleted baseline population" from which it has not recovered. Id. at 13 (quoting FEIS 1A, at 2-90 to -91). As a consequence, entrainment of even a small number of shortnose sturgeon eggs and larvae will be "clearly noticeable and sufficient to destabilize" the species such that the staff's entrainment impacts assessment for proposed Vogtle Units 3 and 4 should have been characterized as LARGE. Id. at 13-15.

4.71 Based on the record in this proceeding, we are unable to endorse Joint Intervenors position in this regard. As is generally the case with the other aquatic species that inhabit the environs in the vicinity of the Vogtle facility, see Staff EC 1.2 Rebuttal Testimony at 14 (agreeing that some individual organisms, particularly those in early developmental stages, will be entrained and lost from the fishery), we certainly are not in a position to say that no shortnose sturgeon larvae will be entrained (or adult sturgeon impinged) as a result of the operation of Units 3 and 4. On the other hand, the record before us supports the staff's finding of minor impacts such that there will be no detectable changes in fish populations attributable to operation of Vogtle Units 3 and 4. Just as we are not willing to assume that this endangered species is per se vulnerable to this project, see section IV.A.4.c above, we also are not

²⁶ As Dr. Young noted, the SRS production reactors have been decommissioned. See Tr. at 934. As is outlined in the history of the SRS production reactors that is found on the SRS website, of which the Board takes judicial notice, see 10 C.F.R. § 2.337(f), the last SRS production reactor, the K-reactor, was placed in cold-standby condition in 1993. See [SRS] History Highlights, <http://www.srs.gov/general/about/history1.htm> (last visited June 19, 2009).

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persuaded that, in the face of the NMFS assessment and the apparent increase in adult members of the population, see FEIS 1A, at 2-90 to -91, that the possible entrainment of some small number of sturgeon larvae or eggs will constitute a LARGE impact.

4.72 In making this determination, we should not be read to derogate the importance, which the staff recognized, see Tr. at 1079-81, of any instance in which a facility's operation results in the taking of a member of an endangered species. That is a serious issue. At the same time, we cannot accept the largely unsupported proposition Joint Intervenors espouse in the face of an evidentiary record showing that (1) recognized, reasonably effective measures, including the intake facility's location relative to the river and its design using a weir wall and skimmer wall, will be put in place to forestall such a taking, see Coutant EC 1.2 Direct Testimony at 14-17; Staff EC 1.2 Direct Testimony at 48, 52, 54; Tr. at 699-702, 787-88, 838; (2) the ongoing operation of Vogtle Units 1 and 2, as well as the reasonably contemporaneous entrainment survey by SNC, have provided no indication of any shortnose sturgeon takings, Staff EC 1.2 Direct Testimony at 35, 60; Tr. 631, 705-06; (3) any entrainment impacts by the SRS facility occurred using a different, more intrusive intake system that, in any event, has not been operating for some fifteen years, see Staff EC 1.2 Direct Testimony at 52; and (4) the spawning locations and the egg attachment/larval drift habits of the shortnose sturgeon do not lend themselves to ready interaction with the existing and proposed Vogtle units intake facilities, see FEIS 1A, at 2-89 to -93; FEIS 1B, at 5-41 to -42; Exh. NRC000046, at 179-80 (Alan M. Richmond & Boyd Kynard, Ontogenetic Behavior of Shortnose Sturgeon, *Acipenser brevirostrum*, [1995] 1 Copeia 172)); NRC Staff Testimony of Dr. Michael T. Masnik, Rebekah H. Krieg, Dr. Christopher B. Cook, and Lance W. Vail Concerning [EC] 1.3 (fol. Tr. at 1062) at 15-16 [hereinafter Staff EC 1.3 Direct Testimony]; Tr. at 668-69, 702-03, 767-68. As a

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consequence, we see no basis for revising the staff's impact assessment of SMALL relative to its findings associated with the shortnose sturgeon.

ii. Adequacy of Entrainment Assessment Regarding Robust Redhorse

4.73 The other endangered species at issue relative to this contention is the Georgia state-designated robust redhorse. In their proposed findings, Joint Intervenors claim that the staff assessment regarding this species is deficient because it fails to provide sufficient information about the life history of the larval or juvenile robust redhorse. See Joint Intervenors Proposed Findings at 16; Joint Intervenors Reply Findings at 3. Additionally, they assert that the sampling conducted under the SNC entrainment study, while purportedly failing to encounter any robust redhorse specimens in either the source water or intake area samples, did produce unidentified taxa that consisted of twenty percent unidentified members of the catostomid (sucker) family, a classification group that includes the robust redhorse. See Joint Intervenors Proposed Findings at 17 (citing Dodd/Montz EC 1.2 Direct Testimony at 12); Joint Intervenors Reply Findings at 6. According to Joint Intervenors, the fact that the entrained catostomids were post-yolk-sack-larvae, in conjunction with the SNC failure to conduct genetic testing on this taxa to the species level, undermines any significance that might be attributed to the supposed failure of SNC to find any robust redhorse as part of its entrainment study. See Joint Intervenors Proposed Findings at 17; Joint Intervenors Reply Findings at 6.

4.74 Although testimony before the Board suggests that any lack of detailed life history information about this species, in particular its larval stage, could be attributable to its relative rarity, see Tr. at 778, the life history that is provided, which shows a species that does not spawn in the immediate vicinity of the VEGP site and tends to stay in the main channel rather than move toward the shore, see FEIS 1A, at 2-88, FEIS 1B, at 5-36, see also Exh. NRC000017, at 1148, 1152 (Timothy B. Grabowski & J. Jeffery Isely, Seasonal and Diel

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Movements and Habitat Use of Robust Redhorses in the Lower Savannah River, Georgia and South Carolina, 135 Transactions of the Am. Fisheries Soc'y 1145 (2006)), when taken in conjunction with the other factors the staff relied upon relative to its entrainment determination, including intake facility location/design and low intake velocities, does not suggest anything about the possibility of entrainment of this fish that would run contrary to the staff's assessment finding of SMALL. Nor do we find Joint Intervenors reliance on the undifferentiated entrainment taxa to be persuasive evidence that a different assessment is merited. Besides the fact that there are eight other catostomid species known to be present in the Middle Savannah River about which we have no information regarding the yolk-sack status of their larvae, see Marcy Savannah River Fishes at 9, but among which the spotted sucker (*Minytrema melanops*) appears to be the most common in the Vogtle vicinity, see Exh. NRC000002, at 222 (The Academy of Natural Sciences, Report No. 01-16F, 2000 Savannah River Biological Surveys for Westinghouse Savannah River Company (Sept. 2001)); 2001 ANSP Study at 215, the testing done by SNC was state-of-the-art analysis that went as far as practical for egg and larva identification for this type of survey, see Tr. at 630-31.

iii. Adequacy of Entrainment Assessment of American Shad

4.75 While not included in Joint Intervenors findings of fact, see supra note 12, in his testimony Dr. Young raised questions about the FEIS treatment of entrainment relative to the American shad, see Young EC 1.2 Direct Testimony at 8, one of the species the staff identified as commercially important, see FEIS IA at 2-81 to -82. In this regard, Dr. Young challenges the adequacy of the baseline data provided, in particular asserting that the staff's reliance on the demersal nature of shad eggs as concentrated along the bottom of the water column is inadequate given the 1995 SRS study by M. H. Paller, et al., regarding the horizontal distribution of American shad eggs in the drift near the VEGP site, which Dr. Young asserts showed an

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abundance of shad eggs toward the western/Georgian bank and supports the proposition that site-specific ichthyoplankton distribution studies near existing or proposed water intakes are important to permit the sensitive resolution of spatial patterns. See Young EC 1.2 Direct Testimony at 8 (citing Exh. JTI000004, at 2 (M.H. Paller, et al., Statistical Methods for Detecting Ichthyoplankton Density Patterns That Influence Entrainment Mortality (1995))). While, as the staff points out, see Staff EC 1.2 Rebuttal Testimony at 16-17, the 1995 Paller report may be seen as supportive of the general proposition that the assumption of uniform distribution, which we discuss in more detail in section IV.A.6.d.iv below, is not realistic, the report's significance here as a basis for extrapolating American shad entrainment impacts relative to Vogtle facility impacts is tempered both by the distance of the Paller test sites some 3.5 miles upriver from the proposed intake structure and the fact that the report assesses the SRS once-through cooling system, which clearly would have larger entrainment impacts than the closed system employed for the Vogtle facilities given the substantial difference in water withdrawal rates.²⁷

d. Role/Adequacy of SNC Entrainment Study

i. Description of SNC Entrainment Study

4.76 As was the case with the impingement study discussed in section IV.A.5.d above, in an effort to characterize the current entrainment rate at the Vogtle Units 1 and 2 makeup water intake structure and use that information to infer an entrainment rate for the similarly designed intake structure for proposed Units 3 and 4, again at the request and under the direction of SNC, Georgia Power Company conducted an entrainment study. This study

²⁷ In this context, Dr. Young also maintains that staff reliance in its FEIS on the lack of American shad egg distribution in river oxbows was not relevant to the staff's impacts analysis, see Young EC 1.2 Direct Testimony at 8, but as the staff notes, this was merely a way of emphasizing the point that, unlike some other species that tend to have greater egg/larval concentrations in oxbows, creeks, or intake canals that are off the main river channel, American shad spawning, and the eggs that result, stay in the main channel so as to be more likely to pass by the VEGP site, see Staff EC 1.2 Rebuttal Testimony at 17.

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began in mid-March 2008 and concluded in late July 2008 based on the SNC assessment that this period represented the most biologically productive time period of the year for fish, when the occurrence of planktonic (drift) fish eggs and larvae is most prevalent in the Middle Savannah River. See SNC Entrainment Study at 5-7, 11.

4.77 Relative to the entrainment study, to provide a basis for comparison relative to what was found via the survey of existing documentary information, SNC conducted sampling of the source water in the Savannah River at the VEGP site as well as in the intake canal upstream of the intake pumps for the cooling system make-up water. Samples from both source water and canal water were collected at six-hour intervals and then composited into one twelve-hour "day" and one twelve-hour "night" sample. See Dodd/Montz EC 1.2 Direct Testimony at 8-10; SNC Entrainment Study at 11.

4.78 The river source water was sampled at two locations, one about 300 feet upstream of the present intake for Units 1 and 2, and the other another 0.3 mile upstream at the location of the proposed intake for Units 3 and 4. Each sampling location included a center-channel station and stations about thirty feet from each shore. Paired 500-micron mesh size plankton nets were towed in the river current behind an anchored boat, starting near the river bottom and progressing every five to ten minutes to the surface at one-meter intervals. Relevant environmental conditions, such as river stage and temperature, were recorded for each sampling event. Egg and larvae densities were calculated from the sample counts and the amount of water filtered through the plankton net. Total water column sample time averaged about twenty minutes per station event, while the mean target sample volume for the background samples was approximately 100 cubic meters of water. See Dodd/Montz EC 1.2 Direct Testimony at 9; Coutant EC 1.2 Direct Testimony at 24-25; SNC Entrainment

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Study at 12-14, 17. No protected species were collected from the source water. See SNC Entrainment Study at 18.

4.79 The Vogtle Units 1 and 2 intake canal was also sampled March through July, essentially simultaneously with the river sampling. A pump collection system (water pumped from the canal was filtered through a plankton net) was needed there because the velocities in the canal were too low to permit use of the plankton nets. A total of thirty-six ichthyoplankton samples were collected during the study period. Comparison of pump and net collections taken simultaneously in the river indicated that both methods were comparable when viewed in terms of types and numbers of organisms caught per unit volume of water, although there were significantly fewer organisms in the canal water than in the river, and the taxa were different. See Dodd/Montz EC 1.2 Direct Testimony at 9; Coutant EC 1.2 Direct Testimony at 25; SNC Entrainment Study at 21. SNC utilized the data gathered during these sampling events, in conjunction with certain assumptions about the representative nature of the semi-monthly samples, see Dodd/Montz EC 1.2 Direct Testimony at 10-11, to calculate an annual entrainment rate that it ultimately declares shows the entrainment impacts of the new units are SMALL, see Coutant EC 1.2 Direct Testimony at 26. In this regard, as was pointed out in section IV.A.6.c above, the SNC study projected that less than one percent of the drift population in the river would be entrained. See SNC Entrainment Study at 23 (comparing estimated daily entrainment rate of 1230 organisms with estimated daily source water drift abundance of 312,039 organisms). Moreover, no protected species were collected inside the intake canal. See SNC Entrainment Study at 21.

ii. Adequacy of SNC Entrainment Study

4.80 Although Joint Intervenors apparently agree that the plankton net sampling method as utilized for river source water was an effective sampling technique, see Young

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EC 1.2 Direct Testimony at 8-9; Tr. at 851, 853, 867, they nonetheless challenge the SNC entrainment study on several other accounts. In their proposed reply findings, Joint Intervenors raise concerns about the timing (biweekly March-July 2008) and number (20) of sampling events relative to the purported "critically depleted baseline populations" of the shortnose sturgeon and robust redhorse populations, which they assert was inadequate to test the impacts of the closed cooling system on these two species so as to validate that these species were not entrained by the Vogtle Units 1 and 2 structure. See Joint Intervenors Reply Findings at 6. In addition, although not raised in Joint Intervenors findings, see supra note 12, Dr. Young expresses concerns in his testimony, as he did relative to the SNC impingement study, about the entrainment study lacking one year of data, see Young EC 1.2 Rebuttal Testimony at 8, as well as contests its accuracy based on (1) a change in survey location from the mouth of the intake canal to the middle of the canal, which would result in undercounting of eggs that were withdrawn from the river and died, but were not counted because they never reached the middle of the canal; (2) the explanation provided by Mr. Dodd and Mr. Montz for not observing any eggs in the entrainment samples, which they attribute to "settling out" in the water column between the mouth of the intake canal and the head of the intake structure due to sediment catchment, but which Dr. Young asserts should have resulted in higher entrainment results because eggs of species like the American shad would likely die; and (3) the taking of significantly fewer samples at the site of the proposed Units 3 and 4 intake, thereby creating an unequal data set. See Young EC 1.2 Rebuttal Testimony at 3-4.

4.81 Relative to the matter of the number and timing/duration of the entrainment sampling events, we are unable to agree with Joint Intervenors that these items are fatal to the efficacy of the survey in this context. The timing/duration matches the period in which an event critical to measuring the impacts of entrainment -- the spawning and egg/larval drift season --

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occurs relative to the Savannah River aquatic community. See Dodd/Montz EC 1.2 Direct Testimony at 8. Nor do we find the disagreement over the number of sampling events to be of substance in this instance. As was the case with timing/duration, although the SNC testimony indicates what was done rested on a scientifically sound sampling basis, see Dodd/Montz EC 1.2 Rebuttal Testimony at 2-3; Coutant EC 1.2 Rebuttal Testimony at 5-6, Joint Intervenors would have preferred more. But the basis upon which they assert this is needed, i.e., the purported critically depleted population, is not one for which the evidentiary record provides support. See supra section IV.A.4.c.

4.82 On the matter of the study data not covering a year, as a practical matter, the purpose for which the one-year collection guidance was established seems to have been fulfilled in this instance. As ESRP indicates, 1999 ESRP at 2.4.2-6, the one-year sampling regimen is intended to ensure that the data “reflect[s] seasonal variations in aquatic populations.” While this makes perfect sense as a general matter, relative to entrainment impacts, the critical period is March through June, see Staff EC 1.2 Direct Testimony at 56, which, as we noted above, see supra section IV.A.6.d.i, is the period SNC targeted the study to encompass. Under the circumstances, we see no cause for refusing to consider this study on that basis alone.

4.83 With respect to the intake canal survey location change and egg sampling, it turns out these concerns have a common theme, as both depend on the definition of what is an entrainment for the purpose of a NEPA impacts analysis. SNC witness Mr. Dodd explained that the location change after the first sampling session to move the sampling station closer to the cooling water system intake was done principally to account for the presence of eddies at the mouth of the intake canal that were perceived to be impacting the scientific/technical objectivity of the sampling in terms of it being representative of aquatic material that is actually entrained,

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i.e., that is subject to the plant's cooling system, as opposed to material that simply goes into the intake canal. See Tr. at 624-27. By the same token, the "settling out" explanation for the lack of eggs in the entrainment water samples, as compared with the abundance found in the study's source water samples, appears not to be an SNC concern because it does not consider such material to have been "entrained," given it would only be in the intake canal without being subjected to the cooling water system. See Tr. at 628-30. Dr. Young, however, has a different perspective, since he considers an assessable entrainment to be any egg mortality that arises as a result of leaving the source water flow and entering the intake canal, whether it occurs in the intake canal because of sediment catchment or because the egg actually enters the cooling water system. See Tr. at 838-42.

4.84 The SNC decision to move the sampling station to avoid the eddies' impact on the scientific validity of its survey was a determination based on sound technical judgment. At the same time, we think Dr. Young's point about consideration of intake canal "settled out" eggs as part of an entrainment impact assessment has some merit as an analytical matter, given the intake canal that can induce this effect is created, like the cooling system itself, to support Vogtle facility operation.

4.85 That being said, we nonetheless conclude, based on the record before us, that such a possible impact does not invalidate the staff's NEPA assessment in this instance. Dr. Young's egg mortality concern was directed principally to the American shad, whose eggs he identified would suffer mortality in such a sediment catchment situation. See Tr. at 839. Given the fecundity of that species, see Tr. at 727-28, 735 (9.3 million American shad eggs would be produced in a year in the river that potentially could be drifting past the Vogtle facilities), and the demersal characteristics of American shad eggs that causes them to stay near the bottom, see FEIS 1A, at 2-82; Staff EC 1.2 Direct Testimony at 54; Exh. NRC000036, at 63 (McFarlane, et

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al., Impingement and Entrainment of Fishes at the Savannah River Plant (Feb. 1978)); Dodd/Montz EC 1.2 Rebuttal Testimony at 6, the SNC position attributing the lack of entrained shad eggs identified by the SNC study to the design characteristics of the intake canal, as opposed to pre-intake egg mortality caused by “settling out,” has more persuasive support in the evidentiary record.

4.86 Finally, as to Dr. Young’s criticism of the adequacy of the source water portion of the SNC entrainment survey as having taken fewer samples from the river near the location for the proposed Units 3 and 4 intake structure (approximately eleven percent) than from the river near the current site of the Units 1 and 2 intake canal (approximately eighty-nine percent), see SNC Entrainment Study at 18, under the circumstances here, as outlined in the record, in which the stretch of river bank in which this structure will reside is uniformly unremarkable in terms of features that might have a particular effect on the assessment of the egg/larval drift, see Staff EC 1.2 Rebuttal Testimony at 19 (site not located in biologically unique stretch of river), we find this concern without substance.

iii. Adequacy of SNC HZI Survey

4.87 Although not challenged in Joint Intervenors proposed findings, see supra note 12, Dr. Young also raised questions in his prefiled testimony about the adequacy of the SNC HZI survey, which was conducted to provide a better understanding of the area of the river influenced by the withdrawal of water into the cooling system. See Dodd/Montz EC 1.2 Direct Testimony at 14. Specifically, Dr. Young asserted that this study lacked sufficient data and analysis because it was conducted while Units 1 and 2 were operating at fifty-six percent of capacity during a limited range of river flows, instead of at full capacity and during different flows to ensure differing water intakes were modeled (e.g., operation at 100 percent capacity will require more water withdrawal) thereby increasing the HZI and the accompanying increased

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intake velocities further into the river channel. See Young EC 1.2 Direct Testimony at 10; Young EC 1.2 Rebuttal Testimony at 4. Before assessing this concern, we provide a brief explanation of the survey methodology and its results.

(1) Description of HZI Survey

4.88 As a complement to SNC's 2008 impingement and entrainment surveys, on May 7, 2008, SNC personnel performed an HZI survey at the intake structure for Vogtle Units 1 and 2. The purpose of the survey was to measure the extent of the HZI by "measuring and recording deviations in the magnitude, direction, and velocity of river flow." Dodd/Montz EC 1.2 Direct Testimony at 14. The idea is to map-out what portion of the river is impacted or influenced by the flow of water into the intake canal. See id. at 15 (HZI boundary determined where water velocities and vectors are not influenced by VEGP intake structure).

4.89 SNC personnel used a boat-based Acoustic Doppler Current Profiler (ADCP) to collect river flow data. They navigated a boat parallel to the Savannah River shoreline, collecting information at eleven transects, which were established at ten-foot intervals beginning at the intake canal and extending into the Savannah River at mid-channel. When the measurements indicated that the water velocities and vectors were unrelated to the intake structure, the boundary of the HZI was established. See id. at 15.

4.90 During the survey, three intake pumps were operating, as compared to the use of two intake pumps in typical operations, and the intake flow was 110 cfs.²⁸ The average flow of

²⁸ This number represents 56 percent of the full capacity of the intake structure flow, but it is typical, slightly higher even, than flows during normal operations at Vogtle. See Dodd/Montz EC 1.2 Rebuttal Testimony at 4; Staff EC 1.2 Rebuttal Testimony at 21. The intake structure for Vogtle Units 1 and 2 is designed to take almost double the capacity of what is typically used. See Dodd/Montz EC 1.2 Rebuttal Testimony at 4; Staff EC 1.2 Rebuttal Testimony at 21; Attachment to May 27, 2008 Letter at 2.

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the river was 4482 cfs. The average flow of the river was measured both before and after the survey, with measured flows varying by less than two percent. See id. at 15.

4.91 Based on the measurements, SNC concluded that the HZI for Vogtle Units 1 and 2 “occupied an area of 1.10 acres, which includes the entire VEGP intake canal and a small portion of the Savannah River.” Id. at 15-16. The small portion of the Savannah River amounted to “a distance of approximately fifty feet from the mouth of the intake canal (or about 13 percent of the total distance across the river channel and proximal to the mouth of the canal).” Id. at 16; see also Attachment to May 27, 2008 Letter at 2, 4.

(2) Adequacy of HZI Survey

4.92 Relative to Dr. Young’s challenge to the HZI survey, as Mr. Dodd and Mr. Montz indicated, see Dodd/Montz EC 1.2 Rebuttal Testimony at 3-4, when the HZI determination was conducted at Plant Vogtle, Unit 1 was operating at 100 percent of its generating capacity, while Unit 2 was operating at 98.1 percent of its generating capacity, and the cooling water intake structure was operating in its normal pumping configuration. Of the four pumps that are available to the cooling water system, during normal operation (i.e., plant at full load) of the intake structure, one pump operates for each unit (two pumps total), a third pump operates intermittently as needed to adjust cooling tower basin water levels and for waste dilution, and a fourth pump is kept in standby should one of the other three pumps require maintenance. According to Messrs. Dodd and Montz, the fifty-six percent capacity to which Dr. Young referred was simply the ratio of the daily withdrawal rate reported by Plant Vogtle for Units 1 and 2 (71.24 million gallons per day (MGD)) for May 7, 2008, to the theoretical limit of all four pumps operating at full design capacity (127 MGD). Regardless of this figure, however, they maintained that on the day the HZI determination was conducted, the plant was operating three of the four cooling water intake pumps, which is the normal mode of operation at full power

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generation. Given this unrebutted testimony, the sufficiency and relevance of which the staff fully supports, see Staff EC 1.2 Direct Testimony at 60-61; Staff EC 1.2 Rebuttal Testimony at 21, we see no basis for crediting Dr. Young's concern in this regard.

4.93 Regarding Dr. Young's assertion that an insufficient range of flows were analyzed, Messrs. Dodd and Montz maintain that the HZI survey was conducted during a period of prolonged drought that was, at a minimum, representative of average river flows during 2008 under normal cooling water withdrawal rates. According to these SNC witnesses, Savannah River flows averaged 4482 cfs on the day the HZI determination was conducted, while for 2008, the average daily flow in the Savannah River at Plant Vogtle was approximately 4950 cfs, which can be contrasted with the average daily flow in the Savannah River from January 22, 2005, to December 31, 2008, which was 7173 cfs, or about 44.7 percent greater than the 2008 average flow. See Dodd/Montz EC 1.2 Rebuttal Testimony at 4 (citing USGS, <http://waterdata.usgs.gov/nwis/> and Exh. SNC000053 (Daily Average Discharge USGS021973269 Savannah River Near Waynesboro, Georgia) (calculation based on tables and charts reflecting daily average discharge at USGS gauge 021973269, on the Savannah River near Waynesboro, Georgia)). Given this unrebutted testimony, which the staff again fully supported, see Staff EC 1.2 Direct Testimony at 60-61; Staff EC 1.2 Rebuttal Testimony at 21-22, as well as our discussion in section IV.A.4.b above regarding the adequacy of the SNC consideration of low-river flows as they impact its various surveys and which roughly correspond to the flow figures extant at the time of the HZI survey, we find no basis for Dr. Young's concerns about the adequacy of the HZI survey in this regard either.

4.94 Consequently, we conclude that the SNC HZI information further supports the FEIS determination that entrainment impacts will be small because only a relatively small

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portion of the river would be influenced by water withdrawals from the intake structure for the cooling water system.

iv. Propriety of Staff Use of Uniform Drift Distribution (UDD) in Assessing Entrainment Impacts

4.95 As another part of their challenge to the FEIS entrainment assessment, albeit not as part of their proposed findings, see supra note 12, Joint Intervenors contested the staff's assumption in the FEIS that the drift community near the VEGP site is uniformly distributed, which assumption the staff indicated was based on its review of the 1985 FES for Vogtle Units 1 and 2 that concluded, using a uniform drift distribution (UDD) assumption, that those units would have an insignificant entrainment impact on drift organisms. See Young EC 1.2 Direct Testimony at 6-7 (citing FEIS 1B, at 5-31). For the reasons outlined below we find that the use of this analytical tool in the entrainment analysis for proposed Vogtle Units 3 and 4 was reasonable.

(1) UDD Defined

4.96 Field surveys of drifting aquatic organisms generally show that the distribution of organisms is spatially and temporally variable. See Coutant EC 1.2 Direct Testimony at 43, Young EC 1.2 Direct Testimony at 7. The UDD is a simplifying assumption under which an analyst takes a high-end estimate of the number of organisms in the free-floating drift community in a water sample, which includes entrainable life stages such as eggs and larvae, and assumes that estimate to be the density of organisms in any given sample. See Coutant EC 1.2 Direct Testimony at 41-43. Thus, drift organisms are assumed to be evenly spread out throughout the water column "such that any x% of the water will contain x% of the drift community within it," and "the drift from all species would be entrained equally." Moorer EC 1.2 Direct Testimony at 9.

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(2) Adequacy of Staff Data/Analysis Supporting Employing UDD

4.97 Joint Intervenors witness Dr. Young challenges the staff's use of the UDD on the basis that drift distributions in general and the drift distribution in the Savannah River in particular are, in fact, nonuniform. See Young EC 1.2 Direct Testimony at 7; Tr. at 842-43. We agree with SNC and the staff, however, that the UDD was appropriate for estimating entrainment impacts at the VEGP site because it is both commonly used and conservative. See SNC Proposed Findings at 33-34; Staff Proposed Findings at 38-39.

4.98 In support of the position that UDD is a commonly used assumption, staff witnesses noted that both relevant EPA regulations and the original FES associated with the Vogtle Units 1 and 2 10 C.F.R. Part 50 operating license also assume a UDD. See Staff EC 1.2 Direct Testimony at 53, 55-56. Further, SNC witness Dr. Coutant noted that in the NEPA analysis context, the details of distribution only become important if a MODERATE or LARGE impact is predicted using the UDD. See Coutant EC 1.2 Direct Testimony at 41. For their part, Joint Intervenors presented no evidence of any instance in which a more in-depth distribution analysis was being used where only a SMALL impact was predicted.

4.99 SNC and staff witnesses also presented evidence showing that the UDD is a conservative assumption for estimating entrainment impacts at the VEGP site. First, some species spawn in nests so that their eggs do not regularly enter the drift community. See Tr. at 667-68. Second, the eggs and larvae of some fish species, including sturgeon, tend to sink to the bottom of the water column, and SRS studies showed that egg concentrations are generally higher near the bottom of the river. See Staff EC 1.2 Direct Testimony at 53-54, Tr. at 668-69. Because the proposed intake structure for Vogtle Units 3 and 4 includes a weir wall and skimmer wall that would result in water from the middle of the water column preferentially entering the intake canal, the entrainment impact on species at the top or bottom of the water

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column would tend to be lower than the impact predicted using the UDD. See Staff EC 1.2 Direct Testimony at 53-54; Coutant EC 1.2 Direct Testimony at 45-46. Finally, the results of SNC's 2008 entrainment study show that organism density was in fact much lower in the Vogtle Units 1 and 2 intake canal than in the source water. See Coutant EC 1.2 Direct Testimony at 43. Joint Intervenors again produced no evidence to rebut this argument that the UDD results in conservative entrainment estimates.

4.100 We thus conclude that the use of the UDD in the analysis of entrainment impacts for proposed Vogtle Units 3 and 4 was appropriate.

7. Thermal Impacts

4.101 We next turn to the portion of this contention under which Joint Intervenors have questioned the adequacy of the staff's assessment of the impacts of thermal emissions from proposed Vogtle Units 3 and 4. As was noted earlier, see supra section IV.A.2, as is the case with existing Units 1 and 2, as part of their cooling water system, cooling tower blowdown from the Vogtle Units 3 and 4 would be discharged back into the Savannah River through an outlet common to both new units. The discharge outfall for the new facilities would lie some 400 feet downstream from the outfall for the existing facilities, also on the western (Georgia) bank of the river. The heated blowdown water would enter the river from a single submerged pipe three feet from the river bottom angled seventy degrees from the shoreline (albeit pointing toward the center of the channel) and slightly downstream. The GDNR has classified the Savannah River at the VEGP site for fishing water use, so that the water quality standards for temperature are twofold: (1) the heated blowdown is not to exceed 90 degrees Fahrenheit ($^{\circ}$ F); and (2) at no time is the temperature of the river water receiving the heated blowdown to be increased by more than 5° F above the intake temperature after allowing for a reasonable and limited mixing zone that would not create an objectionable or damaging pollution condition. This defines two

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mixing zones, the first being a zone that exceeds 5°F and the second being a zone that exceeds 90°F. See FEIS 1A, at 2-43; FEIS 1B, at 5-17 to -19; Staff EC 1.2 Direct Testimony at 85.

a. RG/ESRP Guidance

4.102 ESRP guidance regarding the cumulative impact analysis for aquatic resources from discharge of heated cooling water associated with nuclear unit operation indicates that the NRC staff's review should include "the analysis of alterations to the receiving water body resulting from plant thermal . . . discharges in sufficient detail to predict and determine the nature and extent of potential impacts on aquatic ecosystems." 1999 ESRP at 5.3.2.2-1. The ESRP also states that "the staff's analysis may be provided by referencing the aquatic biota descriptions of ESRP 2.4.2 and describing in brief detail the effects on biota that are 'important' and susceptible to thermal . . . impact." Id. at 5.3.2.2-10.

b. Adequacy of Plume Assessment

4.103 According to the staff, its conclusions regarding thermal impacts were based on the discharge temperature, the size of the plume that emerges from the discharge pipe, the design and the location of the discharge structure, and the width of the river at the location of the VEGP site. See Staff EC 1.2 Direct Testimony at 84. The central focus of the staff's thermal impacts assessment is the interaction between the heated water in the discharge plume and the aquatic species in the river. Of particular import in this regard is the size and shape of the thermal plume that will be created when the blowdown discharge enters the river and creates a mixing zone in which the cooler river water absorbs the heat from the blowdown. Within the mixing zone or plume, the water temperature may exceed the ambient river temperature by more than 5°F. See FEIS 1A, at 2-43; FEIS 1B, at 5-17. The size of the plume

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thus is defined as that region where the temperature of the mixture exceeds the ambient river temperature by more than 5°F. See FEIS 1B, 5-33.

4.104 To determine the extent of this plume, the staff utilized the CORMIX numerical model, an EPA-supported standard computer code for determining regulatory mixing zones from continuous point source discharges, such as are involved for the Vogtle units. Further, to ensure conservatism in this calculation, the staff used a series of inputs designed to maximize the size of the thermal plume, i.e., Drought Level 3 low river discharge (3800 cfs); largest outfall discharge (both Units 1 and 2 and Units 3 and 4 blowdown from the same pipe at 90.5 cfs); and lowest ambient stream temperature (41°F), so as to provide the largest temperature difference between the temperature coming out of the blowdown discharge pipe and the river water. The resulting CORMIX-calculated plume, with a length of ninety-seven feet and a width of fifteen feet, would, after leaving the discharge pipe, be oriented roughly parallel to the river bank as the plume curves downstream with the river flow. See Staff EC 1.2 Direct Testimony at 85; FEIS 1B, at 5-18 to -19, 5-33.

4.105 In addition, the staff evaluated the extent of the mixing zone of the 90°F isotherm, which is only 1°F below the maximum effluent discharge temperature. The same assumptions were made for this analysis except that the maximum rather than the minimum measured ambient river temperature at Shell Bluff Landing (81°F) was used to maximize the size of the mixing zone. The results generated by CORMIX indicated that the maximum downstream extent of the 90°F isotherm would occur at a distance of 0.9 meters (m) (3 feet (ft)) downstream of the outfall pipe. Because of the proximity of the 90°F isotherm to the pipe terminus, the plume had not yet been significantly influenced by the river flow rate, and the lateral extent of the isotherm was greater than the downstream extent. The maximum lateral

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extent of the 90°F isotherm from the outfall pipe terminus toward the river centerline was 2.21 m (7 ft). See FEIS 1B, at 5-18, 5-19.

4.106 The staff also made an assessment of the larger 5°F isotherm zone using very low-flow conditions, which would tend to increase the “above 5°F of ambient” mixing zone. With the caveat that it considered each very low-flow scenario an extremely rare, short duration event that would be most unlikely during the spring and early summer spawning periods when there is considerable up and down river traffic of organisms, the staff calculated the plumes for river flows of 3000 cfs and 2000 cfs. In the latter instance, the result was a plume with approximately double the areal extent. See Staff EC 1.2 Direct Testimony at 87-88.

4.107 In both instances, however, the staff concluded that the impacts of the thermal plume on aquatic resources would be SMALL. Given that the river is 312 feet wide at the discharge point, the staff concluded that the 5°F isotherm would occupy between five and ten percent of the river cross section, thereby avoiding any thermal blockage that would impede the movement of fish or otherwise prevent them from acting on their natural instinct to avoid unhealthy waters. Nor did the staff consider “cold shock” a factor of concern. This condition, which occurs when an otherwise warm body of water cools suddenly because a heat source, such as the reactor blowdown from Units 3 and 4, is abruptly curtailed, would not be a major concern, according to the staff, in light of the small size of the plume and the likelihood of the continued operation of Units 1 and 2. So too, the staff found no significant impact for eggs/larvae floating in the water given they would only be a small percentage of the total number of organisms passing through the site and given the small size of the plume, which the staff asserted some could transit without being impacted. Finally, relative to the low-flow and

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very low-flow conditions,²⁹ the staff again noted that Georgia state environmental authorities could intercede to curtail or halt facility operation if the situation warranted. See id. at 86-88.

4.108 In addition to the staff's CORMIX plume size analysis, SNC provided for the record an additional plume analysis generated by mapping the physical size and temperature characteristics of the VEGP thermal discharge plume under what it asserted were typical cooling tower operations with Units 1 and 2 in operation during a period of stable river flow/stage conditions. As described in the testimony of SNC witnesses Dodd and Montz, the inputs from on-the-water surveys conducted using an ADCP, which provides broad-band acoustic echo information, and a Hydrolab Surveyor, which is a multi-array water quality analyzer instrument that records water temperature, were electronically synthesized with a 3-D computer model to illustrate graphically the spatial effects of the hydraulics and temperature characteristics of the Units 1 and 2 thermal plume. The data indicated that the thermal discharge plume occupied a small zone (approximately 100 feet long by 75 feet wide) located immediately downstream of the discharge pipe/outfall. See Dodd/Montz EC 1.2 Direct Testimony; see also Exh. SNC000011, at unnumbered pages 1-4 (Images from Thermal Study depicting river water temperature).

4.109 Although again not the subject of Joint Intervenors proposed legal and factual findings, see supra note 12, some aspects of the staff's thermal impacts assessment were challenged in Dr. Young's prefiled testimony. Initially, he questions whether the plume modeling was adequate given the possibility of lower river flows, which would increase the chance of channel confinement and concomitant vulnerability to thermal stress and mortality. He also

²⁹ Also in connection with these low flow scenarios, the staff assessed the impact of the AP1000 DCD revision 16 change on the maximum withdrawal figures used to compute consumptive use rates and found that these changes would have no impact on blowdown flow rates or any thermal impacts assessment. See Staff EC 1.2 Direct Testimony at 91.

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challenges the purported failure of the FEIS to consider “all possible river conditions” by focusing on conservative conditions and asserts there is a general lack of analysis of potential thermal impacts on vulnerable aquatic creatures life history stages, and a particular lack of analysis of the impact of elevated temperatures on the earlier life stages of such species as the American shad, blueback herring, shortnose sturgeon, and striped bass. Along these same lines, he contests the sufficiency of the SNC plume study as not accounting for ichthyoplankton drift distribution in the plume and not including additional seasons other than summer. See Young EC 1.2 Direct Testimony at 10-12; Young EC 1.2 Rebuttal Testimony at 4.

4.110 We are unable to agree that Dr. Young’s claims outweigh the showing of the staff and SNC, as supported in the record, relative to the adequacy of the staff’s thermal impacts findings of SMALL. While it is true that the very low-flow conditions about which Dr. Young expresses a concern will expand the warm water plume somewhat, it does not appear that, even if doubled, its size and orientation would result in the sort of thermal barrier that would not allow fish to avoid waters they might find unhealthy. By the same token, the interaction between such a plume and fish eggs/larvae,³⁰ while causing some losses, is not likely to have a substantial impact on the relevant ecosystem. Assuming they would come into contact with the plume area,³¹ some demersal (i.e., sinking) or semi-pelagic (staying in the water column to some extent) eggs/larvae, such as the eggs of the American shad, may very well drift under the more bouyant plume area, while others, such as those of the shortnose sturgeon and striped

³⁰ Dr. Young’s suggestion to the contrary notwithstanding, see Young EC 1.2 Rebuttal Testimony at 5, because ichthyoplankton drift tends to be concentrated in the spring and early summer time frame, see Coutant EC 1.2 Direct Testimony at 37, Coutant EC 1.2 Rebuttal Testimony at 11, we consider the likelihood of eggs/larvae encountering a very low-flow enlarged plume to be low as well.

³¹ For instance, the degree to which eggs/larvae of the shortnose sturgeon or the striped bass even come in the vicinity of the VEGP site is not readily apparent. See Coutant EC 1.2 Rebuttal Testimony at 10.

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bass will not be affected because the water temperature of the river and the plume are, at the time of spawning and egg drift in the spring and early summer, not likely to be in the fatal range. See FEIS 1A, at 2-82; Staff EC 1.2 Direct Testimony at 54; Dodd/Montz EC 1.2 Rebuttal Testimony at 5-6; Coutant EC 1.2 Rebuttal Testimony at 8-10. Moreover, for those eggs/larvae moving through the plume at a time when the temperature differential might be unhealthy, by reason of the average stream velocity of 1.5 fps, they are likely to spend less than two minutes in the plume, a period during which eggs/larvae of a species like the blueback herring and striped bass should not be permanently harmed. See Dodd/Montz EC 1.2 Rebuttal Testimony at 5; Coutant EC 1.2 Rebuttal Testimony at 9-10. These points also address the asserted need for additional analysis relative to particular life histories and for the SNC study to extend to additional seasons other than spring for fish. See Staff EC 1.2 Rebuttal Testimony at 41-43. Thus, we find that the record before us supports the staff's conclusion that the thermal impacts associated with proposed Vogtle Units 3 and 4, both alone and in concert with existing Units 1 and 2, will be SMALL.

8. Adequacy of Cumulative Impacts Analysis

4.111 Finally, in their proposed findings, Joint Intervenors contend that the staff failed to assess adequately the cumulative impacts of Vogtle Units 3 and 4 to the extent it has not assessed or has downplayed the present effects of past actions that have depleted the baseline population of "important species" to the point they are threatened with extinction. According to Joint Intervenors, by asserting that the impacts of proposed Vogtle Units 3 and 4 will be small because the impacts of existing Vogtle Units 1 and 2 have been small, the staff has failed to account for the possibility that individually minor but collectively significant actions are taking place over a period of time. See Joint Intervenors Proposed Findings at 21; Joint Intervenors Reply Findings at 4. In addition, Joint Intervenors maintain, the staff's reliance on the purported

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small impacts of a closed-cycle cooling system, as opposed to a once-through cooling system, in the face of SNC testimony identifying three once-through cooling system power stations operating on the Savannah River, makes it likely these three facilities have significant adverse impacts on aquatic species that are totally ignored by the FEIS. See Joint Intervenors Reply Findings at 4-5.

4.112 These claims are essentially a reframing of Joint Intervenors arguments regarding the “low baseline” and “special species” status of certain aquatic creatures, which now seeks to emphasize the possibility that, notwithstanding the staff’s findings of minor impacts relative to impingement and entrainment, which we have concluded are supported by the preponderance of the evidence here, those impacts might be “the straw that breaks the back of the environmental camel,” Joint Intervenors’ Revised Response Statement and Pre-Filed Rebuttal Testimony (March 2, 2009) at 15 (quoting Hanly v. Kleindienst, 471 F.2d 823, 831 (2d Cir. 1972)), such that the proposed VEGP facility, despite its low impacts, must be shelved until, presumably, other facilities currently operating along the river have decreased their impacts to the point that this project no longer would retain its “back-breaking” characteristics.

4.113 Putting aside the issue of whether, as Joint Intervenors now use the term “cumulative,” these assertions are within the scope of this contention,³² in assessing this

³² Not every impact to which Joint Intervenors might seek to attach that label is necessarily within the contention’s scope. In admitting this contention we found Joint Intervenors had provided sufficient supporting information, in the form of an affidavit from Dr. Young, to support consideration under this contention of “asserted deficiencies concerning the ER impact discussion regarding the intake/discharge structure for the two new proposed facilities -- impingement/entrainment, . . . and thermal discharges, including cumulative impacts from these items associated with the existing Vogtle facilities.” LBP-07-3, 65 NRC at 258. As this language denotes, per the supporting material provided by Joint Intervenors, see Intervention Petition at 12-13 (ER does not adequately address the cumulative impacts on aquatic resources of the new cooling system facilities, combined with the current impacts of the existing intake and discharge); id. Exh. 1.3, at 3 (“An additional two units, especially in conjunction with operation of existing units, have the potential for large cumulative impacts on
(continued...)”)

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challenge we think it worth noting that the existing nature of the environment here is not without significance. Joint Intervenors have cited the majority opinion of the United States Court of Appeals for the Second Circuit in Hanley v. Kleindienst for the proposition that an EIS must be attuned to the “camel’s back” problem. In that opinion, however, the majority also noted that

[w]here conduct conforms to existing uses, its adverse consequences will usually be less significant than when it represents a radical change. Absent some showing that an entire neighborhood is in the process of redevelopment, its existing environment, though frequently below an ideal standard, represents a norm that cannot be ignored. For instance, one more highway in an area honeycombed with roads usually has less of an adverse impact than if it were constructed through a roadless public park.

Hanley, 471 F.2d at 831. Thus the fact that, as the staff recognized in the FEIS, see FEIS 1A, at 2-33, there are various existing facilities making withdrawals from the river does not, under the NEPA rule of reason, automatically compel an extensive analysis of how each facility withdrawing water upstream of the proposed Vogtle Units 3 and 4 interacts with the Savannah River environment.

4.114 Even more specifically, however, on the basis of the record before us, it appears Joint Intervenors seek to have us make a finding that is the environmental impact equivalent of the whole being more than the sum of its parts. Notwithstanding the ongoing river water

³²(...continued)

the Savannah River fish assemblage.”) (Declaration of Shawn Paul Young, Ph.D), the cumulative impacts we found subject to consideration under this contention were those associated with the cumulative effects of the existing and proposed Vogtle facilities.

So too, in ruling on the SNC summary disposition request relative to EC 1.2, in connection with Joint Intervenor arguments that material factual disputes existed relative to the effect of river flow levels on impingement and entrainment impacts because the then-DEIS did not include a discussion of the cumulative impacts of water withdrawals from various facilities upstream of the VEGP facility, including the D-Area powerhouse, Urquhart Station, the Augusta Channel, the Augusta International Paper Mill, and the City of Augusta, the Board declined to permit further litigation on this aspect of the river flow issue as outside the scope of the contention. See LBP-08-2, 67 NRC at 77-78.

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withdrawals of the various facilities about which Joint Intervenors have expressed a concern, and which the staff recognized in its cumulative impacts analysis, see FEIS 1B, at 7-21, as we noted in section IV.A.4.c above, the record does not support their assertion that some kind of special species/low baseline designation is appropriate here relative to any of the aquatic species at issue, including those considered rare.³³ Moreover, even with these various facilities

³³ Nor, on the record before us, are we able to agree with Joint Intervenors apparent suggestion that SRS impingement and entrainment impacts were, and continue to be, a primary source of very significant negative impacts for the Savannah River environs at issue here so that the SRS facility, in combination with the existing VEGP facility and the additional "straw" afforded by the proposed new units, will result in serious environmental damage. Although likewise not pursued in Joint Intervenors proposed findings, see supra note 12, in his testimony Dr. Young takes issue with statements in the record by SNC witness Mr. Moorer regarding the adequacy of the SRS studies as they concluded that, despite the SRS facility's large once-through cooling intake flows, impacts from entrainment (and impingement) were small and did not result in quantifiable fishery or aquatic community impacts. See Young EC 1.2 Rebuttal Testimony at 2; see also id. at 4 (challenging Dr. Coutant statement about lack of link between nuclear facilities on Savannah River and negative impacts on river fisheries). As the discussion on this point during the evidentiary hearing indicates, see Tr. at 898-902, the conclusions Dr. Young appears to draw from the language of an exhibit co-authored by one of the scientists who was also involved in the SRS studies about the significant extent of the negative impacts on the fish population from entrainment from the SRS and Vogtle facilities do not seem wholly consistent with the statements in the exhibit so as to provide sufficient support for Dr. Young's assertion. The exhibit provides in pertinent part:

Historically, the largest sources of entrainment in the MSRB have been the reactor cooling water intakes for the SRS (9.8% of Savannah River flow) and the Plant Vogtle nuclear power station (4.2% of river flow; Wiltz 1981; DOE 1990).

SAVANNAH RIVER SITE Historically, the SRS has affected populations of commercially and recreationally important fish species in the river primarily through impingement and entrainment losses of fish eggs, larvae, and adults during intake of cooling water (McFarlane et al. 1978). The overall rates of impingement at the SRS intakes were low relative to those of other cooling-water intake facilities in the Southeast (DOE 1988). Cessation of reactor operations and the concomitant lack of need for cooling water withdrawals from the Savannah River reduced entrainment impacts substantially.

Marcy Savannah River Fishes at 16.

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operating, as a general matter the prospectus for the large river population associated with recreational fishing indicates that population is relatively healthy, see Exh. SNC000097, at unnumbered pages 1-2 (2009 Fishing Prospects for the Savannah River, <http://www.gofishgeorgia.com/>); see also Tr. at 934 (Dr. Young states that prospectus at [gofishgeorgia.com](http://www.gofishgeorgia.com), which is "looking good," is indicator of species rebounding from earlier declines).

4.115 Thus, whether viewed in terms of rare or populous species, we are unable to find on this record that there has been "a stone left unturned" such that the NEPA cumulative impacts analysis in this instance is deficient in assessing whether the proposed new units will provide the proverbial "straw" about which Joint Intervenors are concerned.

9. Summary of Findings Regarding Contention EC 1.2

4.116 Although Joint Intervenors have provided a variety of challenges to the staff's FEIS findings regarding impingement/entrainment/thermal impacts for Vogtle Units 3 and 4, ultimately we find them unavailing. The preponderance of the evidence does not support their assertion that the staff's reliance upon existing information regarding the much-studied Middle Savannah River Basin was inadequate and required, instead, an extensive site-specific study. Nor do we find their overarching concerns about the adequacy of the river flow data used by the staff in making its impingement/entrainment/thermal impacts assessment in light of the recent drought conditions to be supported by the record, particularly given their strong reliance upon very-low flow conditions that are unlikely to occur or be of any extended duration. So too, their assertion that otherwise protected species should be given an additional designation as "special status species" is untoward and unsupported as a legal or factual matter. Also lacking support in the face of the extensive record provided by the staff and SNC are their challenges to the staff's finding of a SMALL impact relative to impingement/entrainment/thermal discharge

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impacts, particularly in light of the recent SNC studies that have provided significant data on each of these subjects that fully support the staff's impact analysis and conclusions. Finally, we see no basis for a ruling in Joint Intervenors favor on the question of the adequacy of the staff's analysis of the cumulative impacts associated with impingement/entrainment/thermal discharge given that Joint Intervenors concerns rest in large measure upon a view of the ecological health of the Savannah River that fails to account for or recognize that cooling water needs of the former SRS production reactors, albeit substantial, have not been a factor impacting the river for a number of years.

4.117 As such, a judgment on the merits regarding contention EC 1.2 is entered in favor of the staff and SNC.

B. Contention EC 1.3

1. Witnesses and Evidence Presented

4.118 SNC, the staff, and Joint Intervenors each presented witnesses in connection with EC 1.3 during the March 2009 evidentiary hearing in support of their respective positions on the adequacy of the FEIS discussion and analysis of the alternative of implementing a dry cooling system for proposed Vogtle Units 3 and 4. Each of these witnesses presented written direct and/or rebuttal testimony, with supporting exhibits, and gave oral testimony at the evidentiary hearing. See Tr. at 947-1284; Coutant EC 1.3 Direct Testimony; Testimony of James W. Cuchens on Behalf of [SNC] Concerning [EC] 1.3 (fol. Tr. at 955) [hereinafter Cuchens EC 1.3 Direct Testimony]; Rebuttal Testimony of James W. Cuchens on Behalf of [SNC] Concerning [EC] 1.3 (fol. Tr. at 957) [hereinafter Cuchens EC 1.3 Rebuttal Testimony]; Testimony of Thomas C. Moorer on Behalf of [SNC] Concerning [EC] 1.3 (fol. Tr. at 966) [hereinafter Moorer EC 1.3 Direct Testimony]; Rebuttal Testimony of Charles R. Pierce on Behalf of [SNC] Concerning [EC] 1.3 (fol. Tr. at 971) [hereinafter Pierce EC 1.3 Rebuttal

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Testimony]; Staff EC 1.3 Direct Testimony; NRC Staff Rebuttal Testimony of Lance W. Vail Concerning [EC] 1.3 (fol. Tr. at 1064) [hereinafter Staff EC 1.3 Rebuttal Testimony]; Revised Prefiled Direct Testimony of William Powers in Support of EC 1.3 (fol. Tr. at 1096) [hereinafter Powers EC 1.3 Direct Testimony]; Revised Prefiled Rebuttal Testimony of William Powers Concerning [EC] 1.3 (fol. Tr. at 1098) [hereinafter Powers EC 1.3 Rebuttal Testimony]; Revised Prefiled Direct Testimony of Barry W. Sulkin in Support of EC 1.3 (fol Tr. at 1100) [hereinafter Sulkin EC 1.3 Direct Testimony]; Pre-filed Rebuttal Testimony of Shawn P. Young Concerning [EC] 1.3 (fol. Tr. at 1102) [hereinafter Young EC 1.3 Rebuttal Testimony].

a. SNC

4.119 SNC presented four witnesses regarding EC 1.3: (1) Dr. Charles C. Coutant, a private consultant to SNC on aquatic ecology and fisheries biology matters; (2) James W. Cuchens, Principal Engineer, Southern Company Generation Engineering and Construction Services; (3) Thomas C. Moorer, SNC Project Manager-Environmental; and (4) Charles R. Pierce, SNC Licensing Manager. See Tr. at 947-1060, 1199-1285.

4.120 Mr. Cuchens, who has a Bachelor of Science in Mechanical Engineering from Mississippi State University, holds professional engineering licenses in four states. He has thirty-five years of engineering experience with Southern Company and has been involved in all phases of power plant design and construction, including the design of various types of cooling cycles, including closed loop, once-through, and/or cooling ponds serving nuclear, fossil fuel, and cogeneration units. Mr. Cuchens specifically studied the feasibility of dry cooling technology for proposed Vogtle Units 3 and 4. See Cuchens EC 1.3 Direct Testimony at 1-3; Exh. SNC000023 (James W. Cuchens CV).

4.121 Mr. Pierce has a Bachelor of Science and a Master of Science in Mechanical Engineering from Mississippi State University. An SNC engineer for twenty-eight years, Mr.

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Pierce has managed license renewal projects for nuclear facilities and was involved in the development and licensing of the Westinghouse AP1000 standard design. See Pierce EC 1.3 Rebuttal Testimony at 1-2; Exh. SNC000058 (CV of Charles R. Pierce).

4.122 The qualifications of Dr. Coutant and Mr. Moorer have been previously discussed by the Board above in connection with its ruling on contention EC 1.2 regarding impingement/entrainment/thermal impacts on aquatic resources. See supra section IV.A.1.a.

b. Staff

4.123 The staff presented four witnesses in support of its position regarding EC 1.3: (1) Dr. Michael T. Masnik, Senior Aquatic Biologist, DSER/NRO/NRC; (2) Rebekah H. Krieg, Senior Research Scientist, Ecology Group, ESD/EED/PNNL; (3) Dr. Christopher B. Cook, Senior Hydrologist, DSER/NRO/NRC; and (4) Lance W. Vail, Senior Research Engineer in the Hydrology Group, ESD/EED/PNNL. See Tr. at 1060-84.

4.124 The qualifications of all four of these witness have been previously discussed by the Board above in connection with its ruling on contention EC 1.2 regarding impingement/entrainment/thermal impacts on aquatic resources. See supra section IV.A.1.b.

c. Joint Intervenors

4.125 With respect to EC 1.3, Joint Intervenors provided the testimony of three witnesses: (1) William Powers, principal of Powers Engineering; (2) Barry W. Sulkin, a private consultant to Joint Intervenors on water-related environmental matters; and (3) Dr. Shawn P. Young, Research Faculty of Fisheries Biology at the University of Idaho Moscow, Idaho, and a member of the Adjunct Faculty at Clemson University. See Tr. at 1084-1194, 1199-1285.

4.126 Mr. Powers has a Bachelor of Science in Mechanical Engineering from Duke University and a Master of Public Health in Environmental Sciences from the University of North Carolina and is a registered professional engineer in the state of California. He has over

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twenty-five years of experience serving as a lead engineer and project manager for power generation, permitting, technical assessments, and emissions control projects. He has also published and presented on the subject of air cooling of power plants. See Powers EC 1.3 Direct Testimony at 1-3; Exh. JTIR00044 (Bill Powers, P.E., CV).

4.127 The qualifications of Mr. Sulkin and Dr. Young have been previously discussed by the Board above in connection with its ruling on contention EC 1.2 regarding impingement/entrainment/thermal impacts on aquatic resources. See supra section IV.A.1.c.

4.128 Based on the foregoing, and the respective background and experience of the proffered witnesses, the Board finds that each of these witnesses is qualified to testify as an expert witness relative to the subject of the analysis of dry cooling as an alternative to the proposed Vogtle Units 3 and 4 closed-cycle wet cooling system.

2. Dry Cooling System

4.129 In section IV.A.2 above, we described in general the way in which the closed-cycle wet cooling system for the proposed Vogtle Units 3 and 4 would operate. More specifically, in a closed-cycle wet cooling system, the steam leaving the turbine is condensed using a steam surface condenser. This 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 for recirculation in the steam generator. See Cuchens EC 1.3 Direct Testimony at 3-4; Exh. SNCR00024, at 3-4 (Jim Cuchens, Feasibility of Air-Cooled Condenser Cooling System for the Standardized AP1000 Nuclear Plant (Jan. 9, 2009)) [hereinafter SNC Air-Cooled Feasibility Study]. At the same time, the now-heated water in the condenser tubes is pumped to a cooling tower, where it discharges its heat to the atmosphere largely through evaporation. See id. The cooling tower can be either mechanical draft, which uses fans to force air through the tower to cool the water, or natural

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draft, which uses the physical properties of warm and cold air to create a natural flow of air through the tower, much like the effect of the chimney on a fireplace. See SNC Air-Cooled Feasibility Study at 7. The remaining cool water is then collected and pumped back through the condenser tubes in the steam surface condenser. See id. at 4.

4.130 This can be contrasted with an alternative facility cooling system, i.e., a dry system that uses air instead of water as the main heat transfer medium for the steam coming out of the turbine. With an air-cooled condensing (ACC) system, the steam leaving the turbine is piped through large ducts outside of the turbine building to an ACC, where it is condensed into water inside large, metal-finned tubes that have air flowing across their outside surface. While the heat is thus rejected directly to the atmosphere, the water is drained into a large tank from which it is pumped back into the plant to again create steam. See SNC Air-Cooled Feasibility Study at 3, 12. An ACC, somewhat like a wet system with a mechanical draft cooling tower, uses fans to force air across the finned tubes to achieve optimum heat transfer, see SNC Air-Cooled Feasibility Study at 12.

4.131 Another dry cooling system alternative is indirect dry cooling, of which two examples, the HELLER system, see Exh. JTIR00038 (Andras Balogh & Zoltan Szabo, The Advanced HELLER System Technical Features & Characteristics (June 2005)) [hereinafter Heller System Features], and the cooling towers at the Kendal plant in South Africa, see Exh. SNC000098, at 2 (J.W. Cuchens, Kogan Creek Project Dry Cooling Technology Investigation Final Report (May 1999) [hereinafter Kogan Creek Investigation]), were described in this proceeding. In both designs, steam leaving the turbine is condensed using cooling water (or a glycol solution, see Tr. at 1241) in a condenser and not cooled directly by air, see Heller System Features at 3; Kogan Creek Investigation at 2. The cooling water is then pumped to a cooling tower and cooled using air flowing over finned tube bundles in the tower. See Heller System

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Features at 3; Kogan Creek Investigation at 2. The Kendal plant uses a natural draft cooling tower, while the HELLER system can use either a natural or a mechanical draft tower. See Heller System Features at 7-8; Kogan Creek Investigation at 2. Indirect dry cooling systems with natural draft air cooling towers have smaller parasitic loads (i.e., the energy expenditure required to run the cooling system) than a direct dry cooling system. See Tr. at 1232-33.

4.132 The focus of this contention is the extent to which a dry cooling system is an appropriate alternative to the wet cooling system proposed for Vogtle Units 3 and 4.

3. FEIS Discussion Relative to Contention EC 1.3

4.133 The EC 1.3-related discussion in the Vogtle FEIS relative to a dry cooling system as an alternative to a wet cooling system is found in section 9.3 (System Design Alternatives). There the staff noted that although the use of dry cooling would eliminate aquatic impingement/entrainment/thermal impacts, this alternative system had significant disadvantages. Citing an EPA rulemaking (which also was a significant factor in our admission of this contention, see section IV.B.5.a below) that considered, among other things, whether to adopt dry cooling as the best technology available for minimizing adverse environmental impacts, the staff concluded that dry cooling involved additional expenses that made it less cost effective. See FEIS 1B, at 9-26 (citing National Pollutant Discharge Elimination System: Regulations Addressing Cooling Water Intake Structures for New Facilities, 66 Fed. Reg. 65,256 (Dec. 18, 2001)). Also, according to the staff, because of the increased power usage to move large amounts of air through a heat exchanger, dry cooling would involve higher fuel use and spent fuel transportation and storage impacts along with elevated noise levels and increased land use impacts associated with an ACC. See id. at 9-26 to -27. These disadvantages, when considered in conjunction with the staff's conclusion that the aquatic impacts of the proposed wet cooling system would be SMALL, led the staff to conclude that a

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dry cooling system would not be preferable to the wet cooling system being proposed for Vogtle Units 3 and 4.

4. NRC Regulations and Regulatory Guidance

4.134 Contention EC 1.3 as initially admitted challenged the SNC ER as failing to adequately address the dry cooling alternative as required by 10 C.F.R. § 51.45(b)(3). Because NEPA-based challenges raised prior to the issuance of a DEIS become, in effect, challenges to the DEIS and, subsequently, the FEIS as those documents are issued, see supra section III.B, the Board considers contention EC 1.3 to be a challenge to the adequacy of the FEIS dry cooling discussion. The Board also concludes, however, that section 51.45(b)(3) remains the applicable standard in that section 51.90 instructs the staff to prepare the FEIS “in accordance with the [DEIS-related] requirements in §§ 51.70(b) and 51.71,” and section 51.71, in turn, instructs the staff to address in the DEIS matters an applicant is instructed to address in the ER under section 51.45. See 10 C.F.R. §§ 51.90, 51.71(a). Thus, the Board must decide whether the FEIS discussion of the dry cooling alternative is “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.’” Id. § 51.45(b)(3). And in that regard, staff witnesses testified that in determining the level of detail in which to analyze dry cooling as an alternative, they followed ESRP section 9.4.1, which states “[t]he depth of the analysis should be governed by the nature and magnitude of proposed heat dissipation system impacts” 2007 ESRP at 9.4.1-5; see Staff EC 1.3 Direct Testimony at 9-11.

5. Adequacy of Assessment of Dry Cooling System As an Alternative

4.135 Because the staff found the impacts from the proposed closed-cycle wet cooling system to be SMALL, pursuant to ESRP section 9.4.1, the staff indicated it did not conduct a

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more detailed analysis of dry cooling. See Staff EC 1.3 Direct Testimony at 10-11. Joint Intervenors do not challenge the staff's reliance on this ESRP guidance, but instead argue that even under ESRP section 9.4.1 the staff should have analyzed dry cooling in more detail because its SMALL impacts conclusion was unjustified. See Joint Intervenors Proposed Findings at 28-30; Joint Intervenors Reply Findings at 7-8.

4.136 Having found the staff reasonably concluded that impacts from the proposed wet cooling system would be SMALL, see section IV.A.9 above, we also find that it appropriately followed its own NEPA guidance in providing a more limited discussion of the dry cooling alternative than it would have if the impacts had been MODERATE or LARGE. The FEIS assessment of system design alternatives does discuss the environmental impacts of dry cooling, albeit qualitatively, and compares them to the impacts of the proposed wet cooling system before concluding that dry cooling would not be preferable, see FEIS 1B, at 9-26 to -27, in accordance with section 51.45(b)(3).³⁴ Even if that were not the case, however, for the reasons outlined below, the preponderance of the evidence before the Board supports the conclusion that the FEIS discussion, as supplemented by the information now before the Board as a result of the evidentiary hearing, establishes that (1) the agency's NEPA obligations in connection with the adequacy of the discussion of dry cooling have been satisfied; and (2) the staff's conclusion that the dry cooling alternative is not the preferable alternative relative to proposed Vogtle Units 3 and 4 is a reasonable determination.

a. Extremely Sensitive Biological Resources

4.137 As was noted above, see supra section IV.B.3, the FEIS cites EPA's extensive rulemaking analysis of cooling technologies and conclusion that dry cooling is not the best

³⁴ 10 C.F.R. § 51.45(b)(3) states that "[t]o the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form."

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available cooling technology for a national requirement as support for not finding dry cooling to be preferable to closed-cycle wet cooling for proposed Vogtle Units 3 and 4.³⁵ See FEIS 1B, at 9-26. As was also discussed above, see supra section III.B, the staff has the discretion to rely on the data and inferences from this EPA analysis. At the same time, as we noted in our order admitting contention EC 1.3, EPA stated in that rule that dry cooling might be appropriate for some facilities if, for example, they would rely on bodies of water with “extremely sensitive biological resources.” LBP-07-3, 65 NRC at 260 (quoting 66 Fed. Reg. at 65,282); see also LBP-08-3, 67 NRC at 91 (summary disposition ruling regarding EC 1.3). Thus, further NRC analysis of dry cooling might be necessary despite EPA’s analysis if proposed Vogtle Units 3 and 4 were to fall into the category of facilities affecting extremely sensitive biological resources (ESBRs).

4.138 As staff witness Dr. Masnik noted, see Tr. at 1066-67, EPA did not define ESBRs; instead, it merely listed as examples “endangered species” and “specially protected areas,” 66 Fed. Reg. at 65,282. We agree with the staff, however, that its definition of “important species” likely encompasses any ESBRs that might be affected by proposed Vogtle Units 3 and 4.

³⁵ The statement of considerations accompanying the EPA rule includes an analysis of dry cooling implementation as a national strategy based on a nearly zero intake flow and rejects dry cooling as the national minimum requirement because (1) dry cooling technology carries costs that are sufficient to pose a barrier to entry into the marketplace for some facilities; (2) dry cooling has some 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. EPA also indicated the cost is estimated at more than three times the cost of wet cooling. See 66 Fed. Reg. at 65,282.

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4.139 Joint Intervenors appear to argue that the presence of ESBRs in the vicinity of the VEGP site should, by itself, trigger a more detailed analysis of dry cooling.³⁶ See Joint Intervenors Reply Findings at 11. But EPA stated only that dry cooling “may be the appropriate cooling technology for some facilities” and that “[t]his could be the case” when ESBRs are present. 66 Fed. Reg. at 65,282 (emphasis added). At a minimum, the mere presence of ESBRs in the vicinity of a project does not equate to dry cooling being the appropriate cooling technology for that project. Nor do we think it reasonable that the possibility that dry cooling may be appropriate by reason of the presence of ESBRs should necessarily trigger a detailed analysis of the dry cooling alternative if it can be shown that any impacts of a wet cooling system to ESBRs are likely to be minor. Otherwise, the presence of a single specimen of an endangered species near a proposed power plant could trigger an in-depth study of dry cooling even if the plant would have only an insignificant effect on the specimen, and even less on the species. We therefore agree with the staff and SNC that some impact to ESBRs greater than SMALL must be involved to trigger the requirement of a more detailed analysis.³⁷ Thus, because the information in the FEIS properly shows the proposed wet cooling system for Vogtle Units 3 and 4 will have no more than SMALL impacts on important species,³⁸ see supra

³⁶ Joint Intervenors also appeared to maintain, perhaps in the alternative, that a more detailed discussion was necessary because the staff’s SMALL impacts conclusion was unfounded. See Tr. at 1112, 1175.

³⁷ SNC asserts that the definition of ESBRs includes a further requirement that the proposed non-dry cooling system pose “significant risks” to the species or area in question. See Coutant EC 1.3 Direct Testimony at 4; see also Tr. at 1046-47. We do not find it necessary to determine whether the characterization is appropriate, however, as we conclude that some level of impact on ESBRs beyond SMALL must be present to trigger a more detailed discussion of dry cooling than was provided in the FEIS.

³⁸ As we noted in sections IV.A.4.c and IV.A.5.c above, the staff’s analysis of impacts is further supported with regard to the shortnose sturgeon by NMFS, which the staff consulted pursuant to the Endangered Species Act and which stated that proposed Vogtle Units 3 and 4

(continued...)

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section IVA.9, we find that the staff's reliance on EPA's analysis of dry cooling was reasonable and that the FEIS therefore contained sufficient information to support a finding that dry cooling would not be a preferable alternative to wet cooling at the VEGP site.

b. Dry Cooling as a Feasible Alternative

4.140 In addition, SNC asserts that NEPA does not require a more detailed analysis of dry cooling as an alternative because it is not feasible for a large nuclear power plant at the VEGP site and is therefore not a "reasonable" alternative that must be discussed under NEPA. See SNC Proposed Findings at 55-56. The feasibility argument centers on the high level of risk associated with implementing a dry cooling technology that is unproven for an application of the size and geographical location of the Vogtle Units 3 and 4 AP1000 reactors. Given the various implementation risks discussed below, the preponderance of the evidence before us leads us to conclude the use of dry cooling is not a feasible alternative for an AP1000 reactor at the VEGP site.

i. Technical Background

4.141 To generate electricity, a pressurized water nuclear reactor (such as the AP1000) heats water into steam in the steam generators. The steam is then passed to a turbine. The turbine turns a generator to create electricity, while the steam is condensed back into water and returned to the steam generator to repeat the cycle. See Cuchens EC 1.3 Direct Testimony at 3-4; SNC Air-Cooled Feasibility Study at 3.

4.142 According to SNC witness Mr. Cuchens, during the steam condenser cooling process, as steam condenses back into liquid water, it takes up significantly less space or

³⁸(...continued)

are "not likely to adversely affect shortnose sturgeon." NMFS Consultation Letter at 4. Though Joint Intervenors apparently discount the NMFS letter, they do so on the basis of construction impacts, see Joint Intervenors Reply Findings at 12, which are not associated with the facility cooling system operational impacts question that is the focus of contention EC 1.3.

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volume, which creates a vacuum inside the steam condenser and/or turbine exhaust that is referred to as backpressure. See Cuchens EC 1.3 Direct Testimony at 5. The turbine specified in the AP1000 DCD is a standard-backpressure turbine (sometimes referred to as a low-backpressure turbine) that is designed to operate at an average backpressure of 2.92 inches (") of mercury absolute pressure (HgA) at the design inlet cold water temperature of 91°F, see SNC Air-Cooled Feasibility Study at 6; Exh. SNC000028, at 10.2-18 (AP1000 DCD (Rev. 17) § 10.2) [hereinafter AP1000 DCD Rev. 17], though it can operate at backpressures within a range of 1.0" HgA to 5.0" HgA, see Cuchens EC 1.3 Direct Testimony at 6-7. At backpressures above 5.0" HgA, but below the standard-backpressure turbine's trip point of 6.0" HgA, the turbine cannot operate continuously. See SNC Air-Cooled Feasibility Study at 6. At 6.0" HgA, the turbine is set to trip offline to prevent damage to the turbine. See id. Thus, a standard-backpressure turbine cannot function reliably at higher backpressures. A turbine trip can also lead to a reactor scram, which is a rapid shutdown of the reactor, that increases the risk of a safety challenge to the reactor. See Tr. at 1039-40. On the other hand, high-backpressure turbines operate at an average backpressure of 8.0" HgA or higher, see Powers EC 1.3 Direct Testimony at 5, thus minimizing the potential for a reactor scram and turbine trip at relatively high backpressures, see Cuchens EC 1.3 Rebuttal Testimony at 5; Tr. at 985, 1039-40.

4.143 The backpressure experienced in an ACC-cooled unit depends largely on the Initial Temperature Difference (ITD), which is the difference between the temperature of the outside air (ambient temperature) and the temperature of the steam condensing within the tube bundles. See Cuchens EC 1.3 Direct Testimony at 7; SNC Air-Cooled Feasibility Study at 13; see also Powers EC 1.3 Direct Testimony at 5. At a given ITD, the higher the ambient temperature in which an air-cooled turbine operates, the higher the steam saturation

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temperature and, therefore, the higher the backpressures on the turbine. See Cuchens Direct Testimony at 7; SNC Air-Cooled Feasibility Study at 13. According to uncontroverted testimony by Mr. Cuchens, current state-of-the-art ACCs are designed with an ITD of 40° F, and a few have an ITD as low as 35° F, but no currently existing ACC has an ITD lower than 35° F. Id.

4.144 Just as a wet cooling system can operate with either a standard-backpressure or a high-backpressure turbine, a dry cooling system can also be paired with either a standard-backpressure turbine or a high-backpressure turbine under the proper conditions.

ii. Feasibility of a High-backpressure Turbine at Vogtle

4.145 Although Joint Intervenors appear to have abandoned the notion that an ACC with the AP1000 standard-backpressure turbine is a reasonable alternative in this situation,³⁹

³⁹ Even if Joint Intervenors had continued to press that argument, however, we would find that the combination of a standard AP1000 turbine and an ACC would not be feasible at the VEGP site. The standard AP1000 turbine is a standard-backpressure turbine. See SNC Air-Cooled Feasibility Study at 5-6 (normal operating backpressure for AP1000 turbine is between 1.0" and 5.0" HgA). SNC witness James Cuchens nonetheless stated that a high-backpressure turbine would be a "necessity" for an air-cooled system at the VEGP site, Tr. at 1203, and Joint Intervenors witness William Powers confirmed that a high-backpressure turbine would be the "most likely" scenario, Tr. at 1202. This certainly seems correct, for as Mr. Cuchens pointed out, and Mr. Powers did not dispute, at the design temperature for the Vogtle site of 95°F, a state-of-the-art ACC (with an ITD of 35°F) would produce a backpressure of 4.5" HgA, just 0.5" below the alarm point for the standard turbine. See Cuchens EC 1.3 Direct Testimony at 8; Tr. at 982-83 (Cuchens); Tr. at 1120-21 (Powers). Higher ambient air temperatures, wind influences, and normally expected fouling of the ACC would lead to further backpressure increases. See Tr. at 983 (Cuchens: "very difficult" to maintain the five inches in very high temperature period); Tr. at 984 (Cuchens: "fouling itself can incur back pressures additive to half of an inch to one inch"); Tr. at 995 (Cuchens: "So 4.5 represents 95 degrees in a perfect calm, a very perfect calm day, no wind influence, no recirculation influence, no fouling influences."). Also in this regard, Mr. Cuchens testified regarding and produced trip reports indicating that, for example, particularly in its early years wind effects substantially impacted performance and caused load swings and unit trips at Matimba, an ACC-cooled South African coal plant consisting of six 665 megawatt electric (MWe) units. See Tr. at 1268-69; Kogan Creek Investigation at 3-4, 12. Although Mr. Powers argued that wind effects could be mitigated with wind skirts like the ones implemented at Matimba, see Tr. at 1277, as Mr. Cuchens testified, the ACC for Vogtle Units 3 and 4 would likely be designed differently from Matimba, because the AP1000 design is more open so that the ACC would be exposed on all sides so as to require protection on all sides, thereby needing a wind skirt design that has not previously

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they continue to assert that a high-backpressure turbine coupled with an ACC would be feasible for the proposed Vogtle Units 3 and 4. See Joint Intervenors Proposed Findings at 22-23. High-backpressure turbines have never been used with large nuclear reactor units, however. See Tr. at 1170 (“Judge Trikouros: So there is experience out there with high backpressure turbines, but they are not nuclear? Mr. Powers: That is correct.”); Tr. at 1217 (“Judge Trikouros: Are you aware of a high backpressure turbine in use in a commercial nuclear power plant regardless of the specific cooling system applied at the plant? Mr. Powers: No. . . . Mr. Cuchens: No.”). As Mr. Cuchens stated, and Mr. Powers did not contradict, there are no existing high-backpressure turbines capable of handling the 8.4 million pounds per hour steam flow from an 1154 megawatt electric (MWe) AP1000 nuclear unit such as are planned for Vogtle Units 3 and 4. See Cuchens EC 1.3 Direct Testimony at 9; SNC Air-Cooled Feasibility Study at 17; Tr. at 1212. The largest currently-operating high-backpressure turbines that either party mentioned are in the mid-600 MWe South African plants, which are not triple-exhaust turbines. See Tr. at 978. Mr. Powers does appear to rely on North Anna Unit 4, which is to utilize an Economic Simplified Boiling Water Reactor (ESBWR) certified design as proposed in the North Anna ESP application, see Exh. JTI000051 at 1.2-50 (excerpts from General Electric

³⁹(...continued)

been implemented. See Tr. at 1282-83. For his part, Mr. Powers, albeit asserting that “a manufacturer has to meet site conditions,” Tr. at 1120, did not indicate how the effects of fouling might be mitigated.

The record before us thus indicates that to utilize an ACC with the standard AP1000 DCD, a high-backpressure turbine would likely be required so as to avoid operating at or near the alarm setpoints, see Tr. at 980-84, 999-1000, that bring the safety and reliability challenges posed by the higher likelihood of standard-backpressure turbine trips and reactor scrams, see Tr. at 1039, 1203-04. Accordingly, it seems clear that the combination of an ACC with a triple-exhaust, standard-backpressure turbine is neither “sufficiently demonstrated nor practicable for use” in this instance so as to be a viable NEPA alternative. Kelley v. Selin, 42 F.3d at 1521. Further, we note that because an indirect dry cooling system would have the same ITD limitations as an ACC, see Tr. at 1242, it also would not be a feasible alternative for use in combination with a standard-backpressure turbine.

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(GE)-Hitachi Nuclear Energy, ESBWR [DCD] Tier 2, chap. 1, §§ 1.1 to 1.11 (rev. 4 Sept. 2007)), as an example of a large nuclear unit with a completely dry cooling system and possibly a high backpressure turbine, see Tr. at 1211, 1215. When asked, however, Mr. Powers admitted that to his knowledge ESBWR designer GE had not built a prototype of such a turbine.⁴⁰ See Tr. at 1215. Moreover, since no combined license (COL) application has been filed for North Anna Unit 4, we do not know if the facility will attempt to use a high backpressure turbine to implement the completely dry cooling system Dominion apparently committed to relative to the ESP.

4.146 Mr. Powers also suggested that the standard-backpressure turbine for the AP1000 might be modified to become a high-backpressure turbine by removing the last-stage bucket, i.e., the last set of turbine blades. See Tr. at 1159. However, as Mr. Cuchens noted, modification of a standard-backpressure turbine to a high-backpressure turbine has “never been done for a unit the size of AP-1000 ever before,” and no modifications of this nature have been made for a triple-exhaust turbine. Tr. at 1206. When queried, Mr. Powers agreed that the largest existing high-backpressure turbines that are “modifications of a standard turbine by the

⁴⁰ Joint Intervenors assertion that this proceeding, like the North Anna Unit 4 proceeding, concerns an ESP application does not strengthen their argument in this regard. See Joint Intervenors Reply Findings at 9. Given the NRC did not make a feasibility determination regarding the facility cooling system in granting this ESP, see Tr. at 1254-55, this hardly supports the feasibility finding necessary to require an applicant proposing a different cooling system to discuss dry cooling as an alternative.

Similarly, Joint Intervenors earlier references to a potential wet/dry hybrid cooling system for North Anna Unit 3, see Powers EC 1.3 Rebuttal Testimony at 5, which they did not pursue in their proposed findings, see supra note 12, also are unavailing. As Mr. Pierce and Mr. Cuchens pointed out, North Anna 3 would use a standard-backpressure turbine, see Tr. at 1212, and would be completely dry-cooled only under favorable (i.e., cool) weather conditions. See Tr. at 988-89; Exh. SNC000096 at 2-173 (Dominion, North Anna 3 [COL] Application, Part 2: Final Safety Analysis Report (rev. 1 Dec. 2008)) (“Maximum Water Conservation (MWC) -- The dry cooling tower and hybrid cooling tower operate in series with a provision for cold weather bypass”). North Anna 3 therefore does not show that dry cooling would be feasible as a full-time cooling system with the turbine type being utilized at the VEGP site.

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removal of the last stage bucket” are those at South Africa’s Matimba plant, “at just under 700 megawatts.” Tr. at 1209. Again, however, as Mr. Cuchens indicated, these are not triple-exhaust turbines. See Tr. at 978.

4.147 Given that (1) a high-backpressure turbine capable of handling the steam flow from an AP1000 nuclear unit does not currently exist; and (2) modification of a large triple-exhaust turbine like the AP1000 standard-backpressure turbine to a high-backpressure turbine has never been done, it seems apparent that the use of an ACC and high-backpressure turbine in this instance poses a significant implementation risk such that it is neither “sufficiently demonstrated nor practicable for use” so as to be a viable NEPA alternative. Kelley v. Selin, 42 F.3d at 1521.

c. Dry Cooling as a Preferable Alternative

4.148 Additionally, for the reasons set forth below, we find that the extensive hearing record before us, as it supplements the information in the FEIS, fully supports the staff’s conclusion that dry cooling is not preferable to closed-cycle wet cooling towers for Vogtle Units 3 and 4. To be sure, staff witnesses admitted that dry cooling would largely eliminate impacts on aquatic biota. See NRC Staff EC 1.3 Direct Testimony at 7-8. Nonetheless, the record contains ample evidence that dry cooling would require significant modifications to the standard AP1000 design, reduce power output, cost more to design, implement, and maintain, require more land, and delay the licensing and construction process for these proposed facilities. Particularly when combined with the SMALL environmental impact of the closed-cycle wet cooling system, as established by the record regarding the staff’s conclusion concerning impingement/entrainment/thermal impacts on the aquatic environment (including ESBRs), as supplemented by the SNC impingement and entrainment studies, see supra sections IV.A.4 to .8, and the technological challenges of implementing a first-of-a-kind dry cooling system in a

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large nuclear plant that makes implementation here infeasible,⁴¹ see supra section IV.B.5.b, it is clear that the preponderance of the evidence associated with these factors supports a finding that, as the staff found in its FEIS, the dry cooling alternative is not the preferable alternative.⁴²

i. Need for Modifications to AP1000 DCD Standard Design

4.149 SNC maintains that significant modifications to the AP1000 standard design would be needed to accommodate an ACC with or without a high-backpressure turbine. See Tr. at 1000-01. SNC presented essentially un rebutted evidence that changes would be necessary to the turbine building, turbine pedestal, feed water heaters and associated piping, and steam surface condensers. See Cuchens EC 1.3 Direct Testimony at 26-28; Cuchens EC 1.3 Rebuttal Testimony at 5-6; Pierce EC 1.3 Rebuttal Testimony at 5; SNC Air-Cooled Feasibility Study at 26; Tr. at 1004-1006, 1263-1264. Mr. Cuchens particularly emphasized that the need to construct large steam ducts to carry steam from the turbine building to the ACC modules would impact areas with a significant amount of structural steel, thus requiring a re-design of the turbine building structure as well as the relocation of major equipment from its AP1000 DCD-specified locations to make room for the ducts. See Tr. at 1004-05; Exh. SNCR00026 at unnumbered slide 26 (James W. Cuchens, Dry Cooling Presentation). On the other hand, Joint Intervenors, who do not address the impact of turbine building modifications at all in their proposed findings, see supra note 12, failed to provide adequate

⁴¹ Although technical infeasibility, set forth in the previous section, provides a separate basis of support for why the FEIS did not need to analyze the dry cooling alternative in further detail, the same facts supporting a finding that dry cooling is not feasible also support a finding that it is not a preferable alternative if a fuller analysis is performed.

⁴² Under NEPA, once "the adverse environmental effects of the proposed action are adequately identified and evaluated, the agency is not constrained by NEPA from deciding that other values outweigh the environmental costs," Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 351 (1989), so that the agency's NEPA obligations are satisfied once the record contains sufficient support and analysis regarding the dry cooling alternative to explain its determination for not finding dry cooling to be preferable.

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evidence to rebut SNC's evidence that the modifications would be significant. For example, though Mr. Powers suggested that the steam ducts could be customized to accommodate the structural steel, see Tr. at 1156, he also stated that an additional detailed study would need to be made of the standard design to determine whether the building or the ducts should be modified, see id., and he admitted that he himself had not reviewed the building plans, see Tr. at 1159. So too, while not prepared to discuss the extent of modifications identified by Mr. Cuchens, Mr. Powers did agree that changes to the standardized design could increase costs. See Tr. at 1161.

4.150 Additionally, Mr. Pierce suggested that modifications to the turbine would require modifications to the standard AP1000 design. If, for example, SNC were to employ a high-backpressure turbine that does not retain the Tier I characteristics of one high-pressure turbine, three low-pressure stages, and a condenser, an exemption from the certified design would be required. See Tr. at 1016-17. Indeed, Joint Intervenors appear to concede that certain portions of the DCD would need to be re-analyzed in light of the modification of the standard-backpressure turbine to a high-backpressure turbine. See Joint Intervenors Proposed Findings at 23.

ii. Cost Factors

(1) Energy Penalty

4.151 The parties appear to agree that an ACC-cooled system at the VEGP site would produce less net electricity than the proposed wet-cooled system due to a combination of efficiency losses from operating at a higher backpressure and the parasitic load (i.e., electrical generation usage) differences that exist between operating wet systems and ACCs. Mr. Cuchens' analysis of dry cooling for proposed Vogtle Units 3 and 4 concluded that the parasitic load difference between a 4.5" HgA ACC and a wet cooling tower would be 9-15 MWe,

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depending on whether a mechanical draft or a natural draft wet tower were chosen for comparison. See SNC Air-Cooled Feasibility Study at 26. This difference is evidenced in a comparison of the energy requirements of the ACC fans with the circulating water pumps in a wet cooling tower and, for a mechanical wet cooling tower, the fans in the wet tower. See id. Mr. Powers appeared to agree that the difference between an ACC and a mechanical wet tower would be 9 MWe.⁴³ See Tr. at 1147-48. As Mr. Powers noted, there would be no parasitic load from fans in a natural draft dry cooling system.⁴⁴ See Tr. at 1233. Thus, there might or might not be a parasitic load difference between wet and dry cooling systems, depending on whether one compares mechanical (i.e., fan-assisted) or natural draft systems.

4.152 Dry cooling systems do, however, appear to be less efficient than wet cooling systems and would, therefore, result in a lower power output regardless of parasitic load. Mr. Cuchens calculated that, at the VEGP site design temperature of 95° F, the backpressure difference between one of the proposed Vogtle units and a facility with an ACC with a 35° F ITD would lead to a reduction in power output of approximately 55 MWe in a standard-backpressure AP1000 turbine. See SNC Air-Cooled Feasibility Study at 15. Mr. Cuchens did not provide an output differential for a high-backpressure turbine because, as no high-backpressure turbines currently exist for applications such as the AP1000 nuclear reactor, no efficiency curves exist of the type he relied on to reach his 55 MWe figure for the standard-backpressure turbine. See Tr. at 1231. But as both Mr. Cuchens and Mr. Powers noted, conversion of a

⁴³ Mr. Powers correctly indicated that to be done fairly, the cost comparison has to be done on a consistent basis, i.e., wet mechanical v. dry mechanical and wet natural draft v. dry natural draft. See Tr. at 1232-33.

⁴⁴ Mr. Powers further stated that the natural draft dry tower would have a parasitic load advantage over a natural draft wet tower because the dry tower would not require circulating water pumps. See id. However, in the context of indirect dry cooling towers, which rely on circulating water or glycol, rather than air, as a cooling medium, see supra section IV.B.2, we think it unlikely that the parasitic load from the pumps could be eliminated for the dry towers.

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standard-backpressure turbine to a corresponding high-backpressure turbine would also result in some performance degradation because the modified turbine would no longer be able to extract as much energy from the steam passing over it. See Tr. at 1205, 1208 (Powers); Tr. at 1206-07 (Cuchens). Mr. Powers argued that the difference for a standard-backpressure turbine would be much smaller than the figure Mr. Cuchens gave, but did not provide his own figure for an ACC at the design temperature, instead stating that the total output differential between a dry-cooled plant and a wet-cooled plant under average conditions would be 15-20 MWe. See Powers EC 1.3 Direct Testimony at 9; Tr. at 1096. He also stated that a natural draft dry-cooled system, which in his opinion would actually have a lower parasitic load than a natural draft wet-cooled system, would experience a total performance penalty of four percent at 95° F with a yearly average of about two percent. See Tr. at 1233-34.

4.153 Overall, the information in the record supports a finding that a dry-cooled system will be less efficient than a wet-cooled system, particularly at or above the design temperature for the VEGP site, leading to less energy production, especially on hot days.⁴⁵

(2) Capital Costs

4.154 It is also undisputed that a dry cooling system would cost more to build than would the proposed wet natural draft towers. Witnesses for SNC and Joint Intervenors appeared to agree that an ACC would cost around \$200 million more per reactor unit than would a natural draft wet cooling tower system. See Cuchens EC 1.3 Direct Testimony at 22, Tr. at 1151 (Powers). Additionally, both parties appear to agree that modifications taking the facility design away from the standard AP1000 design, which would require additional

⁴⁵ To the degree Joint Intervenors have criticized the staff's failure to calculate the efficiency penalty associated with dry cooling, see Joint Intervenors Proposed Findings at 26, any significance to such an omission is now irrelevant as the hearing record and this opinion supplement the FEIS. See supra section III.A.

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design/engineering/operational/safety analyses, would further increase capital costs. See Cuchens EC 1.3 Direct Testimony at 28-29; Pierce EC 1.3 Rebuttal Testimony, at 6; Tr. at 1161 (Powers); Tr. at 1243-44 (Pierce). In this regard, Mr. Pierce indicated that the capital cost differential between using natural draft wet towers and using ACCs would increase significantly, beyond the \$200 million dollar figure identified above, if a high-backpressure turbine were used in place of the standard AP1000 turbine. See Tr. at 1279 (Pierce: "So look at a dry cooling system with a high backpressure turbine . . . and now so you're looking at several hundred million dollars at this point."). Thus, although the exact re-design costs are unknown at this point, the parties' testimony clearly indicated they could be quite significant.

(3) Maintenance Costs

4.155 The parties dispute as well the extent to which maintenance requirements would be greater for an air-cooled system than for the proposed wet cooling system. SNC witness Mr. Cuchens stated that the metal structure of the ACC, which makes it subject to corrosion, and the greater number of moving parts in an ACC would lead to a greater need for maintenance. See Tr. at 1008-09. In contrast, Joint Interveners witness Mr. Powers argues that fans in an ACC, "operating in clean, ambient air" would not be subject to a significant amount of fouling and would therefore not require a significant amount of maintenance. See Tr. at 1250-51. Mr. Powers, however, did not offer any testimony to contradict SNC's evidence that actual experience with ACCs indicates that a significant amount of maintenance was required. See Tr. at 1246-47, 1250-51; Kogan Creek Investigation at 3-4. Accordingly, we find that maintenance costs would likely be higher for an ACC than for a wet cooling system.⁴⁶

⁴⁶ In the context of maintenance requirements, the parties did not specifically discuss natural draft dry cooling towers. Nonetheless, given the evidence in the record indicating that capital costs for natural draft dry towers are two to three times higher than for ACCs, see Kogan Creek Investigation at 10, we consider it likely the increased capital costs for a natural draft dry
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iii. Land Use Impacts

4.156 SNC and Joint Intervenors both indicated that ACCs would occupy more land than the proposed wet cooling towers. SNC witness Thomas Moorer estimated an area of 248.9 acres for a 324-cell ACC, see Moorer EC 1.3 Direct Testimony at 4, but noted that a 202-cell ACC (the size that would achieve a 35°F ITD) would occupy about two thirds of that area, see Tr. at 1057, which would translate to approximately 166 acres. Mr. Powers, testifying for Joint Intervenors, suggested that the 202-cell ACC would occupy about sixty percent of the area of a 324-cell ACC, see Powers EC 1.3 Rebuttal Testimony at 4-5, or just under 150 acres, but Joint Intervenors now appear to concede that an ACC would require an area of approximately two-thirds of the expanse originally estimated by Mr. Moorer. See Joint Intervenors Proposed Findings at 27. By both parties' estimates, however, an ACC would require more than twice the amount of land the proposed Vogtle Units 3 and 4 wet cooling towers would occupy. See Moorer EC 1.3 Direct Testimony at 5 (wet towers would occupy seventy acres). Thus, land use impacts would necessarily seem to be greater with an ACC than with the proposed wet cooling system.⁴⁷

iv. Schedule Impacts

4.157 Finally, depending on the extent of modifications necessary to the AP1000 standard design to accommodate dry cooling, see section IV.B.5.c.i above, portions of the site safety analysis report might need to be reconsidered before proposed Vogtle Units 3 and 4

⁴⁶(...continued)
tower would outweigh the lower maintenance costs.

⁴⁷ Although neither party addressed natural draft dry towers in this context in their proposed findings, SNC witness Mr. Cuchens stated that natural draft dry towers would require an amount of land between the amount required for wet towers and the amount required for an ACC. See Tr. at 1058-59. Thus, natural draft dry cooling towers would also likely have greater land use impacts than the proposed Vogtle Units 3 and 4 natural draft wet towers.

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could be licensed as dry-cooled units. See Pierce EC 1.3 Rebuttal at 5-6; Tr. at 1018-23. For example, Mr. Pierce testified that a design analysis would need to be done of the effect of a dry cooling system on the plant's ability to accommodate the full range of design basis events, such as a full-load rejection. See Tr. at 1017-19. Although this topic was only discussed qualitatively by the parties, implementing dry cooling at proposed Vogtle Units 3 and 4 no doubt would lead to delays in the licensing process and incur additional analysis costs. See id. at 1255.

4.158 Thus, the evidentiary support for the various factors outlined above establishes by a preponderance that impacts associated with the design/construction/operational changes from the AP1000 standard design that will result by implementing a dry-cooling system in lieu of the planned wet cooling system, as well as those arising from increased costs, expanded land use, and scheduling delays, render dry-cooling as not being preferable to wet cooling in this instance.

6. Summary of Findings Regarding Contention EC 1.3

4.159 In summary, the Board finds that the discussion of the dry-cooling alternative in the staff FEIS, as supplemented by the record in this proceeding, satisfies the NRC's NEPA obligations. Because the staff reasonably concluded that aquatic impacts in general, and impacts to ESBRs in particular, would be SMALL, the staff reasonably relied on the ESRP assessment guidance and EPA's cooling technology rulemaking in arriving at a finding that dry cooling not to be a preferable alternative. In this regard, we disagree with Joint Intervenors assertion that the mere presence of ESBRs in the vicinity of the VEGP site mandates a detailed analysis of dry cooling, and we find the staff's reliance on EPA's analysis to be reasonable absent any indication that the impact of the proposed new reactors on ESBRs would be more than minor.

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4.160 Additionally, dry cooling need not be explored in more detail for the VEGP site under NEPA because, in this instance, the preponderance of the evidence establishes it is not technologically feasible and is therefore not a "reasonable" alternative for NEPA purposes. The high-backpressure turbine, although apparently now championed by Joint Intervenors because it would minimize the safety and reliability problems that are likely to be caused by using dry cooling in conjunction with a standard-backpressure AP1000 turbine, is an unproven technology for large nuclear plants such as the proposed Vogtle units.

4.161 Finally, the preponderance of the evidence in the record of this proceeding, which supplements the FEIS, further demonstrates that dry cooling is not a preferable alternative to a closed-cycle wet cooling system in this instance because it would require substantial modifications going away from the standard AP1000 design, cost significantly more, require more land, and likely would delay construction and operation of the new reactors.

4.162 Accordingly, a judgment on the merits regarding contention EC 1.3 is entered in favor of the staff and SNC.

C. Contention EC 6.0

1. Scope of Contention EC 6.0

4.163 As discussed in section II.B above, Joint Intervenors contention EC 6.0 as submitted was broader than what was admitted by the Licensing Board. The Board found that certain foundational support proffered for the contention did not meet the requirements for contention admissibility under 10 C.F.R. § 2.309(f). The contention as admitted reflects Joint Intervenors concerns that the discussion regarding federal navigation channel dredging was inadequate to support the staff's finding that the impacts of dredging could be MODERATE. Specifically, it includes Joint Intervenors allegations -- as discussed in the declarations of their two expert witnesses, Dr. Donald Hayes and Dr. Shawn Young -- that the FEIS should contain

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more information about the extent and duration of any dredging, the impacts on water quality, the disposal of any dredged material, and the impacts on aquatic biota as a result of any dredging. In addition, it includes Joint Intervenors claim that the FEIS should have contained a discussion of environmental impacts from any releases that the USACE might make from upstream reservoirs to accommodate barge transportation.

4.164 There were references in the testimony proffered during the evidentiary phase of this proceeding that mentioned the potential for transportation of construction components by rail or highway. See Tr. at 1319-20. However, to the extent that Joint Intervenors now claim that the staff's FEIS should have analyzed the impacts associated with other modes of transportation for construction components, see Joint Intervenors Proposed Findings at 31-32; Joint Intervenors Reply Findings at 18-20, these issues are not properly within the scope of EC 6.0 because these issues were not raised in the contention admissibility phase. Alternative modes of transportation will be discussed here only to illustrate the other options besides barging that SNC has relative to construction component transportation.

2. Witnesses and Evidence Presented

4.165 SNC, the staff, and Joint Intervenors presented witnesses in support of their respective positions on contention EC 6.0, providing written direct and rebuttal testimony, with supporting exhibits, as well as oral testimony at the evidentiary hearing. See Tr. at 1287-1382, 1475-1631; [SNC] Testimony of Jeffrey Neubert, Benjamin Smith, and David Scott Concerning EC 6.0 (fol. Tr. at 1290) [hereinafter Neubert/Smith/Scott EC 6.0 Direct Testimony]; [SNC] Testimony of Thomas Moorer Concerning EC 6.0 (fol. Tr. at 1291) [hereinafter Moorer EC 6.0 Direct Testimony]; [SNC] Testimony of Dr. Charles Coutant Concerning EC 6.0 (fol. Tr. at 1292) [hereinafter Coutant EC 6.0 Direct Testimony]; [SNC] Rebuttal Testimony of Dr. Charles C. Coutant on [EC] 6.0 (fol. Tr. at 1293) [hereinafter Coutant

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EC 6.0 Rebuttal Testimony]; NRC Staff Testimony of Mark D. Notich, Anne R. Kuntzleman, Rebekah H. Krieg, Dr. Christopher B. Cook, and Lance W. Vail Concerning Environmental Contention EC 6.0 (fol. Tr. at 1477) [hereinafter Staff EC 6.0 Direct Testimony]; NRC Staff Rebuttal Testimony of Anne R. Kuntzleman Concerning Environmental Contention EC 6.0 (fol. Tr. at 1479) [hereinafter Staff EC 6.0 Rebuttal Testimony]; Revised Pre-filed Direct Testimony of Shawn P. Young in Support of EC 6.0 (fol. Tr. at 1569) [hereinafter Young EC 6.0 Direct Testimony]; Rebuttal Testimony of Dr. Shawn P. Young Concerning Contention EC 6.0 (fol. Tr. at 1570) [hereinafter Young EC 6.0 Rebuttal Testimony]; Revised Pre-filed Direct Testimony of Donald F. Hayes in Support of EC 6.0 (fol. Tr. at 1572) [hereinafter Hayes EC 6.0 Direct Testimony]; Prefiled Rebuttal Testimony of Dr. Donald [Hayes] Concerning Contention EC 6.0 (fol. Tr. at 1573) [hereinafter Hayes EC 6.0 Rebuttal Testimony]. USACE representatives who appeared at the request of the staff, provided direct testimony and oral testimony at the evidentiary hearing. See Tr. at 1383-1467; [USACE] Testimony of William G. Bailey, Carol L. Bernstein, Lyle J. Maciejewski, and Stanley L. Simpson Concerning Environmental Contention EC 6.0 (fol. Tr. at 1385) [hereinafter USACE EC 6.0 Direct Testimony].

a. SNC Witnesses

4.166 SNC presented five witnesses: (1) Dr. Charles C. Coutant, a consultant for SNC in the areas of aquatic ecology and fisheries biology; (2) Thomas C. Moorer, SNC's Project Manager for Environmental Support; (3) Jeffrey L. Neubert, Director of Logistics for Nuclear Power for Westinghouse Electric Company; (4) Captain H. David Scott, Owner, President, and Principal Surveyor of Southeastern Marine Surveying Company; and (5) Benjamin B. Smith, Operations Manager for Stevens Towing Company. See Tr. at 1287-1382.

4.167 Dr. Coutant's and Mr. Moorer's expert qualifications have been previously discussed in connection with contention EC 1.2. See supra section IV.A.1.a.

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4.168 Mr. Neubert earned a Bachelor of Science degree in Engineering Mechanics from Pennsylvania State University and an Executive Masters of Business Administration from University of Pittsburgh. He has over thirty-five years of experience in logistics management, including teaching university-level courses on transportation management, logistics management, and supply chain management. Mr. Neubert is currently employed as the Director of Logistics for Nuclear Power at Westinghouse Electric Company, where, earlier in his career, he was involved in the delivery of major components to over forty nuclear power plant construction sites, including Vogtle Units 1 and 2. See Neubert/Smith/Scott EC 6.0 Direct Testimony at 1-2.

4.169 Captain Scott earned a Bachelor of Science in Nautical Science from Maine Maritime Academy. He has over thirty years of experience in the shipping trade and maritime industry, holds licenses and certifications for piloting vessels on oceans and on the Savannah River, and for the past twenty-six years has served as the Owner, President, and Principal Surveyor of Southeastern Marine Surveying Company. See Neubert/Smith/Scott EC 6.0 Direct Testimony at 1, 3.

4.170 Mr. Smith earned a Bachelor of Arts in History from The University of the South, Sewanee, Tennessee, and a Masters of Business Administration from the Citadel. He has over twenty years of experience planning and supervising all inland and offshore operations for a barge transportation company with a fleet of nine tug boats and twenty-five barges. He has supervised operations on all of the navigable rivers in the Southeast, including the Savannah River, delivering large manufactured pieces, transformers, generators, turbines, and chemical plant vessels. Mr. Smith is versed in shallow water tug and barge operations and the practices and techniques required for deliveries of difficult project cargo. He is currently employed as the

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Operations Manager at Stevens Towing Company, Inc. See Neubert/Smith/Scott EC 6.0 Direct Testimony at 1-3.

b. Staff Witnesses

4.171 The staff presented five witnesses: (1) Dr. Christopher B. Cook, Senior Hydrologist, DSER/NRO/NRC; (2) Rebekah H. Krieg, Senior Research Scientist in the Ecology Group, ESD/EED/PNNL; (3) Anne R. Kuntzleman, Aquatic Biologist, DSER/NRO/NRC; (4) Mark D. Notich, Senior Project Manager, DSER/NRO/NRC; and (5) Lance W. Vail, Senior Research Engineer in the Hydrology Group, ESD/EED/PNNL. See Tr. at 1475-1566.

4.172 The qualifications of Dr. Cook, Ms. Krieg, Ms. Kuntzleman, and Mr. Vail have been previously discussed by the Board in connection with contention EC 1.2. See supra section IV.A.1.b.

4.173 Mr. Notich earned a Bachelor of Science in Agricultural Chemistry from the University of Maryland. He has over thirty years experience with the preparation of environmental assessments and environmental impact statements. Mr. Notich currently is employed as a Senior Project Manager, DSER/NRO/NRC. In this capacity he served as the NRC Project Manager for the environmental review of the Vogtle ESP application. See Staff EC 6.0 Direct Testimony at 1 & unnumbered attach. 6 (Mark D. Notich SPQ).

c. USACE Witnesses

4.174 Pursuant to the staff's request and an authorization by the USACE Savannah District to address topics within USACE's authority, see USACE EC 6.0 Direct Testimony at 3, four USACE witnesses also appeared: (1) William G. Bailey; (2) Carol L. Bernstein; (3) Lyle J. Maciejewski; and (4) Stanley L. Simpson. See Tr. at 1383-1466.

4.175 Mr. Bailey earned a Bachelor of Science in Forestry from Syracuse University, a Bachelor of Science in Biology from SUNY College of Environmental Science and Forestry, and

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a Master of Science in Civil Engineering from North Carolina State University. He is currently employed with USACE as Chief of the Savannah Planning Unit, Savannah-Mobile Regional Planning Center (Environmental Resources, Plan Formulation, and Economics), Mobile District. He manages the Savannah District Unit's planning program, which evaluates the environmental impacts and economic feasibility of new projects and the environmental compliance of existing projects. In this capacity Mr. Bailey provides advice and direction and reviews the work of environmental staff. See USACE EC 6.0 Direct Testimony at 1-2 & unnumbered attach. 2 (William George Bailey SPQ); Tr. at 1390-91.

4.176 Ms. Bernstein earned a Bachelor of Science in Renewable Natural Resources from the University of Arizona and a Master of Science in Interdisciplinary Environmental Sciences Studies from Johns Hopkins University. She is currently employed with USACE as Chief of the Coastal Branch, Regulatory Division, Savannah District. The Regulatory Division has full responsibility for planning, programming, administering, and enforcing the Regulatory Program, including permit evaluation, enforcement, noncompliance, and mitigation under the Rivers and Harbors Act and the Clean Water Act. In her capacity as Chief of the Coastal Branch in the Regulatory Division she manages and executes the regulatory program for the southern half of Georgia and supervises eighteen interdisciplinary staff, including two section chiefs and one field office. See USACE EC 6.0 Direct Testimony at 1-2 & unnumbered attach. 4 (Carol L. Bernstein SPQ); Tr. at 1390.

4.177 Mr. Maciejewski earned both a Bachelors and a Masters degree in Civil Engineering from the South Dakota School of Mines and Technology. He is currently employed with USACE as Operations Project Manager in the Navigations Branch, Operations Division, Savannah District. In this capacity he budgets, schedules work, coordinates, monitors funding, and serves as technical point of contact with internal and external customers for work involving

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maintenance dredging of the Savannah Harbor and river basin. See USACE EC 6.0 Direct Testimony at 1-2 & unnumbered attach. 6 (Lyle Maciejewski SPQ); Tr. at 1389.

4.178 Mr. Simpson earned a Bachelor of Science in Civil Engineering from Clemson University. He is currently employed with USACE as the Savannah District Water Control Manager, Engineering Division, Wilmington District. In his capacity as the Water Control Manager, Mr. Simpson is involved in the day-to-day operations of water management in the Savannah River Basin, establishing rules in the Water Control Manuals, and developing the Drought Contingency Plan. He manages water resources, prepares periodic reports and data-calls on Water Control activities and the Water Control Data System, and provides technical support to other USACE divisions. His work involves daily communication with USACE personnel and entities both within and outside the USACE. See USACE EC 6.0 Direct Testimony at 1-3 & unnumbered attach. 8 (Stanley L. Simpson SPQ); Tr. at 1392-93.

d. Joint Intervenors Witnesses

4.179 Joint Intervenors presented two witnesses for contention EC 6.0: Dr. Donald Hayes, a civil engineering professor and professional engineer, and Dr. Shawn P. Young, a fisheries biologist. See Tr. at 1567-1631.

4.180 Dr. Hayes earned both a Bachelor of Science and a Master of Science in Civil Engineering from Mississippi State University and a Ph.D. in Civil Engineering with emphases in Environmental Engineering and Water Resources Planning and Management from Colorado State University. He is currently employed as the Director of the Institute for Coastal Ecology and Engineering and is an Endowed Professor of Civil Engineering at the University of Louisiana at Lafayette. He is a registered Professional Engineer in the State of Mississippi and a Board Certified Environmental Engineer by the American Academy of Environmental Engineers. Dr. Hayes has over twenty-seven years of experience as an engineer, much of it

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related to dredging and associated impacts. He also serves on the Board of Directors of the Western Dredging Association. See Hayes EC 6.0 Direct Testimony at 1-2; Exh. JTIR20041, at unnumbered page 1 (Declaration of Donald Hayes (Sept. 21, 2008)); see also Exh. JTIR00045 (CV of Donald Hayes).

4.181 Dr. Young's background and expert qualifications are discussed in connection with EC 1.2 in section IV.A.1.c supra.

4.182 Based on the foregoing, and the respective background and experience of the witnesses, the Board finds that each of these witnesses is qualified to testify as an expert witness relative to the analysis of likely impacts from any dredging of the Savannah River federal navigation channel necessary for construction of proposed Vogtle Units 3 and 4.

3. Factual Background for Contention EC 6.0

4.183 SNC has stated that "the optimal and desired method of delivery of heavy components to the Plant Vogtle Units 3 [and] 4 construction site [is] via barge." Neubert/Smith/Scott EC 6.0 Direct Testimony at 3. This is because, in SNC's estimation, barge delivery is "the most efficient and cost-effective method of delivery," id. at 4, considering that these components likely will be manufactured overseas and will arrive in the United States via ship, and, as SNC witness Mr. Neubert explained, traveling as far as possible by water with such components is generally preferred. See Tr. at 1340-41. SNC plans to transport only the heavy components (such as the reactor vessel and steam generators) via barge, with the other construction components likely being transported by rail or highway. See Tr. at 1319-20. SNC currently estimates thirty to sixty barge shipments for the heavy components. See Tr. at 1322.

4.184 The proposed barge shipments will travel through a portion of the Savannah River downstream from the VEGP site known as the federal navigation channel, which is under USACE jurisdiction. See FEIS 1A, at 4-27. USACE has the authority to maintain the channel to

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a depth of nine feet by a width of ninety feet to enable river navigation, but has not maintained the channel since 1979. See id.; Tr. at 1338, 1463.

4.185 Because of this gap in maintenance dredging, federal and state authorities and citizens groups provided comments on the staff's DEIS that indicated the staff should consider the impacts of potential dredging of the channel in the staff's environmental review process. See FEIS 1C, at E-55 to -57. This resulted in the staff's inclusion of a brief discussion in the Cumulative Impacts section of the FEIS and a staff conclusion that any impacts from dredging could be MODERATE. See id. at E-58; FEIS 1B, at 7-20 to -21. The adequacy of the staff's analysis and the purported lack of reasoning behind the staff's conclusion were subsequently challenged by Joint Intervenors and became one of the subjects of this contention. The other aspect of the contention concerns the staff's decision not to include a discussion of any water releases from upstream reservoirs that Joint Intervenors allege will be made to otherwise support the navigation of SNC barges through the federal navigation channel.

4.186 As an initial matter, it is useful to outline the SNC options relative to use of the federal navigation channel and the process that would follow a decision to pursue any one of the options. SNC has three options if it plans to use the federal navigation channel for the transportation of construction components to the Vogtle site: (1) proceed without dredging, relying on the flow of the Savannah River to enable barging; (2) request that the USACE perform maintenance dredging of the federal navigation channel pursuant to its authority; or (3) request a permit from USACE for SNC to perform its own dredging of the federal navigation channel. See Tr. at 1346-47.

a. Barging Without Dredging

4.187 If SNC makes the determination that it will transport at least some of the construction components by barge, but decides that it will not pursue dredging of the federal

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navigation channel and, instead, will rely on the flow of the Savannah River, SNC will be limited in its use of the channel to periods of time when the flow is sufficient to accommodate barging of its components. Witnesses from USACE and the staff acknowledged that one of the barge shipments on the Savannah River within the past ten years, a Chem Nuclear shipment of contaminated reactor vessels to Barnwell, South Carolina (which involved the transport of a 700-ton payload on a 200 by 40-foot barge with a draft of about 5.5 feet), required a flow of about 10,000 cubic feet per second. USACE EC 6.0 Direct Testimony at 5; Staff EC 6.0 Direct Testimony at 9; Tr. at 1438-40. According to USACE, this shipment was roughly equivalent to what would be required to ship a steam generator, the largest component that will be transported to the VEGP site for proposed Units 3 and 4.⁴⁸ See Tr. at 1439-40. According to SNC witnesses, a flow of 10,000 cubic feet per second would be in excess of what is needed to ship a steam generator.⁴⁹ See Tr. at 1327-28.

4.188 As of the date of the evidentiary hearing, given that the Savannah River has been in drought condition, the river flow was at a level where barging of large industrial components would not be feasible without dredging. See USACE EC 6.0 Direct Testimony at 5. The flow of the river as of January 5, 2009, was 3790 cfs based on data from the United States Geological Survey Augusta gauge. See Neubert/Smith/Scott EC 6.0 Direct Testimony at 9. USACE witness Mr. Simpson indicated, however, that the river flow could change in a relatively short period of time following precipitation, which could involve a transition from a drought to a

⁴⁸ Compare USACE EC 6.0 Direct Testimony at 5, and Tr. at 1439-40, with Neubert/Smith/Scott EC 6.0 Direct Testimony at 5.

⁴⁹ Although SNC witnesses indicated that the Chem Nuclear shipment had a somewhat higher payload that required a greater barge draft, see Tr. at 1327-28, this does not diminish the relevance of their testimony regarding the sufficiency of a 10,000 cfs flow for the Vogtle steam generators. If sufficient for what might have been a somewhat larger load, such a 10,000 cfs flow would be more than enough for a (relatively) lighter component.

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flood. Mr. Simpson testified that the transition out of the 1998 to 2003 drought occurred in about two to three months. See Tr. at 1442-43.

4.189 Although SNC will not need USACE permission for navigation prior to a barge shipment that can be accomplished without dredging (or, indeed under either of the two dredging scenarios delineated in section IV.C.3 above once the channel has been adequately dredged), if SNC wants USACE to release water from the reservoirs upstream from the VEGP site, this must be coordinated with USACE. See id. If drought conditions were not present, as they were at the time of the hearing, USACE would attempt to accommodate such a request, and “would release as little [water] as [necessary] . . . to provide that service.” Tr. at 1445. The amount of water necessary is determined ahead of time by the pilot who will be handling the trip or by USACE's review of its gauges at various locations on the river, although USACE does not have the duty to ascertain the status of the navigation channel. See Tr. at 1444-46.

4.190 The Chem Nuclear barge shipment discussed above involved a release by USACE and serves as an example of what is required for a release. See Tr. at 1441. USACE “had to water up the river about a week in advance,” and “keep it watered up while they transport[ed] their barge up, off-load[ed] it, turn[ed] it around and ship[ped] it back,” which took roughly a two-week period. Tr. at 1439. This has occurred about three or four times in the last twenty years. See id. In other instances, when there is enough water stored in the flood control pools, water can be released for the duration required for a barge shipment without requiring USACE “to do anything out of the ordinary.” Tr. at 1441. In these instances, USACE stores water in its flood control pools after a “high storm event, high inflow event” and then “release[s] it at a non-damaging rate rather than just passing the storm on through.” Tr. at 1441-42. Additionally, in the past, when USACE knew ahead of time that a shipment was planned,

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USACE stored water in the flood control pools to provide enough water for the shipment. See Tr. at 1440.

4.191 Prior to making such a release, USACE will consider environmental concerns that might be identified by resource agencies. See Tr. at 1451. For example, relative to a release, USACE witness Mr. Simpson explained that "[w]e have concerns about the way we make the release, the time that we make the release[, or i]f it's a spawning season or that time of year." Tr. at 1447. This would be done in accordance with USACE's current authority and likely would not require a new NEPA analysis. See Tr. at 1451-52. Nonetheless, because of the drought, USACE is currently operating pursuant to its Drought Contingency Plan, under which it will not release water from its reservoirs to facilitate barge shipments. See id.

b. Request for USACE to Conduct Maintenance Dredging

4.192 Alternatively, assuming SNC decides that it will transport at least some of the construction components by barge, it might choose to request that USACE conduct maintenance dredging pursuant to USACE's current authority to dredge the federal navigation channel. SNC indicated that this would be the preferred option if dredging were determined to be necessary. See Tr. at 1315-16, 1373.

4.193 At the evidentiary hearing, USACE described in detail the steps that would need to be taken to resume maintenance dredging of the channel. USACE has the authority to perform maintenance dredging of the federal navigation channel to enable transportation. See FEIS 1A, at 4-27. USACE has been authorized to maintain the channel to a depth of nine feet and a width of ninety feet. See id. The last time USACE dredged the channel, however, was in 1979, approximately thirty years ago. See id. Since that time, sediment has settled in the channel, and trees and snags, or woody debris, have accumulated, changing the depth and width of the channel. Based on a survey commissioned by SNC and performed in July 2008,

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SNC estimates that a total of 36,500 cubic yards of dredged material and 277 snags and trees would need to be removed from the 110-mile stretch of river between the mouth of the Savannah River and the VEGP facility to enable barge transportation on a barge 220 feet in length by 55 feet in width carrying 730 tons of cargo with a 5.5 foot draft. See Neubert/Smith/Scott EC 6.0 Direct Testimony at 5; Tr. at 1321. USACE stated that it does not have the funds to review the survey commissioned by SNC, although it acknowledged that it was aware of the SNC survey. See Tr. at 1457.

4.194 Although USACE has the authority to dredge the federal navigation channel, it currently does not have the funds to resume maintenance dredging. See Tr. at 1411, 1452-53; USACE EC 6.0 Direct Testimony at 9. To request funds, USACE would need to develop a budget request that would be submitted at the district level, then the regional level, and then the national level as the President's budget proposal to Congress. See Tr. at 1409-10. At each level, proposed projects are ranked against each other and are in competition for funding with other projects. See Tr. at 1410. The budget "process typically takes [eighteen] months." Id. To give an idea of how far in advance the process is initiated, USACE will soon begin work on its budget for fiscal year 2011, which begins in October 2010. See Tr. at 1419.

4.195 USACE witness Mr. Maciejewski explained, however, that funds are normally requested when there are at least two users of the channel. See Tr. at 1461; see also Tr. at 1448-49. Accordingly, with SNC being considered one user, it normally would require another user also to request that the channel be dredged before USACE will consider dredging. See Tr. at 1448. Mr. Maciejewski also stated that he believed USACE had made funding requests to dredge the channel since 1979, but that they were out-competed by other projects. See Tr. at 1461-63.

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4.196 An alternative to initiating a funding request would be if Congress directed the USACE to resume maintenance dredging and appropriated the funds. Tr. at 1419-20.

4.197 Aside from the initial funding needed for conducting the maintenance dredging, because the channel has not been maintained since 1979, the USACE might be required to perform an environmental assessment (EA) or an EIS prior to resuming maintenance, which likely will require additional funds as well as additional time to complete the environmental review process. See Tr. at 1453-54; see also Tr. at 1398 (stating EIS process takes approximately two years to complete). The environmental review process in this instance is similar to that for permit applications, see infra section IV.C.3.c, in which public comment is elicited on the proposed project, members of the public have an opportunity to request a hearing or otherwise participate in the review process, and an EA or an EIS is produced. See Tr. at 1412-15.

4.198 Furthermore, because this is an “older project,” an additional time consideration for maintenance dredging likely would be the necessary review of any “real estate actions,” or anything having to do with real estate, to ensure that USACE and its dredging contractor have access to disposal sites, parking for workers, and storage for supplies. See Tr. at 1455-56. Mr. Maciejewski stated that this process “might be quite time intensive.” Tr. at 1456.

c. Request for a Permit for SNC to Perform Dredging

4.199 Finally, assuming SNC were to decide that it will transport at least some of the construction components by barge, it might choose to apply for a permit from USACE for SNC to perform the federal navigation channel dredging. If that is the case, SNC would need to provide USACE with a complete application and be prepared to provide any additional information USACE requires, such as sediment testing. See Tr. at 1393-94. In addition, SNC would need to ensure that any other project for which a permit would be required that is

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sufficiently related to the dredging request is also included in its application at that time. This is because USACE regulations prohibit segmentation, or deliberate attempts to submit piecemeal requests to make a project appear smaller than it is. See Tr. at 1402-03. Because SNC plans to dredge parts of the river for a barge slip and the intake and discharge structures for its Vogtle Units 3 and 4 cooling system, for which USACE anticipates SNC will apply for a permit in winter 2009, see USACE EC 6.0 Direct Testimony at 7, these projects likely would have to be included with any project to dredge the channel in one complete application to avoid segmentation, and this process could delay permit issuance. See Tr. at 1346, 1348, 1402-03; USACE EC 6.0 Direct Testimony at 7. For this reason, the permit option likely is the least desirable for SNC. See Tr. at 1314-16, 1348.

4.200 USACE described the permit application process in detail during the evidentiary hearing. Once an application for a dredging permit is received, it is reviewed for completeness and a public notice is issued with a thirty-day period for comment on the proposed project. See Tr. at 1394, 1397. The comment period might be extended up to ninety days at the request of other federal and state agencies that wish to provide comments. See Tr. at 1397. USACE then performs a NEPA analysis of the proposed project. Over the course of its review, USACE might seek additional information from the applicant in order for it to make its permit decision. See Tr. at 1399. If USACE issues an EA with a "Finding of No Significant Impact," it will proceed to a permit decision without an additional comment period. See Tr. at 1398. If it determines that an EIS is necessary, either from the EA process or at the outset of its review of the application, an additional public involvement process ensues, which can take approximately two years to complete. See id. The need to produce an EIS could also add additional time to the permit decision process because the Regulatory Division that handles permitting typically is not funded to conduct its EIS process. See Tr. at 1421. USACE witness Ms. Bernstein explained that the

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Regulatory Division “ha[s] to go to headquarters and ask for that funding usually a year ahead . . . to give them a heads up and say, ‘we’ve got this coming down, and put us in the budget for this EIS for this project.’” Id. She also indicated that the applicant will pay for the EIS. See id.

4.201 For certain projects, any member of the public may request a public hearing, although these are not often held. At a public hearing, the District Engineer presides and testimony is taken in the presence of a court reporter. More often USACE will hold a workshop, or request that the applicant hold a workshop, which is a less formal forum for allowing public participation than the public hearing. See Tr. at 1400.

4.202 If issued, the permit likely would contain specific information about the areas authorized for dredging, the method of dredging, and the disposal areas, but would allow for some flexibility for the permit holder to “adaptively manage” the project. Tr. at 1404, 1406. The permit might also contain certain conditions, if, after its environmental review, USACE determines them to be necessary. See Tr. at 1404-05; USACE EC 6.0 Direct Testimony at 7-8. For example, USACE could place restrictions on dredging where cultural resources are found, restrict the time of year dredging is conducted, limit the type of dredge, or limit the disposal area. See Tr. at 1404-05. Generally the permit would be valid for five years, with an opportunity to request an extension. See Tr. at 1403. USACE will also conduct a compliance inspection at some point after the permit is issued and work begins on the project. See Tr. at 1405.

d. Barging Not Used for Transportation

4.203 The three options discussed above all assume that SNC will decide to barge at least some of the construction components for Vogtle Units 3 and 4. After reviewing its options, however, SNC could forego barging altogether and decide to transport its components solely by rail or by truck. See Tr. at 1315. SNC witness Mr. Neubert testified that in his employment for

Westinghouse Electric Company he was required to analyze “at least two viable delivery methods for every component that goes into the AP1000,” Tr. at 1320, and stated 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. at 1321.

4. Staff’s FEIS Methodology Regarding Dredging-Related Impacts

4.204 After receiving comments on the DEIS from federal and state resource agencies as well as members of the public regarding the possibility of dredging, the staff determined that the potential impacts associated with dredging were “worthy of mention,” Tr. at 1497, in the Cumulative Impacts section of the FEIS. Staff EC 6.0 Direct Testimony at 5-6, 11. The staff, pursuant to the definition of cumulative impacts provided in CEQ regulations and the staff’s environmental review guidance document, “determined this was the appropriate section for the discussion of dredging because the action of dredging the Federal navigation channel in the Savannah River is not under the NRC’s jurisdiction and would require a separate review under [NEPA].” Id. at 11-12.

4.205 At the time the staff incorporated this analysis into the FEIS, little information was available as to what SNC’s plans were in terms of transporting its components via barge and any dredging of the river that would be required to enable transportation. See id. at 7-8, 10; Staff EC 6.0 Rebuttal Testimony at 3-4; FEIS 1A, at 4-27. The staff held informal discussions with SNC and with members of the USACE both prior to and after issuance of the DEIS. See Staff EC 6.0 Direct Testimony at 7-8. In these discussions, SNC “stated that the Corps had a mandate to maintain the Federal navigation channel,” while members of the USACE “stated that while the Corps had authorization for maintaining the Federal navigation channel, the channel had not been maintained for decades and Congress would need to provide funding before maintenance dredging could resume.” Id. at 8. USACE officials also indicated in these

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discussions that SNC had not made any formal request for dredging the federal navigation channel. See id. at 8. Based on these discussions, the staff “did not believe that dredging for the Federal navigation channel was expected to occur.” Id. at 7; see also id. at 8 (“[T]he staff determined that it was unlikely that dredging of the Federal navigation channel would occur and certainly not within any short-term time frame.”).

4.206 The staff also assumed that there would be other options that SNC could pursue. The staff, based on informal conversations with USACE, “believe[d] that large components could be barged during periods of naturally occurring high flow” without dredging. Id. at 8. Moreover, the staff assumed that there were other available transportation options besides barging -- road and rail transportation, for example. See id. at 7.

4.207 Because of the limited information available to the staff and the uncertainty over whether (1) the AP1000 components would be barged; and, if so, (2) the channel would need to be dredged to enable barging, the staff performed a qualitative analysis of the impacts of the dredging project. See Staff EC 6.0 Rebuttal Testimony at 3. The staff emphasized that “[w]ithout project-specific information for such a potentially large-scale dredging project (one that indeed may change in scope after review by the resource and regulatory agencies or not occur at all), the Staff could not conduct a meaningful quantitative assessment.” Id. at 3; see also id. at 4. Despite the limited information available, “based on the [s]taff’s familiarity with previous dredging projects, the [s]taff determined that a qualitative analysis to identify the types of potential environmental impacts likely to occur with such a project was appropriate.” Id. at 3.

4.208 To perform the qualitative analysis, the staff drew upon the experience of Ms. Kuntzleman, who for almost twenty years served as a biologist for the Department of the Navy, Engineering Field Activity Northeast, where she “worked on very complex, controversial, and environmentally sensitive dredging projects” located throughout the northeast. Staff

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EC 6.0 Direct Testimony at 13-14. The staff also relied on its understanding of USACE's environmental review process and the types of considerations that USACE would take into account regarding either resuming maintenance dredging or approving a permit for SNC to perform the dredging, with the understanding that dredging will have to comply with state water quality standards. See id. at 16-18.

4.209 Given that there was a limited amount of information available regarding the possibility of dredging the channel, the staff had to assume certain conditions in order to perform its analysis. Although "[t]here were orders of magnitude of possible volumes of dredging," Tr. at 1546, the staff assumed that the channel would be dredged to a depth of nine feet and a width of ninety feet, see Tr. at 1487, 1546, and that "depending on the level of water flow, most areas of the Federal navigation channel above rkm 56 (RM 35) would likely need to be dredged to allow barge traffic during normal river flow." FEIS 1A, at 4-27.

4.210 In the FEIS and in its testimony provided at the evidentiary hearing, the staff outlined the types of impacts that might result from dredging the federal navigation channel or disposing of the dredged material and mitigating measures to minimize such impacts. See FEIS 1B, at 7-20; Staff EC 6.0 Direct Testimony at 13-15, 20-21.

a. Types of Impacts on Aquatic Biota

4.211 In terms of the potential impacts on aquatic biota as a result of dredging or disposing of dredged material, the staff stated that dredging the federal navigation channel "would likely have an effect on aquatic organisms for most trophic levels." Staff EC 6.0 Direct Testimony at 13. Based on "the general types of potential adverse environmental effects [Ms. Kuntzleman] ha[s] evaluated with previous dredging projects," Staff EC 6.0 Direct Testimony at 14, dredging could result in a "destruction of benthic habitat, disruption of spawning

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migrations, . . . and the direct (e.g., toxicological) and indirect (e.g., habitat alteration) effects on fish and their prey species.” Staff EC 6.0 Direct Testimony at 14. The staff elaborated that

[m]aintenance dredging may result in adverse effects to benthic habitat either by direct removal of the benthic substrate by the dredging operation itself, or via disposal of the dredged material onto the benthic habitat at the disposal site. Various fish species can also lose a source of forage from removal of benthic macroinvertebrates within the dredged area. Sediment disturbance can also impact fish spawning, egg and larval development, and juvenile survivorship.

Id. at 15.

b. Types of Impacts on Water Quality

4.212 In terms of potential impacts on water quality from dredging and disposal of dredged material, the staff stated that

[w]ater quality impacts . . . include physical, chemical, and biological impacts. Physical impairment of the water column occurs from changes in dissolved oxygen, pH, oxidation-reduction state, and turbidity with a resultant decrease in light penetration. Chemical impairment is caused by release of various chemical contaminants that may occur within the sediment. Biological impairment can occur when introduction of dredged material into the water column kills submerged aquatic vegetation and macroalgae (either through direct smothering or via impaired light penetration) leading to higher rates of bacterial decomposition and a resultant increase in bacterial oxygen demand.

Id.

c. Disposal of Dredged Material

4.213 According to the staff, the amount of dredged material and the locations for, and method of, disposing of dredged material could not be identified based on the limited information available regarding SNC's plans to transport the heavy components to the VEGP site. See FEIS 1A, at 4-27; FEIS 1B, at 7-20; Tr. at 1534-35. The staff, however, did take into account the potential impacts of dredged material disposal when discussing the impacts to aquatic biota and water quality that are outlined above. See Staff EC 6.0 Direct Testimony

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at 15. The staff also noted at the hearing that USACE likely would use upland disposal locations rather than the in-water placement method that was employed in 1979 when the channel was last maintained. See Tr. at 1535. The staff indicated that the eventual review of the upland dredge disposal locations, would “get down to a level of detail” of evaluating “the access road into the disposal site” as well as the disposal areas “to make sure there were no wetlands or endangered species there.” Tr. at 1536.

d. Mitigation Measures

4.214 Based on the staff's understanding of typical USACE environmental review practice, the staff believed that any adverse environmental impacts as a result of dredging or disposal of dredged material would be mitigated or minimized through appropriate steps taken by USACE. See Staff EC 6.0 Direct Testimony at 17. Regarding impacts to aquatic biota, the staff assumed that after consultation with “Federal resource agencies, including the U.S. Fish and Wildlife Service . . . and National Marine Fisheries Service” and coordination with state regulatory and resource agencies over “where the dredging and dredged material disposal would occur,” biota at risk would be identified. Id. The agencies would then “determine the time of the year the areas proposed for maintenance dredging would be used by important species (e.g., birds, fish, macroinvertebrates) for breeding, foraging, rearing, or migration.” Id. Accordingly, USACE “would likely be required to avoid dredging activities during peak reproductive and migratory activities, and seasonal restrictions (or environmental windows) would be established by the Federal and state resource agencies for the project.” Id.

4.215 If there are endangered mussel species present in a proposed dredging area, relocation of mussels might be a last resort option; otherwise, every effort likely would be made “to minimize the amount of dredging in that area.” Tr. at 1535-36; see also Staff EC 6.0 Direct Testimony at 22. Relocation of mussels is a last resort option because the success of

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relocation depends on the experience level of the person conducting the relocation, the time of year, and the weather conditions. See Tr. at 1536.

4.216 With regard to mitigation of potential water quality impacts, the staff explained that “if dredging were conducted, by employing best management practices, impacts to water quality would be minimized and the water quality of the Savannah River would return to pre-project conditions.” Staff EC 6.0 Direct Testimony at 21. These best management practices include

selection of the proper dredge type and/or size, use of a sealed or environmental bucket for mechanical dredging, deployment of silt curtain containments, use of sheet pile enclosures, management of barge overflow, and control of sediment loss from bucket to barge as well as from the barge to the upland offloading location.

Id. Time-of-year restrictions on dredging could also reduce water quality impacts, see id., as could any water quality restrictions that are put in place by the states of Georgia and South Carolina under the Clean Water Act, see id. at 18. For example, “Georgia and South Carolina likely would require implementation of a water quality monitoring plan, and violation of state water quality standards would not be permitted to occur beyond a designated mixing zone.” Id.

4.217 The staff cautioned that these mitigation measures were discussed “as examples only and not as specific recommendations . . . because there was (and is) no formal request or permit application to dredge the Federal navigation channel before the Corps for its review.” Id. at 20.

e. Staff’s Conclusion Regarding Cumulative Impacts of Dredging

4.218 After making the above observations regarding potential impacts to aquatic biota, water quality, and possible mitigation measures, the staff concluded “that the cumulative impacts to aquatic organisms in the region from the construction including dredging of a navigation channel could be MODERATE, depending on the type of mitigation.” FEIS 1B,

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at 7-20. As we noted previously, “MODERATE” is defined as “[e]nvironmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.” FEIS 1A, at 1-4. In the staff’s view, this was a conservative assessment of the potential impacts given the staff’s “anticipat[ion] that the Federal and state regulatory and resource agencies responsible for reviewing the dredging project would require project-specific mitigation measures to ensure that the cumulative impacts to aquatic organisms in the region would not be LARGE,” Staff EC 6.0 Direct Testimony at 18-19; see also id. at 22, 24, which is defined as “clearly noticeable” environmental effects that “are sufficient to destabilize important attributes of the resource.” FEIS 1A, at 1-4. Instead, according to the staff, it was likely that the impacts could be “up to” MODERATE, and even could be SMALL, but the selection of MODERATE represented a range of possibilities without more specific information. Tr. at 1525-26. In making its MODERATE finding, the staff noted that “these impacts would be evaluated in more detail in the NEPA analysis that would need to be conducted by the USACE.” FEIS 1B, at 7-21.

5. Parties’ Arguments Regarding Dredging-Related Impacts

4.219 The staff and SNC both argue that because it is speculative whether the channel will need to be dredged, a cumulative impacts analysis of dredging is not required under NEPA to be included in the staff’s FEIS. See Staff Proposed Findings at 83; SNC Proposed Findings at 92. Alternatively, both argue that even assuming such an analysis were required, the staff’s review is sufficient to satisfy NEPA requirements because USACE will ultimately identify potential impacts and potential mitigation measures that will ensure any impacts are not greater than MODERATE. See Staff Proposed Findings at 84, 96-100; SNC Proposed Findings at 92-93.

4.220 Joint Intervenors maintain that dredging is not speculative. To the contrary, Joint Intervenors conclude that SNC has planned to barge some of its components, that no dredging

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of the federal navigation channel would occur but for SNC's barging needs, and that the NRC staff thus is required to provide a direct impacts analysis of such dredging. See Joint Intervenor Reply Findings at 14-15. In the alternative, assuming that a direct impacts analysis is not required, Joint Intervenor argue that a cumulative impacts analysis is required, and that the staff's cumulative impacts analysis was insufficient to provide the "hard look" that NEPA requires. See id. at 14, 33-36. Joint Intervenor take issue with the staff's " cursory treatment" of the impacts of dredging based on the staff's assumption that dredging "impacts would be evaluated in more detail" by USACE. See JTI Proposed Findings at 36 (quoting FEIS 1B, at 7-21).

4.221 Specifically, Joint Intervenor challenge several aspects of the staff's analysis. First, Joint Intervenor demand a quantitative analysis of the impacts of dredging, with the staff required to provide a range of possibilities of potential impacts related to a range of possible volumes of dredged material. See Hayes EC 6.0 Direct Testimony at 6. Second, Joint Intervenor insist that site-specific studies should be provided with regard to the presence of aquatic biota in proposed dredging locations. See Young EC 6.0 Direct Testimony at 5; Young EC 6.0 Rebuttal Testimony at 4. Third, Joint Intervenor argue that sediment management should be explored, particularly the potential for contaminated sediments and any impacts associated with disposal of dredged material. See Hayes EC 6.0 Direct Testimony at 5-6.

6. Legal Background for EC 6.0

4.222 As discussed more fully in section III.A supra, NEPA imposes procedural restraints on an agency, calling for the agency to take a "hard look" at the environmental impacts of a proposed action, as well as reasonable alternatives to that action. See Claiborne, CLI-98-3, 47 NRC at 87-88. This "hard look" is, however, subject to a "rule of reason" in that the consideration of environmental impacts need not address every impact that could possibly

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result, but rather only those that are reasonably foreseeable or have some likelihood of occurring. See, e.g., Shoreham, ALAB-156, 6 AEC at 836. Agencies are given broad discretion in determining how thoroughly to analyze a particular subject, see Claiborne, CLI-98-3, 47 NRC at 103, and may decline to examine issues the agency in good faith considers “remote and speculative” or “inconsequential small,” Vermont Yankee, ALAB-919, 30 NRC at 44 (citing Limerick Ecology Action, 869 F.2d at 739).

4.223 In implementing NEPA, the NRC uses the definitions provided in CEQ regulations. 10 C.F.R. § 51.14(b). The CEQ regulations state that an agency EIS must consider direct, indirect, and cumulative impacts of an action. See 40 C.F.R. § 1508.25. Direct impacts are those caused by the federal action, and occurring at the same time and place as that action, while indirect impacts are caused by the action at a later time or more distant place, yet are still reasonably foreseeable. See id. § 1508.8. Cumulative impacts are 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.

Id. § 1508.7. This definition is also provided in the NRC's ESRP, which as we have discussed previously, see section IV.A.4.a.i supra, is a guidance document the staff uses for its environmental review. See Staff EC 6.0 Direct Testimony at 12. If impacts are remote or speculative, the EIS need not discuss them. See Vermont Yankee, 435 U.S. at 551.

4.224 For impacts that are reasonably foreseeable, but for which the agency lacks complete information in its analysis, the agency must indicate that such information is lacking. See 40 C.F.R. § 1502.22. Significantly, the unavailability of information does not “halt all government action.” Sierra Club v. Sigler, 695 F.2d 957, 970 (5th Cir. 1983). “This is

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particularly true when information may become available at a later time and can still be used to influence the agency's decision." Id.

4.225 Joint Intervenors focus on the types of actions that an EIS must consider. They argue that dredging the Savannah River federal navigation channel is a connected action to the proposed ESP, and they therefore conclude that it must be addressed with a direct impacts analysis, or alternatively, a cumulative impacts analysis. Under section 1508.25 of the CEQ regulations, which defines the term "connected action," the types of impacts that are to be considered are outlined separately from the types of actions that are to be considered. See 40 C.F.R. § 1508.25. This indicates that each type of action and each type of impact has its own independent significance in the sense that a conclusion that something is a "connected action" does not necessarily inform the type of impacts analysis that is performed, whether direct, indirect, or cumulative. See id. § 1508.25 ("To determine the scope of environmental impact statements, agencies shall consider 3 types of actions, 3 types of alternatives, and 3 types of impacts."). That being the case, the Board rejects Joint Intervenors argument that a direct impacts analysis should have been performed in lieu of a cumulative impacts analysis.

4.226 Finally, with regard to the parties' arguments as to whether an analysis need be included in the FEIS at all based on the foreseeability of dredging the federal navigation channel -- i.e., the staff's and SNC's arguments that dredging is not reasonably foreseeable and an analysis need not be included, and Joint Intervenors argument that dredging is reasonably foreseeable and an analysis must be included -- the Board finds in these circumstances that it need not address these arguments, but will instead focus in the first instance on the sufficiency of the staff FEIS discussion that was provided regarding the impacts of any potential dredging.

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7. Adequacy of Staff's Conclusion Regarding Cumulative Impacts of Dredging

4.227 Based on the staff's qualitative review discussed above, the Board finds that the staff's conclusion that the cumulative impacts as a result of dredging the federal navigation channel could be MODERATE is a reasonable, adequately supported, conservative conclusion given the limited information available regarding the nature and extent of any dredging.

4.228 As discussed above, the staff included the cumulative impacts analysis in the FEIS in response to comments received on the DEIS regarding possible dredging of the federal navigation channel. The staff was limited to a discussion of potential impacts and possible mitigation measures and an assumption that the channel would be dredged to a depth of nine feet and a width of ninety feet. As of the date of the evidentiary hearing and of this decision, as far as the Board is aware there has been no change in the amount of information available regarding SNC's intent with respect to dredging -- SNC has not made a formal request that USACE resume maintenance dredging, nor has SNC filed a permit application with USACE. See, e.g., USACE EC 6.0 Direct Testimony at 10. Nevertheless, the staff's analysis and MODERATE conclusion comport with SNC's testimony regarding the potential extent of dredging the federal navigation channel and any impacts associated with dredging as well as USACE's testimony regarding its eventual review of any dredging-related impacts. Thus, for the reasons outlined below, the evidentiary record amply supports the staff's conclusion that the cumulative impacts associated with dredging could be MODERATE.

a. Extent of Dredging

4.229 For the purposes of transporting the largest construction component -- one of the steam generators -- a barge measuring 220 feet in length and 55 feet in width would be required. See Neubert/Smith/Scott EC 6.0 Direct Testimony at 5. "The expected operational draft of a barge of this size loaded with one steam generator would be 5 1/2 feet." Id. With a

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barge of these dimensions and this operating draft, and with the preliminary survey of the federal navigation channel that SNC commissioned, SNC determined that there were “[eight] locations along the Savannah River where a total of only approximately 36,500 cubic yards of dredged material would need to be removed.” Id. at 4. This volume of dredged material assumes that the eight locations will be dredged to a depth of six feet, which will accommodate the barge draft and 1/2 foot of under-keel clearance. See id. at 8.

4.230 Joint Intervenors are concerned that SNC underestimated the depth necessary for safe navigation and therefore underestimated the volume of dredged material. See Hayes EC 6.0 Rebuttal Testimony at 3. Joint Intervenors suggest that “[a] dredging depth of [seven] feet or greater is probably more realistic.” Id. The USACE could not confirm whether 36,500 cubic yards would be a realistic estimate of the volume of dredged material. See Tr. at 1426. Even assuming, however, that seven feet would have been more appropriate, this does not adversely affect the staff's MODERATE conclusion. If anything, because the staff assumed that the channel would be dredged to a depth of nine feet, this would serve to support the finding that the staff's MODERATE conclusion was conservative. See Tr. at 1546. Moreover, the amount of dredging required could be less, depending on the flow of the river at the time any dredging is conducted. Because SNC's survey was conducted when the river was in drought conditions with an assumed flow rate of about 3700 cfs, see Neubert/Smith/Scott EC 6.0 Direct Testimony at 8, SNC's estimated dredged material volume was itself a conservative estimate.

b. Impacts on Aquatic Biota and Water Quality from Dredging and Tree/Snag Removal

4.231 It is important to note, however, that despite the possibility that the volume of dredged material likely will be much smaller than what the staff originally assumed in preparing its FEIS, this does not answer the question of the impacts to aquatic biota in the eight

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SNC-identified locations for dredging. See Tr. at 1547. As Joint Intervenor witness Dr. Young opined, “[e]ven if only one mile of river is dredged, the dredged areas may be hotspots of high abundance for benthic organisms,” or the dredging “may change flow velocity or location of the thalweg which in turn may then cause changes in habitat.” Young EC 6.0 Rebuttal Testimony at 1. As discussed below, SNC witnesses provided testimony that further supported the staff's conclusion in this regard -- establishing by a preponderance of the evidence that such impacts likely would not be greater than MODERATE.

i. Freshwater Mussels

4.232 In the interest of further understanding potential impacts to freshwater mussels, Joint Intervenor claim that “a thorough freshwater mussel survey for the entire affected area should be completed” including “a thorough discussion of each mussel species’ life history.” Young EC 6.0 Direct Testimony at 5. Studies proffered by SNC and the staff, however, indicate that the habitats identified for dredging are not favored habitats for mussels. The locations that SNC identified for dredging are primarily in the Savannah River shifting sand habitats. See Tr. at 1350. A study conducted on the Pee Dee River that involved a comprehensive survey of mussel habitats and “spent much more time on the shifting sand habitats that would be the subject of dredging here,” id., concluded that “[m]uch of the habitat in the center of the channel . . . is of poor quality for freshwater mussels due to unstable, shifting sediment. The best mussel habitat in these rivers is often restricted to narrow troughs, usually within the thalweg [(the deepest part of the channel), Tr. at 1351,] adjacent to river banks.” Exh. SNC000066, at 30 (Freshwater Mussel Surveys of the Pee Dee River Basin in South Carolina (Jan. 3, 2006)).

4.233 SNC witness Dr. Coutant testified, see Tr. at 1350-51, that this finding was consistent with the mussel survey conducted on the Savannah River that was cited by Joint Intervenor as “the most recent information available about the mussel species of the Savannah

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River,” Young EC 6.0 Rebuttal Testimony at 3. The Savannah River survey reached the same conclusion as the Pee Dee survey, i.e., that “[i]n general, mussels were most abundant in the thalweg at the base of the river bank, and rare or absent in the shifting sand dominated runs in the center of the channel.” Exh. Catena Group Mussel Surveys at 5. Because mussel species were not likely to be found in the potential dredge areas, Dr. Coutant thus concluded that the impacts on mussel species as a result of dredging likely would be small. See Tr. at 1354.

4.234 Joint Intervenors assert that Dr. Coutant was incorrect to rely heavily on the Pee Dee River survey as opposed to the Savannah River survey because the dredging will take place on the Savannah River. See Young EC 6.0 Rebuttal Testimony at 3. The Savannah River survey, however, was not as comprehensive as the Pee Dee River survey and focused on the deep water habitats rather than those similar to the potential dredged areas identified by SNC. See Tr. at 1350. Because the Pee Dee River survey focused on areas similar to the potential dredge areas and both surveys reached the same conclusion, the Board finds Dr. Coutant was not incorrect to rely on the Pee Dee River survey.

4.235 Although Joint Intervenor witness Dr. Young initially disagreed with the SNC interpretation of the studies, explaining that several species of mussels were collected in an area that he believed to be a shifting sand habitat, see Tr. at 1599-1602, Dr. Young admitted that he was not able to discern the type of habitat where these species were observed. See Tr. at 1628.

4.236 Joint Intervenors are also concerned with the staff’s mention of the possible relocation of freshwater mussels in the event they are present in dredging locations, noting that “[r]elocations of freshwater mussels have had variable success – with some relocation attempts resulting in 100% mortality.” Young EC 6.0 Direct Testimony at 5; see also Tr. at 1608. The staff did not disagree with the risk involved in mussel relocation. This is the reason the staff

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stated that the relocation of mussels would be a last resort option. The staff believed that in the first instance every effort likely would be made “to minimize the amount of dredging in [an] area [where mussel species are present].” Tr. at 1535-36; see also Staff EC 6.0 Direct Testimony at 22. Joint Intervenors did not otherwise dispute the staff's explanation of possible efforts to minimize adverse effects on freshwater mussels.

4.237 Therefore, contrary to Joint Intervenors claim that more thorough mussel surveys should be conducted relative to the staff's cumulative impacts analysis, see Young EC 6.0 Direct Testimony at 5, both the Savannah River and Pee Dee River surveys are sufficient to support the staff's finding that impacts will be MODERATE because they show that mussels are not likely to be found in the potential dredge areas. Joint Intervenors do not provide any evidence that would support a finding that, given the above evidentiary record supporting the staff's conclusion, impacts on freshwater mussels would be greater than MODERATE.

ii. Fish

4.238 Joint Intervenors witness Dr. Young stated that dredging might negatively impact other aquatic species such as the shortnose and Atlantic sturgeon, the robust redhorse, and the striped bass, and that more studies are necessary. See Young EC 6.0 Direct Testimony at 4; Young EC 6.0 Rebuttal Testimony at 4. In response to Joint Intervenors concerns, SNC witness Dr. Coutant prepared a report that concluded that the food web dynamics and spawning success of these species would not be significantly affected. See SNCR20051, at unnumbered pp. 11-12 (Analysis of Impacts of Navigation Channel Maintenance for Barge Delivery of Materials for Construction of Vogtle Units 3 and 4 on the Ecology of the Savannah River (Jan. 2, 2009, corrected Mar. 13, 2009)) [hereinafter Coutant Report]. In addition, he stated at the hearing that “[t]here obviously will be some change in turbidity” or “some increase in the silt that's put into the water” from dredging or snag removal, but “[t]hat kind of turbidity effect is very

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brief. The siltation settles out very quickly and has no long term effect.” Tr. at 1362. Further, Dr. Coutant stated that these species tend to be in deep water in the channel, whereas the dredging habitats are shallow by definition. See id. Therefore, he expected that these species “are not going to be unduly impacted.” Id.

4.239 Although Dr. Young specifically took issue with Dr. Coutant's statement in his report that the robust redhorse has not been identified in the reach of the Savannah River where the dredging is proposed, see Young EC 6.0 Rebuttal Testimony at 4, Dr. Young did not challenge Dr. Coutant's conclusions regarding these fish species other than to allege that more studies are necessary. For the purposes of the staff's FEIS, however, more studies at this stage are not necessary. As Dr. Young acknowledged, site-specific studies likely will be conducted by USACE if dredging is pursued as an option. See Tr. at 1614-15. Dr. Coutant's report and testimony support the staff's finding that impacts to fish from dredging or snag removal could be MODERATE, with nothing provided by Joint Intervenors indicating that these impacts would be greater than MODERATE.

iii. Snag Removal

4.240 Joint Intervenors argue that the removal of trees and snags identified by SNC could negatively impact fish and mussel species. See Young EC 6.0 Rebuttal Testimony at 2-3. Joint Intervenors witness Dr. Young asserted that removal of trees from the main channel, even though it could positively impact shallow water species when the trees and snags are then deposited along the banks, could negatively impact main channel mussels and fish. See id. In particular, Dr. Young emphasized that woody debris provides a very important habitat to “a number of . . . species of concern or threatened or endangered species.” Tr. at 1612. Dr. Young asserted that from “the number of trees that may have to be removed from the channel, . . . there's no way it would not affect these vulnerable species.” Id. He also noted the

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importance of reestablishment of these habitats, with a potential mitigation measure of replacing the snags after they have been removed. See Tr. at 1616-17.

4.241 SNC witness Dr. Coutant agreed that there is a potential impact on aquatic biota from snag removal. See Tr. at 1359. He stated that “if you have a large tree that falls in and its branches will catch smaller woody debris, th[en] it becomes a velocity barrier and fish will tend to hide behind it.” Id. Dr. Coutant did not believe, however, that snag removal would have a significant impact. This is because he estimated that “only about a third” of these barriers that are present in the channel will be removed. Tr. at 1360. Not only would this leave the remaining two-thirds in place, but he indicated that the one-third being taken from the channel would be “moved to another spot out of the way of the barges” so that “ecological function is still going to occur.” Id. In addition, Dr. Coutant stated that snags “tend[] to reappear quite quickly as you have a flooding cycle. . . . [, s]o this kind of habitat is reestablished very quickly.” Tr. at 1360. SNC witness Mr. Moorer added that in his experience with USACE dredging, the USACE “do[es] not allow . . . dredging to occur during spawning periods, and they might have similar controls for snag removal as well,” Tr. at 1361, further indicating that any impacts from snag removal likely will be limited.

4.242 Citing a study that he participated in, which indicated that woody debris provides important habitats for fish and mussel species, Joint Intervenor witness Dr. Young asserted that there likely would be a negative impact on species whose habitats are disrupted. See Tr. at 1611-14. As discussed above, the staff and SNC appear to agree that there will be some negative impacts from the removal of trees and snags. The important question, however, is whether these impacts will exceed the highest potential impact that the staff predicted could occur in the FEIS -- whether it would exceed a MODERATE impact. Joint Intervenor do not

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provide any evidence to rebut the staff's and SNC's evidence establishing, by a preponderance of the evidence, that impacts from snag removal likely would not exceed MODERATE.

iv. Sediment Contamination

4.243 Joint Intervenors allege that the sediments that might be resuspended as a result of dredging might be contaminated, which could impact water quality, aquatic biota, see Tr. at 1588-89, 1598-99, 1609-10, and dredge disposal options, see Hayes EC 6.0 Direct Testimony at 10. SNC witness Dr. Coutant responded, however, that “there is good evidence . . . that these river sediments are not contaminated.” Tr. at 1356. Dr. Coutant cited a “study of three representative sites in the reach of river that we’re talking about for dredging[,] where sampling was done of the bottom sediments and the water quality[,] . . . [that] indicated that all of the sediment concentrations of the materials you might consider as contaminating the water quality,” Tr. at 1356, were in concentrations that fell below relevant standards. Tr. at 1356-1358. Based on this study, Dr. Coutant concluded that “I’m quite confident that the sediments in the river are not contaminated,” and that the impacts associated with any potential risk of contamination “look like they’d be small.” Tr. at 1357; see also Tr. at 1358.

4.244 Consistent with his conclusion that the sediments likely are not contaminated, Dr. Coutant explained that even though there are fish consumption advisories for the Savannah River, likely due to the presence of mercury in fish, “it doesn't necessarily mean that . . . mercury has come out of the sediments.” Tr. at 1381. He elaborated that although “there is a potential source of mercury in the Savannah system and that’s the Chlor-Alkali Plant . . . near Augusta, . . . the mercury levels . . . in the Savannah River are quite low.” Tr. at 1380. Mercury concentration at these levels often can be attributed to “the general atmospheric deposition of mercury from coal burning and other activities that give that pretty consistent background of mercury level in the water,” Tr. at 1380-81, which is then “taken up by organisms.” Tr. at 1379.

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Joint Intervenors did not dispute Dr. Coutant's testimony with respect to contamination. See Tr. at 1589.

4.245 Joint Intervenors witness Dr. Hayes explained that in citing fish consumption advisories and a paper concerning mercury contamination related to the Chlor-Alkali plant near Augusta, he merely wanted the issue of potential contamination to be considered in the environmental analysis. See Tr. at 1588-89. Likewise, Joint Intervenors witness Dr. Young cited his own experience studying fish with possible contamination, and asserted that this was an area of concern for him as a biologist. See Tr. at 1609-10. However, neither Dr. Hayes nor Dr. Young disputed Dr. Coutant's assertion that contamination in the sediment was not likely to be an issue. Thus, the preponderance of the evidence establishes that Joint Intervenors evidence is insufficient to rebut the staff's finding that the impacts from dredging likely would be no greater than MODERATE.

c. Disposal of Dredged Material

4.246 Joint Intervenors claim that the staff did not adequately address the management and disposal of dredged material. See Hayes EC 6.0 Direct Testimony at 5-6. When the staff wrote the FEIS it did not have any information on potential disposal areas, but it considered the disposal of dredged material in finding that the impacts could be MODERATE. See Staff EC 6.0 Direct Testimony at 15. This information was corroborated by testimony from SNC at the evidentiary hearing. Based on his experience with channel maintenance and dredging operations, SNC witness Mr. Moorer stated it was his opinion that the USACE will "use existing upland disposal areas or move the material to heavily eroded areas to replenish sand lost to hurricane or heavy wave damage" rather than a "within bank" disposal program that the USACE previously used for channel maintenance. Moorer EC 6.0 Direct Testimony at 4-5. In addition,

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Dr. Coutant stated in his report that these disposal options are “feasible because of the relatively small amount of material involved.” Coutant Report at 4.

4.247 Joint Intervenors appeared to agree that given the small amount of material anticipated, disposal would be manageable. After learning of SNC’s estimated dredge volume of approximately 36,500 cubic yards of material, Joint Intervenors witness Dr. Hayes characterized the dredging project as a “very small to modest” project that “can be managed fairly readily.” Tr. at 1586. He was therefore “not particularly concerned whether [the volume is] 36,000 or 40,000, or 30,000.” Id. Instead he would be concerned if that number changed by an order of magnitude, from 36,000 to 360,000. If that were the case, “things [would] change very dramatically” because more material would need to be managed and placement areas for dredged material would need to be assessed for environmental impacts. Id. However, Dr. Hayes acknowledged that USACE or SNC, whichever would be paying for the dredging, would eventually perform a survey to better estimate the volume of dredged material before beginning work on any dredging project. See Tr. at 1596-97.

4.248 As discussed above with respect to the extent of dredging, the staff assumed that the channel would be dredged to the greatest USACE-authorized extent of nine by ninety feet, and with this amount determined that construction impacts, including those related to the disposal of dredged material, would not be greater than MODERATE. There was otherwise no evidence that contradicted the staff’s MODERATE finding in terms of impacts from dredge disposal. Furthermore, although there is limited information available with regard to dredge disposal, the staff, SNC, USACE, and Joint Intervenors all agreed that this is an area that will be addressed if and when dredging is pursued as an option. See Tr. at 1536 (staff); Moorer EC 6.0 Direct Testimony at 4-5 (SNC); Tr. at 1404-06 (USACE); Tr. at 1596-97 (Joint Intervenors).

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d. Mitigation Measures

4.249 The staff's analysis and conclusion are consistent with the USACE testimony regarding USACE's eventual review of any dredging project and identification of mitigation measures. As discussed above, in making its FEIS finding, the staff relied on the types of impacts that USACE likely would evaluate and the types of actions or conditions on dredging that USACE would consider to mitigate those impacts. USACE indicated that it will be required under NEPA to perform an environmental review of an application for a permit submitted by SNC and likely will be required to perform an environmental review prior to resuming maintenance dredging. See Tr. at 1394-98, 1434-35; USACE EC 6.0 Direct Testimony at 6-7. Witnesses for the USACE also confirmed that in both cases, compliance with water quality standards will be required prior to any dredging. See USACE EC 6.0 Direct Testimony at 6-7. This further supports a finding that dredging-related impacts likely will not be greater than MODERATE.

4.250 Witnesses for Joint Intervenors and SNC appear to be in agreement that the environmental impacts will be bounded by USACE's more in-depth review. Dr. Coutant and Mr. Moorer, both witnesses for SNC, testified that based on their experience with environmental review, impacts on mussels, impacts from sediment contamination, and impacts from snag removal will be explored in greater detail by USACE if and when SNC makes a formal request for USACE maintenance dredging or a dredging permit. See Tr. at 1355, 1357, 1361. USACE might place time of year restrictions on dredging so as not to interfere with spawning, for example. See Tr. at 1361. Dr. Hayes, a witness for Joint Intervenors, stated that in terms of the USACE process, he did not really have anything "to say that is really contradictory to what has already been said by the Corps of Engineers or the NRC panel." Tr. at 1593. Dr. Hayes added that if SNC were to request a permit, then SNC would perform the assessment that he had

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expected to see in the staff's FEIS, which USACE would then use as part of the permitting process. Id. Joint Intervenors witness Dr. Young also acknowledged areas where the USACE likely would perform an in-depth review. See Tr. at 1614-15.

4.251 Based on the foregoing, the Board agrees with the undisputed evidence that any impacts associated with dredging the navigation channel likely would not exceed MODERATE, and finds that the staff's conclusion in this regard was reasonable and is supported by the preponderance of the evidence before the Board.

8. Adequacy of Staff's FEIS Methodology Regarding Impacts of Upstream Reservoir Operations

4.252 The FEIS does not contain an analysis of the impacts of upstream reservoir operations for transportation of construction components on the Savannah River. This is because, after discussions with USACE, "the [s]taff assumed reservoir operations would not be altered solely for the purpose of navigation." Staff EC 6.0 Direct Testimony at 6. "Accordingly the staff did not consider it reasonably foreseeable that there would be impacts to the upstream reservoirs associated with releases for navigation, in connection with either the NRC's action or the potential dredging of the Federal navigation channel." Id.

a. Parties' Arguments Regarding Impacts of Upstream Reservoir Operations

4.253 The staff argues that because the USACE will not be making any releases from upstream reservoirs outside of its ordinary flood control plan operations, it is not "reasonably foreseeable that there would be impacts to the upstream reservoirs associated with releases for navigation." Id. SNC likewise argues that such an analysis was not required to be included in the FEIS because it was not reasonably foreseeable that USACE would make additional water releases to support navigation outside of its ordinary operations. See SNC Proposed Findings at 46-47.

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4.254 Joint Intervenors, on the other hand, assert that because the impacts of water releases from upstream reservoirs are unaddressed, this is a violation of the staff's responsibilities under NEPA. Joint Intervenors insist that an analysis of impacts from water releases must be conducted before an ESP is issued. See Joint Intervenors Proposed Findings at 42-43.

b. Adequacy of Staff's Decision Not to Address Impacts of Upstream Reservoir Operations

4.255 The Board finds that the preponderance of the evidence establishes that it is not reasonably foreseeable that USACE would release water from upstream reservoirs to support barge transportation of SNC's construction components on the Savannah River outside of its normal operations. Accordingly, the staff's decision not to address these impacts was reasonable because it was not required under NEPA to include this information in the FEIS.

4.256 As discussed in section IV.C.3.a above, one of SNC's options if it decides to transport at least some of its construction components by barge, but decides not to dredge the federal navigation channel to enable barging, is to choose to coordinate with USACE a release of water from upstream reservoirs.

4.257 The staff assumed that USACE would not be making any releases to support barge transportation for SNC's construction components outside of USACE's normal flood control operations. This was confirmed in testimony from USACE. Although USACE has released water outside of its normal flood control operations a few times in the last twenty years, it more likely would do so incident to its normal flood control operations. Moreover, SNC has unequivocally stated that it "does not plan to request any extra or special releases from upstream reservoirs to support navigation. Operations in accordance with existing Corps procedures is all that is expected." Moorer EC 6.0 Direct Testimony at 7. Indeed, without such a request, USACE will not make any special releases.

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4.258 Under NEPA, the staff is required to include an analysis of only those impacts that are reasonably foreseeable or have some likelihood of occurring. See, e.g., Shoreham, ALAB-156, 6 AEC at 836. Because there is nothing in the record to indicate that USACE will make any releases outside of its normal water control operations to support barging of construction components -- and there is overwhelming evidence to the contrary, i.e., that USACE will not make any releases outside of its normal water control operations -- it is not reasonably foreseeable that such releases will be made. Accordingly, the staff's decision not to include an analysis of the impacts of such releases was reasonable.

9. Joint Intervenors Likely Will Have Another Opportunity to Raise Their Concerns

4.259 In reaching this decision regarding Joint Intervenors contention EC 6.0 and finding reasonable the staff's FEIS conclusion that the cumulative impacts from dredging the federal navigation channel could be MODERATE, the Board also notes that Joint Intervenors are not necessarily foreclosed from raising their concerns if and when a decision is made to dredge the federal navigation channel.

4.260 If the ESP has not been issued and new and significant information is obtained with respect to dredging the channel, the staff will issue a supplemental EIS in this proceeding. See Tr. at 1547. Also, in accord with its review of the SNC COL application for Vogtle Units 3 and 4 (which is the subject of a contested proceeding before a separate licensing board, albeit one that contains the same membership as this Board), the staff will issue a supplemental EIS that will address any new and significant information identified by SNC. See Tr. at 1547-48; see also Tr. at M-2387 to M-2388.⁵⁰ For both proceedings, the draft supplemental EIS will be

⁵⁰ Although this is a citation to the transcript of the mandatory hearing for this proceeding, to which Joint Intervenors were not a party, it is noted here merely as providing further confirmation of the testimony regarding the NEPA procedural process that was given in the contested hearing.

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published in the Federal Register, and the public, including Joint Intervenors, will be given an opportunity to provide comments on the draft. See Tr. at 1548-49. A final supplemental EIS then will be issued incorporating the staff's responses to those comments. See Tr. at 1548. In the event SNC determines that there is no new and significant information and the staff agrees, a draft supplemental EIS will be issued with a statement to that effect and the public will have an opportunity to comment on that determination. See Tr. at M-2389-90. Joint Intervenors also may be able to submit a contention challenging any analysis of planned dredging. See, e.g., 10 C.F.R. § 52.39(c); Virginia Elec. & Power Co. (Combined License Application for North Anna Unit 3), LBP-08-15, 68 NRC 294, 309 (2008).

4.261 Alternatively, Joint Intervenors might be able to raise their concerns in a USACE proceeding if and when an environmental review process for any dredging is initiated. As discussed in section IV.C.3. above, USACE allows public participation through comment on proposed projects, the opportunity to request a hearing on a proposed project, attendance at informal meetings with USACE, and the opportunity to comment on any draft EIS that will be issued.⁵¹

10. Summary of Findings Regarding Contention EC 6.0

4.262 The staff's review process and discussion of potential dredging-related impacts satisfied its obligation under NEPA and Commission regulations to take the requisite "hard look" at the environmental impacts of such dredging. Although from initial discussions with USACE and SNC the staff determined that dredging was unlikely, it responded to comments on the DEIS by including this information. See 10 C.F.R. § 51.91(a)(1). The staff also properly noted

⁵¹ Relative to the possibility of future USACE water releases to permit barging without dredging, the record indicates that USACE would not undergo an environmental review process if it were making releases within its normal flood control operations. See Tr. at 1451-52. Nothing on the record before us suggests that any release necessary to accommodate the components at issue here would lie outside those parameters. See supra section IV.C.8.

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in the FEIS the areas in which it did not have enough information to make a more thorough analysis. See 40 C.F.R. § 1502.22 (providing that any agency should make clear when information is incomplete or lacking).⁵²

⁵² In response to SNC's proposed findings, Joint Intervenors assert in their reply findings that 40 C.F.R. § 1502.22 cannot be relied upon to justify the limited information available in the FEIS. They argue that the standard in 40 C.F.R. § 1502.22(a) has not been met because the overall costs of obtaining information regarding dredging impacts are not exorbitant "[i]n light of the \$7 billion costs of each proposed Unit." Joint Intervenors Reply Findings at 35-36. Arguing in the alternative, Joint Intervenors maintain that even if the staff were excused from obtaining the information under 40 C.F.R. § 1502.22(a), the standards in 40 C.F.R. § 1502.22(b) have not been met. According to Joint Intervenors, neither the FEIS, nor the record as a whole, contains the additional explanation required to be included under 40 C.F.R. § 1502.22(b) when the information cannot be obtained. Id. at 36.

Contrary to Joint Intervenors assertion, the staff was not required under 40 C.F.R. § 1502.22(a) to obtain additional information regarding dredging-related impacts. Based on the information that the staff had at the time, with a potentially wide-ranging dredging project encompassing over 100 miles of river dredged to a depth of nine feet and a width of ninety feet, a quantitative study of environmental impacts, indeed, the type of study that Joint Intervenors demand, see Joint Intervenors Reply Findings at 32, likely would be exorbitant. Compare Hayes EC 6.0 Direct Testimony at 6 ("[A]bout 116 miles of river channel . . . will need to be dredged. For a 90 foot wide channel, the requisite dredging activities could disturb 140 acres or more of benthic habitat and result in about two million cubic yards of sediment to be dredged per foot of deepening required. . . . Despite the lack of specific data, the FEIS could provide a range of estimates for sediment volume and dredging duration based upon some reasonable assumptions and ranges of conditions."), with Staff EC 6.0 Rebuttal Testimony at 3 ("[A] large-scale dredging project [potentially such as this one] does involve a comprehensive environmental analysis that would call for substantial ecological, geotechnical, chemical, and physical information."), and id. at 4 ("Without a pending plan or dredging application before the Corps, the Staff was severely constrained during preparation of the FEIS. . . . Any quantitative evaluation by the Staff would have been a highly speculative effort, since the range of postulated dredging quantities alone would encompass several orders of magnitude."). Although the survey conducted by SNC provided additional information that indicated the extent of dredging could be much less than originally thought, this information cannot be known for certain until SNC, if it decides to do so, applies for a permit with USACE or requests that USACE resume maintenance dredging, thereby initiating USACE's environmental review process.

Because the costs of obtaining additional information likely would be exorbitant, the question becomes whether 40 C.F.R. § 1502.22(b) has been satisfied. Looking at the FEIS, as now supplemented by this decision, the additional explanation required under 40 C.F.R. § 1502.22(b) has been provided. The staff stated numerous times in the FEIS and in testimony that certain information is unavailable to perform the quantitative or site-specific analysis of

(continued...)

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4.263 Moreover, the preponderance of the evidence presented at the hearing, as it supplements the staff's FEIS, supports the staff's finding that the cumulative impacts from dredging could be MODERATE. Although Joint Intervenors raised issues that indicated there might be negative impacts from dredging and snag removal, nothing described by Joint Intervenors indicated that any of these impacts would be greater than MODERATE. Joint Intervenors arguments amount ultimately to an assertion that more information is needed regarding the scope of the dredging project and that more studies are necessary to understand the environmental impacts of dredging. NEPA's hard look requirement is subject to a rule of reason, however, and extensive studies of every conceivable impact need not be addressed. See Shoreham, ALAB-156, 6 AEC at 836. The staff provided a reasonable analysis of the potential dredging-related impacts and a reasonable explanation for why they determined that such impacts could be MODERATE. This is all that NEPA requires.

4.264 Furthermore, if SNC determines that dredging will be necessary to transport heavy construction components to the VEGP site and it decides either to request that USACE resume maintenance dredging or to request a permit, more information likely will be provided and more studies likely will be conducted, and this information likely will be incorporated into

⁵²(...continued)

dredging impacts that USACE would eventually perform, satisfying 40 C.F.R. § 1502.22(b)(1). See, e.g., FEIS 1B, at 7-20 to -21. As all parties to the proceeding and USACE stated both in prefiled and oral testimony, this information, when available, is relevant to determining if, when, where, and how any dredging and any mitigating measures will be conducted, satisfying 40 C.F.R. § 1502.22(b)(2). See generally Tr. at 1287-1631. In addition to what was included in the FEIS, the testimony provided at the hearing satisfies 40 C.F.R. § 1502.22(b)(3), with experts in the field from all three parties explaining, and with SNC and Joint Intervenors referencing particular scientific studies, the types of impacts that could occur. See, e.g., Tr. at 1349-52, 1588-89, 1599-1602, 1611-12; Staff EC 6.0 Direct Testimony at 14-15. And, finally, the staff's conclusion that the impacts could be MODERATE, with the Board's finding that this was a reasonable conclusion, satisfies 40 C.F.R. § 1502.22(b)(4) in that it is the agency's evaluation of the potential dredging impacts and the potential methods of mitigating those impacts based on a review of the evidence presented by qualified expert witnesses with relevant experience.

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any environmental review document produced by USACE. That this information is not available now should not “halt government action” in this instance, Sigler, 695 F.2d at 970, particularly when it would become available with USACE's eventual environmental review and could still be used to inform a USACE decision or the staff's NEPA decision relating to this SNC ESP application, or the pending SNC COL application for Vogtle Units 3 and 4, depending on the timing of its availability.

4.265 The Board therefore concludes that the staff's FEIS finding that cumulative impacts from dredging the federal navigation channel could be MODERATE is adequately supported. Moreover, the staff was not required to include an analysis of the impacts of releases from upstream reservoirs because such releases were not reasonably foreseeable. Accordingly, a judgment on the merits regarding Joint Intervenors contention EC 6.0 is entered in favor of the staff and SNC.

V. SUMMARY FINDINGS OF FACT AND CONCLUSIONS OF LAW

5.1 With respect to contention EC 1.2, the Board rules that (1) the staff's reliance on the extensive body of existing scientific and technical information regarding the Middle Savannah River Basin in reaching its FEIS conclusions regarding impingement/entrainment/thermal impacts for Vogtle Units 3 and 4, met the NEPA requirement to take a “hard look” at those impacts, notwithstanding Joint Intervenors assertion that a contemporary site-specific assessment was necessary; and (2) the staff's conclusion that impingement/entrainment/thermal impacts associated with the operation of Vogtle Units 3 and 4, including cumulative impacts, would be SMALL was fully supported by the record, including the additional information provided by applicant SNC as a result of several recent scientific surveys

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it undertook in connection with its currently operating Vogtle Units 1 and 2 facility. As such, a judgment on the merits regarding contention EC 1.2 is entered in favor of the staff and SNC.

5.2 With respect to contention EC 1.3, the Board finds that (1) the lack of significant impacts on ESBRs from the proposed closed-cycle wet cooling towers justifies the FEIS's limited discussion of dry cooling and reliance on EPA's prior findings; (2) in the context of the proposed Vogtle facilities, implementing a dry cooling system is technically infeasible so that it is not a reasonable alternative in the context of NEPA and, therefore, does not need to be analyzed further to satisfy NRC's NEPA obligations; and (3) the record now contains sufficient evidence on dry cooling to support a conclusion that dry cooling would not be preferable to the proposed wet cooling system at the Vogtle site. We thus conclude that the agency's NEPA obligations relative to the discussion of design alternatives have been satisfied with regard to dry cooling, and contention EC 1.3 is resolved on the merits in favor of the staff and SNC.

5.3 With respect to contention EC 6.0, the Board concludes that (1) the staff's review process and discussion of potential dredging-related impacts satisfied its obligation under NEPA and Commission regulations to take a hard look at the environmental impacts of such dredging, given the information that it had when the FEIS was issued; (2) the preponderance of the evidence presented at the hearing supports the staff's finding that the cumulative impacts from dredging could be MODERATE; (3) if SNC determines that dredging will be necessary to transport heavy construction components to the VEGP site and it decides either to request that USACE resume maintenance dredging or to request a permit, more information likely will be provided and more studies likely will be conducted, and this information likely will be incorporated into any environmental review document produced by USACE, which would become available and inform a USACE decision on the dredging or the staff's NEPA decision relating to this SNC ESP application, or the pending SNC COL application for Vogtle Units 3

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and 4, depending on the timing of its availability. The Board also finds that the staff was not required to include an analysis of the impacts of releases from upstream reservoirs outside of USACE's normal flood control operations as such releases are not reasonably foreseeable. As a consequence, a judgment on the merits regarding Joint Intervenors contention EC 6.0 is entered in favor of the staff and SNC.

6.1 Pursuant to 10 C.F.R. § 2.1210, it is this twenty-second day of June 2009, ORDERED, that:

- A. In accord with 10 C.F.R. §§ 2.319(m), 2.332(b), (1) the record of this proceeding is reopened; (2) exhibit NRCR00014 is admitted into evidence; (3) exhibit NRC000014 is stricken from the evidentiary record of this proceeding; and (4) the record of this proceeding is closed.⁵³
- B. Joint Intervenors contentions EC 1.2, EC 1.3, and EC 6.0 are resolved on the merits in favor of the staff and applicant SNC, and the contested portion of the Vogtle Units 3 and 4 ESP proceeding before this Board is terminated.
- C. In accordance with 10 C.F.R. § 2.1210, this partial initial decision will constitute a final decision of the Commission forty (40) days from the date of issuance (or the

⁵³ During its post-hearing review of the record, the Board discovered that two different documents were prefiled in this proceeding with the exhibit number NRC000014: the 1974 FES for the Vogtle Units 1-4 construction permit and the 1985 FES for the Vogtle Units 1 and 2 operating license. Although the 1974 FES was marked and admitted into evidence at the evidentiary hearing, it is apparent that the staff intended to submit the 1985 FES, see NRC Staff Revised Exhibit List and Corrected Exhibit NRC000014 (Jan. 16, 2009) at 2; Tr. at 750-51, and that the parties have referred to the 1985 FES and not the 1974 FES in their proposed findings. Accordingly, the 1974 FES, exhibit NRC000014-00-BD01 as admitted at the evidentiary hearing, see Tr. at 765, is being stricken, and NUREG-1087, [FES] related to the operation of Vogtle Electric Generating Plant, Units 1 and 2, dated March 1985, is being admitted into evidence as exhibit NRCR00014-00-BD01 and is being placed into the record of this proceeding.

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first agency business day following that date if it is a Saturday, Sunday, or federal holiday, see 10 C.F.R. § 2.306(a)), i.e., on Monday, August 3, 2009, unless a petition for review is filed in accordance with 10 C.F.R. § 2.1212, or the Commission directs otherwise. Any party wishing to file a petition for review on the grounds specified in 10 C.F.R. § 2.341(b)(4) must do so within fifteen (15) days after service of this partial initial decision. The filing of a petition for review is mandatory for a party to have exhausted its administrative remedies before seeking judicial review. Within ten (10) days after service of a petition for review, parties to the proceeding may file an answer supporting or opposing Commission review. Any petition for review and any answer shall conform to the requirements of 10 C.F.R. § 2.341(b)(2)-(3).

6.2 Although this ruling resolves all contested matters before the Licensing Board in connection with the August 2006 application of SNC for an ESP for its proposed Vogtle Units 3 and 4, staff issuance of a 10 C.F.R. Part 52 ESP relative to those facilities must abide, among

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing FIRST PARTIAL INITIAL DECISION (Contested Proceeding) (LBP-09-07) have been served upon the following persons by Electronic Information Exchange.

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Docket No. 52-011-ESP
FIRST PARTIAL INITIAL DECISION (Contested Proceeding) (LBP-09-07)

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Office of the Secretary of the Commission

Dated at Rockville, Maryland
this 22nd day of June 2009

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

LBP-09-19

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before the Licensing Board:

G. Paul Bollwerk, III, Chairman
Nicholas G. Trikouros
Dr. James F. Jackson

In the Matter of

SOUTHERN NUCLEAR OPERATING CO.

(Early Site Permit for Vogtle ESP Site)

Docket No. 52-011-ESP

ASLBP No. 07-850-01-ESP-BD01

August 17, 2009

SECOND AND FINAL PARTIAL INITIAL DECISION
(Mandatory/Uncontested Proceeding)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

LBP-09-19

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before the Licensing Board:

G. Paul Bollwerk, III, Chairman
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Dr. James F. Jackson

In the Matter of

SOUTHERN NUCLEAR OPERATING CO.

(Early Site Permit for Vogtle ESP Site)

Docket No. 52-011-ESP

ASLBP No. 07-850-01-ESP-BD01

August 17, 2009

SECOND AND FINAL PARTIAL INITIAL DECISION
(Mandatory/Uncontested Proceeding)

I. INTRODUCTION

1.1 On August 15, 2006, Southern Nuclear Operating Company (SNC) filed an application with the Nuclear Regulatory Commission (NRC) for an early site permit (ESP) under 10 C.F.R. Part 52 for two additional reactors utilizing the Westinghouse Electric Company AP1000 certified design at the existing Vogtle Electric Generating Plant (VEGP) site near Waynesboro, Georgia. Subsequently, on August 16, 2007, SNC submitted a supplement to its ESP application requesting that it be granted a limited work authorization (LWA) pursuant to 10 C.F.R. §§ 50.10, 52.17(c) to permit SNC to perform certain construction-related activities prior to receiving a Part 52 combined license (COL) (for which SNC has also applied¹). This second and final partial initial decision presents the Licensing Board's findings of fact and conclusions of law associated with the mandatory or uncontested aspects of this proceeding, as

¹ See Southern Nuclear Operating Co. (Vogtle Electric Generating Plant, Units 3 and 4), LBP-09-3, 69 NRC __ (Mar. 5, 2009), appeals denied, CLI-96-16, 70 NRC __ (July 31, 2009)).

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relevant matters have been identified by the Board based on its review of the pending SNC ESP application, and the associated LWA supplement, and the NRC staff's final environmental impact statement (FEIS) and final safety evaluation report (FSER) regarding those licensing requests, along with the Board's findings relative to the environmental and safety issues set forth in the notices of hearing for this proceeding, see [SNC]; Notice of Hearing and Opportunity to Petition for Leave to Intervene on an [ESP] for the Vogtle ESP Site, 71 Fed. Reg. 60,195, 60,195 (Oct. 12, 2006) [hereinafter ESP Hearing Notice]; [SNC]; Supplementary Notice of Hearing and Opportunity to Petition for Leave to Intervene on an [ESP] for the VOGTLE ESP Site, 72 Fed. Reg. 64,686, 64,686 (Nov. 16, 2007) [hereinafter LWA Hearing Notice], and in 10 C.F.R. §§ 50.10, 52.24.

1.2 For the reasons set forth below, we conclude that staff issuance of the ESP, and the associated LWA, for the Vogtle ESP site should be authorized, effective immediately.

II. PROCEDURAL BACKGROUND

2.1 In response to the Commission's October 5, 2006 notice of hearing and opportunity to petition for leave to intervene, Joint Intervenors² (then Joint Petitioners) filed a request for hearing and petition to intervene. On December 15, 2006, this Atomic Safety and Licensing Board was established to adjudicate the Vogtle ESP proceeding. The Board's various rulings on contested matters, including the admission of Joint Intervenors as parties to the proceeding and the disposition of Joint Intervenors three admitted ESP-related environmental contentions, are discussed in detail in its first partial initial decision relative to

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

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contested matters.³ See LBP-09-7, 69 NRC ___ (slip op.) (June 22, 2009), petition for Commission review pending.

2.2 The uncontested or mandatory portion of this ESP proceeding, to which only SNC and the staff were parties, was conducted more or less in tandem with the contested portion. In a series of administrative orders, see, e.g., Licensing Board Memorandum and Order (Prehearing Conference and Initial Scheduling Order) (May 5, 2007); Licensing Board Memorandum and Order (Revised General Schedule) (July 14, 2008); Licensing Board Memorandum and Order (Revised General Schedule) (Nov. 13, 2008) [hereinafter Nov. 13, 2008 Scheduling Order], the Board established a schedule for both the contested and uncontested portions of the proceeding.

³ Although a hearing opportunity was afforded to interested persons in connection with the LWA supplement to the SNC ESP application, see LWA Hearing Notice, 71 Fed. Reg. at 64,686-87, no intervention requests challenging the SNC LWA request were filed.

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Subsequent to the public release of the staff's August 14, 2008 FEIS,⁴ on October 17, 2008, the Board issued a memorandum and order posing initial written questions and outlining potential presentation topics relative to the environmental portion of the mandatory hearing. See Licensing Board Memorandum and Order (Providing Initial Questions and Potential Presentation Topics Associated with Mandatory Hearing on Environmental Matters) (Oct. 17, 2008) (unpublished) [hereinafter Licensing Board Environmental Questions]. Both SNC and the staff filed written responses to the Board's questions on November 7, 2008. See Exh. SNC000068 ([SNC] Response to the Licensing Board's Order of October 17, 2009 (Nov. 7, 2008)) [hereinafter SNC Response to Environmental Questions]; Exh. NRC000057 (NRC Staff Responses to the Licensing Board's Questions Regarding Environmental Matters) [hereinafter Staff Response to Environmental Questions]. Following the staff's November 12, 2008 publication of an advanced safety evaluation report (ASER), see [NRO, NRC], Safety Evaluation

⁴ See Exhs. NRC00001A (Office of New Reactors [(NRO), NRC], NUREG-1872, 1 [FEIS] for an [ESP] at the [VEGP] Site (Aug. 2008) (Sections 1.0-4.0)) [hereinafter FEIS 1A]; NRC00001B ([NRO, NRC], NUREG-1872, 1 [FEIS] for an [ESP] at the [VEGP] Site (Aug. 2008) (Sections 5.0-11.0)) [hereinafter FEIS 1B]; NRC00001C ([NRO, NRC], NUREG-1872, 2 [FEIS] for an [ESP] at the [VEGP] Site (Aug. 2008) (apps. A-J)) [hereinafter FEIS 1C]; NRC00001D ([NRO, NRC], NUREG-1872, 2 [FEIS] for an [ESP] at the [VEGP] Site (Aug. 2008) (app. F)); NRC00001E ([NRO, NRC], NUREG-1872, [FEIS] for an [ESP] at the [VEGP] Site (Sept. 2008 to vols. 1 & 2) (Errata)).

In connection with the exhibit citations above, as entered into the record and reflected in the agency's ADAMS-associated electronic hearing docket, the official exhibit number for each evidentiary item reflects a three-alpha character party identifier (i.e., SNC, NRC); followed by six alpha and/or numeric characters to reflect its number and whether it was revised subsequent to its original submission as a prefiled exhibit (e.g., admitted exhibit SNCR00073 is a revised version of prefiled exhibit SNC000073); followed by a two-character alpha or numeric identifier that will be used in this case to distinguish between an exhibit utilized in the mandatory/uncontested portion of this proceeding (i.e., MA) as opposed to the contested portion of the proceeding (i.e., 00); followed by the designation BD01, which indicates that this Licensing Board (i.e., BD01) was involved in its identification and/or admission. Accordingly, the official designation for the first exhibit cited above is NRC00001A-MA-BD01. For the sake of simplicity, however, we will refer to all exhibits admitted in the uncontested portion of this proceeding by their initial nine character designation only.

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of the [ESP] Application in the Matter of [SNC], for the Vogtle [ESP] Site (Nov. 2008) (ADAMS Accession No. ML080290280) [hereinafter ASER],⁵ the Board issued a memorandum and order on December 5, 2008, posing an initial set of written questions and potential presentation topics relative to the safety portion of the mandatory hearing, see Licensing Board Memorandum and Order (Providing Initial Questions and Potential Presentation Topics Associated with Mandatory Hearing on Safety Matters) (Dec. 5, 2008) (unpublished) [hereinafter Licensing Board Safety Questions]. SNC and the staff filed written responses to this set of questions on January 16, 2009. See Exh. SNC000069 ([SNC] Response to Licensing Board Order of December 5, 2008 (Jan. 16, 2009)) [hereinafter SNC Response to Safety Questions]; Exh. NRC000058 (NRC Staff Responses to Licensing Board's Questions Regarding Safety Matters) [hereinafter Staff Response to Safety Questions]. On December 31, 2008, the Board issued a memorandum and order setting forth an additional presentation topic for the mandatory hearing. See Licensing Board Memorandum and Order (Additional Presentation Topic and Administrative Directives for Mandatory Hearing) (Dec. 31, 2008) (unpublished) [hereinafter Dec. 31, 2008 Order]. Thereafter, on February 5, 2009, the staff issued its FSER. See Exh. NRC000056 (Safety Evaluation of the [ESP] Application in the Matter of [SNC], for the Vogtle [ESP] Site (Feb. 2009)) [hereinafter FSER].

2.3 In accordance with the Board's November 13, 2008 scheduling order, the Board held an evidentiary hearing on uncontested environmental and safety topics on March 23-25, 2009, in Waynesboro, Georgia. See Tr. at M-1662 to -2410. At the hearing, in accordance with

⁵ Although this document, as well as a number of other agency review or guidance documents associated with the staff's safety and environmental reviews of the SNC ESP application for Vogtle Units 3 and 4, were not placed into evidence by either SNC or the staff, for purposes of the mandatory/uncontested portion of this ESP proceeding, the Board takes official notice of these publicly-available documents and their contents. See 10 C.F.R. § 2.337(f). Given these documents are not in the evidentiary record, as an aid to locating them, the Board has provided an ADAMS accession number or an NRC website location for each.

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an administrative order issued by the Board on February 23, 2009, see Licensing Board Memorandum and Order (Additional Administrative and Scheduling Information) (Feb. 23, 2009) at 3-4 (unpublished), witnesses for SNC and the staff provided oral presentations on the following topics: Cumulative Water Use Impacts, Radiological Impacts, Groundwater Impacts on Safety-Related Structures, Environmental Impacts of Alternatives, LWA and Site Redress Plan (SReP), Site Emergency Plan, Seismic Evaluation, Severe Accident Mitigation Design Alternatives (SAMDA), Deferrals to COL, Permit Conditions, and AP1000 Design Certification Revisions. During the hearing, the witnesses for both of the parties were seated and sworn at the same time in a panel format for each presentation topic. Presentation materials, generally in the form of slide presentations and supporting documents, were provided to the Board in advance of the evidentiary hearing and admitted as exhibits in the proceeding. The Board asked questions of these witnesses during the course of these presentations and afforded the witnesses of one party the opportunity to comment upon the responses of the other party's witnesses.

2.4 Following the March 23-25, 2009 evidentiary hearing, in response to the Board's March 30, 2009 post-hearing administrative order, see Licensing Board Memorandum and Order (Post-Hearing Administrative Items) (Mar. 30, 2009) at 3 (unpublished), on April 8, 2009, SNC filed a set of joint stipulations agreed to by the staff as well as an affidavit addressing certain requirements under 10 C.F.R. § 52.24. See Exhs. SNC000099 (Affidavit of Charles R. Pierce (Apr. 7, 2009)) [hereinafter Pierce Affidavit]; SNC000100 (SNC Submittal of Affidavit Addressing Requirements under 10 C.F.R. § 52.24 (Apr. 7, 2009)). Additionally, in an April 17, 2009 memorandum and order adopting certain corrections to the hearing transcripts, the Board marked for identification and admitted into evidence the affidavit submitted by SNC on April 8, 2009, and closed the record of the mandatory portion of this proceeding as of that date. See

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Licensing Board Memorandum and Order (Transcript Corrections; Closing the Record of Mandatory/Uncontested Proceeding) (Apr. 17, 2009) at 1-3 (unpublished) [hereinafter Apr. 17, 2009 Order].

2.5 Pursuant to the Board's November 13, 2008 general schedule, see Nov. 13, 2008 Scheduling Order app. A, at 5, SNC and the staff filed proposed findings of fact and conclusions of law regarding the mandatory portion of this proceeding on May 22, 2009. See [SNC] Proposed Findings of Fact and Conclusions of Law Regarding Uncontested Issues (May 22, 2009); NRC Staff's Proposed Findings of Fact and Conclusions of Law Concerning Uncontested Matters (May 22, 2009).

III. APPLICABLE LEGAL STANDARDS

A. General Legal Standards

3.1 Under the Commission's 10 C.F.R. Part 52 regulations, an applicant who may apply for a construction permit under Part 50, or a combined license under Part 52, may apply for an ESP. See 10 C.F.R. § 52.15(a). If granted, an ESP, which is defined as "a partial construction permit," evidences Commission approval of a site for one or more nuclear power facilities. Id. § 52.1(a). An ESP applicant may also request that an LWA under 10 C.F.R. § 50.10 to be issued in conjunction with the ESP. See id. § 52.17(c).

3.2 The Atomic Energy Act (AEA) of 1954, as amended, provides that "[t]he Commission shall hold a hearing . . . on each application under section 2133 or 2134(b) of this title for a construction permit for a facility." 42 U.S.C. § 2239(a)(1)(A).⁶ ESP applications, as

⁶ In the order establishing this Licensing Board, the authority to conduct a mandatory hearing in this proceeding was delegated to the Board. See Establishment of Atomic Safety and Licensing Board; ASLBP No. 07-850-01-ESP-BD01, 71 Fed. Reg. 77,071 (Dec. 22, 2006). This delegation was confirmed in an August 30, 2007 Commission memorandum and order. See CLI-07-24, 66 NRC 38, 38-39 (2007).

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partial construction permit applications, see 10 C.F.R. § 52.1(a), are subject to the AEA hearing requirement, as well as “all procedural requirements in 10 CFR part 2,” 10 C.F.R. § 52.21; see also Sys. Energy Res., Inc. (Early Site Permit for Grand Gulf ESP Site), LBP-07-1, 65 NRC 27, 35, permit issuance authorized, CLI-07-14, 65 NRC 216 (2007).

B. Scope of Licensing Board Review

3.3 When reviewing an ESP application in an uncontested proceeding, licensing boards are instructed to “conduct a simple ‘sufficiency’ review” rather than a de novo review on both AEA and National Environmental Policy Act (NEPA) of 1969 issues. Exelon Generation Co., LLC (Early Site Permit for Clinton ESP Site), CLI-05-17, 62 NRC 5, 39 (2005). Thus, boards “should decide simply whether the safety and environmental record is ‘sufficient’ to support license issuance. In other words, the boards should inquire whether the NRC Staff performed an adequate review and made findings with reasonable support in logic and fact.” Id. With respect to certain NEPA findings, however, boards are instructed to make independent environmental judgments, though they “need not rethink or redo every aspect of the NRC Staff’s environmental findings or undertake their own fact-finding activities.” Id. at 44; see also Dominion Nuclear North Anna, LLC (Early Site Permit for North Anna ESP Site), LBP-07-9, 65 NRC 539, 559-60, permit issuance authorized, CLI-07-27, 66 NRC 215 (2007). The board’s role thus is to “carefully probe [staff] findings by asking appropriate questions and by requiring supplemental information when necessary,” but “the NRC Staff’s underlying technical and factual findings are not open to board reconsideration unless, after a review of the record, the board finds the NRC Staff review inadequate or its findings insufficient.” Clinton ESP, CLI-05-17, 62 NRC at 39-40.

3.4 Additionally, in a mandatory hearing, a licensing board “must narrow its inquiry to those topics or sections in Staff documents that it deems most important and should

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concentrate on portions of the documents that do not on their face adequately explain the logic, underlying facts, and applicable regulations and guidance.” Exelon Generation Co., LLC (Early Site Permit for Clinton ESP Site), CLI-06-20, 64 NRC 15, 21-22 (2006).

C. Required Board Findings

1. Required ESP-Related Safety Findings

3.5 Pursuant to the AEA and agency regulations in effect at the time the notice of hearing for this proceeding was published, this Board is required to make two safety findings -- answering the first in the negative and the second in the affirmative -- before an ESP can be issued for the VEGP site:

- (1) Whether the issuance of an ESP will be inimical to the common defense and security or to the health and safety of the public (Safety Issue 1); and (2) whether, taking into consideration the criteria contained in 10 CFR part 100, a reactor, or reactors, having characteristics that fall within the parameters for the site, can be constructed and operated without undue risk to the health and safety of the public (Safety Issue 2).

ESP Hearing Notice, 71 Fed. Reg. at 60,195. Subsequent to the publication of the notice of hearing in this proceeding, the 10 C.F.R. Part 52 regulations were revised to, among other things, clarify what is required in the findings associated with the issuance of an ESP. See Licenses, Certifications, and Approvals for Nuclear Power Plants, 72 Fed. Reg. 49,352, 49,524 (Aug. 28, 2007). Under a new section 52.24, an ESP may issue if the Commission, or, presumably, the Licensing Board, as the Commission’s delegate, see supra note 6, finds, among other things, that:

- (1) [The ESP application] meets the applicable standards and requirements of the [AEA] and the Commission’s regulations;
- (2) Notifications, if any, to other agencies or bodies have been duly made;
- (3) There is reasonable assurance that the site is in conformity with the provisions of the Act, and the Commission’s regulations;
- (4) The applicant is technically qualified to engage in any activities authorized;

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- (5) The proposed inspections, tests, analyses and acceptance criteria, including any on emergency planning, are necessary and sufficient, within the scope of the early site permit, to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the license, the provisions of the Act, and the Commission's regulations; [and]
- (6) Issuance of the permit will not be inimical to the common defense and security or to the health and safety of the public.

10 C.F.R. § 52.24(a)(1)-(6). In addition, section 52.24 states that if the Commission decides to authorize issuance of the ESP, the issued ESP "must specify the site characteristics, design parameters, and terms and conditions of the [ESP] the Commission deems appropriate." Id. § 52.24(b).

3.6 Because the substantive findings that must be made under the pre-2007 regime overlap to a significant degree those required under the current regulations,⁷ and SNC has both revised its application to reflect the new rule and provided information in this proceeding to address both sets of provisions, the Board will address the findings outlined in each.

2. Required ESP-Related Environmental Findings

3.7 In authorizing issuance of an ESP, to fulfill its NEPA obligations the Board must:

- (1) Determine whether the requirements of Sections 102(2)(A), (C), and (E) of NEPA and the [10 C.F.R. Part 51, Subpart A] regulations have been met;
- (2) Independently 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;
- (3) Determine, after . . . considering reasonable alternatives, whether the [ESP] should be issued, denied, or appropriately conditioned to protect environmental values[; and]
- (4) Determine, in an uncontested proceeding, whether the NEPA review conducted by the NRC staff has been adequate.

⁷ In this regard, in issuing the November 2007 supplemental notice relative to the SNC LWA application, the Commission essentially incorporated into this proceeding the findings in paragraphs (1), (4), and (6) of section 52.24(a), denominating them as Safety Issues 3, 4, and 5. Compare 10 C.F.R. § 52.24(a)(1), (4), (6), with LWA Hearing Notice, 72 Fed. Reg. at 64,686.

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10 C.F.R. § 51.105(a)(1)-(4); see also ESP Hearing Notice, 71 Fed. Reg. at 60,195. These findings are consistent with the requirement under 10 C.F.R. § 52.24(a) that, prior to issuance of an ESP, “[t]he findings required by subpart A of 10 CFR Part 51 have been made.” 10 C.F.R. § 52.24(a)(8).

3.8 With regard to the first three of these findings, i.e., the “baseline” NEPA issues, the Board must reach its own independent determination, but should do so without “second-guess[ing] underlying technical or factual findings by the NRC Staff.” Clinton ESP, CLI-05-17, 62 NRC at 45.

3. Required LWA-Related Findings

3.9 As noted above, see supra section III.A, an ESP applicant may request that an LWA be issued in conjunction with the ESP. See 10 C.F.R. § 52.17(c). Before the LWA can issue, the staff must issue an FEIS in connection with the LWA, and the Board must perform essentially the same NEPA analysis described above for the ESP, see supra section III.C.2, with respect to the LWA activities, although, instead of making a finding on NEPA Baseline Issue 3, the Board is to “[d]etermine whether the redress plan will adequately redress the activities performed under the [LWA]” should the activities be terminated by either the holder of the LWA or by Commission denial of any corresponding ESP or COL. See 10 C.F.R. §§ 50.10(e)(1)(ii), 51.105(c); see also LWA Hearing Notice, 72 Fed. Reg. at 64,686. Finally, the Board must find that (1) “the applicable standards and requirements of the Act, and the Commission’s regulations applicable to the activities to be conducted under the [LWA] have been met”; (2) “[t]he applicant is technically qualified to engage in the activities authorized”; (3) “[i]ssuance of the [LWA] will provide reasonable assurance of adequate protection to public health and safety and will not be inimical to the common defense and security”; and (4) “there are no unresolved safety issues relating to the activities to be conducted under the [LWA] that

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would constitute good cause for withholding the authorization.”⁸ 10 C.F.R. § 50.10(e)(1)(iii)-(iv); see LWA Hearing Notice, 72 Fed. Reg. at 64,686.

3.10 In an instance when an ESP is issued with an associated LWA, the Board must find relative to the LWA that “[a]ny significant adverse environmental impact resulting from activities requested under § 52.17(c) can be redressed.” 10 C.F.R. § 52.24(a)(7). In addition, if LWA activities are approved by the NRC in conjunction with an ESP, the ESP as issued “shall specify those 10 CFR 50.10 [authorized] activities.” 10 C.F.R. § 52.24(c).

D. Immediate Effectiveness of Initial Decision

3.11 Licensing board initial decisions in earlier ESP proceedings have not been effective until they were reviewed by the Commission. See, e.g., North Anna ESP, LBP-07-9, 65 NRC at 629. Subsequently, however, the 10 C.F.R. Part 2 regulations were revised to provide for immediate effectiveness of initial decisions in certain proceedings. See 72 Fed. Reg. at 49,416, 49,475-76. Accordingly, under the current rules, “[a]n initial decision directing the issuance or amendment of a limited work authorization under 10 CFR 50.10 [or] an early site permit under subpart A of part 52 of this chapter . . . is immediately effective upon issuance unless the presiding officer finds that good cause has been shown by a party why the initial decision should not become immediately effective.” 10 C.F.R. § 2.340(f).

⁸ Although section 50.10(e)(1)(iii) and the LWA hearing notice give the responsibility in the first instance for making three of these findings to the Director, NRO, see 10 C.F.R. § 50.10(e)(1)(iii); LWA Hearing Notice, 72 Fed. Reg. at 64,686, in light of the fact that the LWA hearing notice attributes to the Board the authority to make the three additional ESP safety findings found in section 52.24(a)(1), (4), (6) in the context of the LWA, see LWA Hearing Notice, 72 Fed. Reg. at 64,686, which, in turn, are essentially the same as the three findings in section 50.10(e)(iii), the Board likewise will make these findings in accord with 10 C.F.R. § 50.10(e)(iii) and the LWA hearing notice.

IV. FACTUAL FINDINGS AND LEGAL CONCLUSIONS

A. Hearing Issues

4.1 In setting forth the Board's determinations relative to the uncontested portion of this ESP proceeding, we begin with the subject matter of the various presentations that were made by SNC and the staff in response to the Board's requests for additional information on these particular items.

1. Cumulative Water Use Impacts

a. Introduction

4.2 Water use impacts resulting from the operation of the proposed units were evaluated in section 5.3.2 of the FEIS, with cumulative impacts discussed in section 7.3.1. The staff concluded in the FEIS that water use impacts would be SMALL. See FEIS 1B, at 5-10 (surface water), 5-17 (groundwater). For surface water, this conclusion was based on the staff's analysis that the maximum consumptive use of Savannah River water for proposed Vogtle Units 3 and 4 would be 0.7 percent at the normal flow rate of 8830 cubic feet per second (cfs), and 1.7 percent at the low flow rate of 3800 cfs. See id. at 5-8 to -9. The staff argued that withdrawal rates this small would not destabilize the river resource, and would even be difficult to detect, since the uncertainty in flow gauge measurements is in the five to ten percent range. See id. at 5-9 to -10. In the cumulative impacts analysis, the staff concluded that although the impacts might be detectable, they nonetheless would not destabilize the river resource, and so would continue to be SMALL. See id. at 7-5.

4.3 At the limited appearance sessions held by the Board as part of this ESP proceeding, members of the public expressed concerns over potential water use impacts of the new facilities, particularly in light of the recent severe drought conditions in the Savannah River basin. See, e.g., Limited Appearance Session Tr. at 27-29, 50-51 (Apr. 27, 2008); Limited

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Appearance Session Tr. at 34 (Apr. 28, 2008). The Board was also concerned about whether the staff had considered an adequate range of river flows in preparing the draft environmental impact statement (DEIS). This led the Board to pose several questions to the staff (and SNC if it wished to respond) regarding the impacts of river flow rates lower than the 3800 cfs considered in the DEIS. See Licensing Board Environmental Questions app. A, at 3-5. Given these concerns and the importance of water use impacts, the Board requested that the staff provide a summary presentation on this topic at the mandatory hearing, so the Board could further evaluate the adequacy and conservatism of the staff's analysis and conclusions in the FEIS. Specifically, the Board requested that the staff provide:

a presentation reviewing the cumulative surface and groundwater impacts associated with the operation of Vogtle Electric Generating Plant (VEGP) Units 1-4. In this review, include the potential impact of other relevant facilities in the area, such as the D-Area Powerhouse and the Urquhart Station. In particular, address these impacts under a range of drought conditions, including the possibility of conditions more severe than Drought Level 3. Address why the limiting conditions used in the evaluation of cumulative impacts, where the evaluations were often limited to Drought Level 3, are conservative in light of recent drought conditions in the VEGP area.

Id. at 2.

b. Witnesses and Evidence Presented

4.4 The staff, which was the lead and sole presenter for this topic, provided four witnesses to discuss the staff review of water use impacts. These witnesses provided oral testimony, in conjunction with their prefiled slide presentation that was admitted as an exhibit, at the evidentiary hearing.⁹ See Tr. at M-1692 to -1736; Exh. NRC000059 (NRC Staff Presentation Topic #1, Water Use Impacts) [hereinafter Staff Water Use Impacts Presentation].

⁹ Although the staff seated four witnesses in connection with this topic, only Dr. Christopher B. Cook, Dr. Charles T. Kincaid, and Lance W. Vail spoke at the hearing on this topic.

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4.5 Dr. Christopher B. Cook earned a Bachelor of Science degree (B.S.) in Civil Engineering from Colorado State University and a Master of Science degree (M.S.) and a Ph.D. in Civil and Environmental Engineering from the University of California at Davis. He is currently a Senior Hydrologist in the NRC/NRO Division of Site and Environmental Reviews (NRC/NRO/SERD). See Exh. NRC000070, at 1 (Christopher Bruce Cook, Statement of Professional Qualifications (SPQ)). Prior to joining the NRC, Dr. Cook was employed as a Senior Research Engineer at Pacific Northwest National Laboratory (PNNL) for over seven years. See id. While employed at PNNL, Dr. Cook provided assessments for the hydrology-related sections in the Vogtle DEIS. See id. at 2.

4.6 Dr. Charles T. Kincaid earned a B.S. in Civil Engineering from Humboldt State College and a Ph.D. in Engineering (Hydraulics) from Utah State University. He is currently a Staff Scientist with the Energy and Environment Directorate at PNNL. See Exh. NRC000071, at 1 (Curriculum Vitae (CV) for Charles T. Kincaid). Over the course of his approximately thirty-year employment at PNNL, Dr. Kincaid has focused on soil physics and ground-water studies, and has specialized in the area of computational fluid mechanics of environmental systems. See id.; Tr. at M-1727.

4.7 Mark D. Notich earned a B.S. in Agricultural Chemistry from the University of Maryland. He is currently an NRC/NRO Senior Project Manager. See Exh. NRC000072, at 1 (Mark D. Notich, SPQ). As the Environmental Project Manager for the Vogtle ESP, Mr. Notich has been involved in all activities relating to the staff's issuance of the DEIS and FEIS for the VEGP site and oversees the team of specialists from PNNL that aids the staff with its environmental review for the Vogtle ESP application. See id.

4.8 Lance W. Vail earned a B.S. in Environmental Resources Engineering from Humboldt State University and an M.S. in Civil Engineering from Montana State University. He

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is currently a Senior Research Engineer in the Environmental Technology Division at PNNL. See Exh. NRC000073, at 1 ([SPQ] of Lance W. Vail). Over the course of his approximately twenty-eight-year employment at PNNL, Mr. Vail has developed expertise in a broad spectrum of areas related to water resources. His more recent projects have included participation as Task Manager of PNNL's assessments of three of the ESP applications that have been submitted to the NRC. See id.

4.9 Based on the respective qualifications and experience of the proffered witnesses, the Board finds each of these witnesses qualified to testify as an expert regarding the cumulative water use impacts associated with Vogtle Units 1 through 4.

c. Regulations and Guidance Relating to Water Use

4.10 The agency's NEPA regulations require that the staff prepare an environmental impact statement (EIS) in connection with the issuance of an ESP. See 10 C.F.R.

§ 51.20(b)(1). The staff must first prepare a DEIS, see id. §§ 51.70, 51.75(b), that includes, among other things,

an evaluation of the environmental effects of construction and operation of a reactor, or reactors, which have design characteristics that fall within the site characteristics and design parameters for the [ESP] application, but only to the extent addressed in the [ESP] environmental report [(ER)] or otherwise necessary to determine whether there is any obviously superior alternative to the site proposed.

Id. § 51.75(b). Though the DEIS may rely in part on the applicant's ER, the regulations require the staff to "independently evaluate and be responsible for the reliability of all information used in the [DEIS]." Id. § 51.70(b). The DEIS is then distributed for public comment and, based on the comments received, a review of information provided by the applicant, and supplemental independent information and analysis, the staff prepares and issues an FEIS. See id. §§ 51.73, 51.91.

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4.11 Additionally, in implementing NEPA, the NRC uses certain of the definitions provided in Council on Environmental Quality regulations. See id. § 51.14(b). Among those is section 1508.25, which states that an agency EIS must consider direct, indirect, and cumulative impacts of an action. See 40 C.F.R. § 1508.25. Direct impacts are those caused by the federal action, and occurring at the same time and place as that action, while indirect impacts are caused by the action at a later time or more distant place, yet are still reasonably foreseeable. See id. § 1508.8. In addition, cumulative impacts are 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.

Id. § 1508.7.

4.12 Section 5.2.2 of the staff's environmental standard review plan (ESRP), which is a staff guidance document, outlines the staff's review responsibilities with respect to the discussion in the EIS of water use impacts from plant operation. The ESRP states that the staff's review "should be in sufficient detail to predict and assess potential impacts and to recommend how these impacts should be treated in the licensing process," including recommendations for mitigating measures, as necessary. Office of Nuclear Reactor Regulation (NRR), [NRC], NUREG-1555, Environmental Standard Review Plan at 5.2.2-1 (1999 & 2007), available at <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1555/> [hereinafter ESRP]. This staff review should include an evaluation of "the impacts of water use on water availability, hydrologic alterations, and water quality." Id. at 5.2.2-7. With respect to cumulative impacts from operation of the plant, the ESRP states that the staff should identify, evaluate, and summarize the "potential cumulative impacts associated with plant operation," and provide a "characterization of the impacts using the NRC's SMALL, MODERATE, LARGE terminology."

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Id. at 5.11-3. These three characterizing terms, which we likewise utilize in this decision as appropriate, are defined as follows:

SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE - Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE - Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

See FEIS 1A, at 1-4.

4.13 In conducting the cumulative impacts analysis, the reviewer should obtain information from the staff reviewers conducting the assessment of the direct impacts from operation, including water use impacts under ESRP 5.2.2. See ESRP at 5.11-2.

d. Evidentiary Presentation

4.14 At the hearing on uncontested issues, as requested the staff made a presentation to the Board regarding the staff's assessment of the cumulative water use impacts associated with operation of the existing and proposed Vogtle units. This included a discussion of both the cumulative surface water impacts and the cumulative groundwater impacts. See Staff Water Use Impacts Presentation at 3, 17.

4.15 As it is advised to do in the ESRP, see section IV.A.1.c supra, in its cumulative impacts analysis of the water use impacts in FEIS section 7.3, the staff referenced the potential water use impacts discussed in FEIS section 5.3. See FEIS 1B, at 7-3. To the extent applicable to the staff's discussion of its cumulative impacts assessment, the Board also references portions of the staff's assessment of potential water use impacts in FEIS section 5.3.

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i. Cumulative Surface Water Impacts

4.16 The evidence presented relative to cumulative surface water impacts focused on the impact of withdrawing water from the Savannah River to supply the existing and proposed closed-cycle cooling systems for the VEGP units. See id. at 7-4. For existing Units 1 and 2, the cooling water requirements are outlined in the FEIS. See id. For proposed Units 3 and 4, the cooling water requirements are defined in the AP1000 design certification document (DCD) and outlined in the FEIS. See FEIS 1A, at 3-5 to -7 (discussing the cooling water requirements for the VEGP Units 3 and 4).¹⁰ To calculate the impacts from use of surface water, the staff compared the water withdrawal values and the consumptive use values for all four units to various Savannah River flow conditions to determine the percentage of flow used. See FEIS 1B, at 7-4 to -5.

4.17 The FEIS reports that the average annual flow of the Savannah River is 8830 cfs, see id. at 7-4, but when the water level in the upstream Thurmond Dam drops below a prescribed value, the United States Army Corps of Engineers implements a Drought Level Contingency Plan under which the release rate from the dam is restricted. See id. at 5-7. The lowest release rate explicitly specified in the plan is 3800 cfs. This is associated with what is termed Drought Level 3. See id. at 5-7, 7-4. There is also a Drought Level 4, but the release rate is not explicitly specified. At Drought Level 4, the release rate is set equal to the inflow to the dam, in order to maintain a fixed water level. See id. at 5-7. Conditions have never reached Drought Level 4, however. See Staff Water Use Impacts Presentation at 12-13 (showing no Drought Level 4 conditions between February 1980 and February 2009); see also FEIS 1B, at 5-7 (as of date FEIS written, Drought Levels 3 and 4 had never been reached). Evidence

¹⁰ The FEIS was prepared using the information from revision 15 of the AP1000 DCD. After the staff published the FEIS, however, SNC advised the staff that some of the values for the cooling water requirements would change based on the subsequently proffered AP1000 DCD revision 16. See FEIS 1A, at 3-7; see also section IV.A.1.e infra.

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presented at the hearing showed that the Thurmond Dam had been operating at Drought Level 3 during the later part of 2008 and, in fact, recently the release rate was temporarily reduced to 3100 cfs for several months. See Tr. at M-1711; Staff Water Use Impacts Presentation at 13.

4.18 As discussed above, the Board was concerned with whether the staff used an appropriately conservative Savannah River flow rate in its environmental analysis of the Vogtle ESP application. The staff chose 3800 cfs as the basis for its NEPA evaluation. Mr. Vail presented data at the hearing that showed that the river flow at the site is generally higher than the release rates at the Thurmond Dam. See Staff Water Use Impacts Presentation at 7. This is mainly due to drainage inflow into the river between the dam and the Vogtle site. See Tr. at M-1702 to -1703. Data from the Waynesboro flow gauge located near the site shows that even with the historically low release rate of 3100 cfs from Thurmond Dam, the flow at the VEGP site rarely fell below 3800 cfs. See Staff Water Use Impacts Presentation at 7; see also Exh. SNC000016 (United States Geological Survey (USGS) Charts Depicting Recent Flows of Savannah River).¹¹

4.19 The staff also presented a chart providing data representing weekly average flows recorded by the flow gauge near Augusta, Georgia, upstream of the VEGP site, from 1925 to the present, which showed the effects of the upstream reservoirs on river flow. See Tr. at M-1703 to -1704; Staff Water Use Impacts Presentation at 6. The staff explained that the flood control function of the reservoirs will “clip off some of the higher flows” and the drought management function “pulls up some of the lower flows.” Tr. at M-1703. Noticing that there appeared to be a downward trend in the flows starting in about the 1980s, the Board asked Mr.

¹¹ Exhibit SNC000016 is a contested hearing exhibit. Nonetheless, because it generally contains the same data as the staff’s mandatory hearing presentation, albeit in a more easily readable format, for clarity we reference both documents.

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Vail if the staff had analyzed recent drought data to see if there was a trend that might lead it to project even more severe drought conditions in the future. See Tr. at M-1704 to -1705, M-1709 to -1710. In addressing this question, Mr. Vail showed a chart overlaying precipitation and river flow measured at the Augusta gauge that provided a history back to 1944. See Tr. at M-1723; Staff Water Use Impacts Presentation at 15. While acknowledging that there had been two recent periods of significant drought, Mr. Vail stated that the staff did not necessarily see these as indicative of a long-term trend. See Tr. at M-1725.

4.20 The staff then identified other major users of Savannah River water in the area, including, as the Board had requested, the D-Area Powerhouse and Urquhart Station, and conservatively estimated their total consumptive use at 78.7 cfs. See Tr. at M-1712 to -1714; Water Use Impacts Presentation at 8. The staff estimated the total consumptive use for Vogtle Units 1 through 4 at 129 cfs. Although this number exceeds the consumptive use of other users, Mr. Vail testified that drainage into the river between Thurmond Dam and the Vogtle site more than off-sets the withdrawals by other users. See Tr. at M-1715; see also Staff Water Use Impacts Presentation at 9. He stated that this supported the staff's use of the average Savannah River flow of 3800 cfs in its cumulative impact analysis. See Tr. at M-1715, M-1726.

4.21 The results of the staff's analysis showed that the operation of Units 1 through 4 would consume 1.5 percent of the normal average river flow of 8830 cfs, and 3.4 percent at the conservative flow rate of 3800 cfs. The corresponding consumption percentages when other major users are included were 2.4 percent and 5.5 percent. See Staff Water Use Impacts Presentation at 9. While the staff emphasized the appropriateness of using 3800 cfs, Mr. Vail explained that the staff did consider flow rates of 3000 cfs and 2000 cfs to provide additional context for its analysis. See Tr. at M-1715. For example, at an assumed Savannah River flow rate of 3000 cfs, all four units would consume 4.3 percent of the flow. See Staff Water Use

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Impacts Presentation at 9. But data presented showed that 3000 cfs is considerably lower than any flow measured at the Augusta gauge since the Thurmond Dam was put into operation in the 1950s. See id. at 6. Based on the above, the staff concluded that there was sufficient support for the conclusions in the FEIS that the cumulative surface water use impacts of the VEGP ESP would be SMALL. See Tr. at M-1726 to -1727; Staff Water Use Impacts Presentation at 16.

ii. Cumulative Groundwater Impacts

4.22 With respect to cumulative impacts, the proposed Vogtle Units 3 and 4 would use groundwater to supply make-up water for the service water system, the fire protection system, the plant demineralized water system, the potable water supply, and other miscellaneous uses. See FEIS 1B, at 5-10. This water would be pumped from wells in the deep Cretaceous aquifer that underlies the site. See id. at 7-12.

4.23 The staff's groundwater impacts review focused on four topics. One concerned groundwater resource use generally, while the other three concerned groundwater quality as impacted by (1) tritium in the unconfined aquifer; (2) groundwater contamination associated with the Department of Energy's (DOE) Savannah River Site (SRS); and (3) saltwater intrusion. See Tr. at M-1727; FEIS 1B, at 7-12 to -15.

4.24 Staff witness Dr. Kincaid summarized the staff's review of groundwater usage projections. He stated that, during normal operation, the four units would require 2.13 million gallons per day (gpd) (3.30 cfs) from the deep aquifer. He also testified that a low estimate of the base flow of the deep Cretaceous aquifer, which is the groundwater resource that VEGP draws upon, see Tr. at M-1729, was 119 million gpd (184 cfs). Thus, all four units are projected to use about two percent of the groundwater resource, with the two new units accounting for half of this usage. See Tr. at M-1728; Staff Water Use Impacts Presentation at 18. These estimates were based on data from a severe drought period in 1968 that was published in a

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1987 USGS report. See Tr. at M-1728. In response to Board questions regarding whether the staff was concerned about the current validity of a report that was published over twenty years ago, Dr. Kincaid stated that the water in the deep aquifer was on the order of thousands of years old and, therefore, the base flow is relatively unaffected by droughts, such as the current drought. He thus indicated he was not concerned with the age of the data because the quantity of the deep base flow was long-term. See Tr. at M-1728 to -1730.

4.25 The staff also reviewed the projected aquifer drawdown that would result from the groundwater removal outlined in FEIS section 5.3.2.2. Dr. Kincaid testified that the Cretaceous aquifer had 120 meters of confining head, while the projected drawdown at the site boundary would be four meters, and the drawdown at the nearest neighboring well would be three meters. See Tr. at M-1730.

4.26 The FEIS stated there was an upward gradient from the Cretaceous to the Tertiary aquifer, but that pumping could reduce this upward gradient. See FEIS 1B, at 5-15. The Board inquired whether pumping in the Cretaceous aquifer at the projected rates could reverse this gradient, and thereby lead to potentially contaminating flow from the Tertiary to the Cretaceous aquifer. See Licensing Board Environmental Questions, app. A, at 2. Dr. Kincaid testified that gradient reversal was possible, but that it would be localized to the vicinity of the production wells. See Tr. at M-1730. The staff therefore concluded that the impact from use of the groundwater resource is SMALL. See Tr. at M-1730 to -1731.

4.27 Dr. Kincaid then summarized the staff's review of the three specific items relating to impacts to groundwater quality. Relative to tritium in the Water Table aquifer, Dr. Kincaid explained that, although tritium was first discovered in the Water Table aquifer in 1988, subsequent studies by the Georgia Geological Survey and USGS indicated that the source of tritium was atmospheric release from SRS. See Tr. at M-1731 to -1734; Staff Water Use

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Impacts Presentation at 19. Because the two current and two proposed units do not and will not withdraw water from the Water Table aquifer or make releases to it, the staff concluded that “there is no reason to believe that the proposed project will contribute to the issue of tritium in the [W]ater [T]able aquifer.” Tr. at M-1731; Staff Water Impacts Presentation at 19.

4.28 Regarding SRS groundwater plumes, the staff determined from groundwater modeling conducted by USGS that contamination in the aquifers underlying SRS is intercepted by the Savannah River. See Tr. at M-1734 to -1735; FEIS 1B, at 7-14; Staff Water Use Impacts Presentation at 20. According to the staff, the production of groundwater at the VEGP site “does not appear to contribute to the broader migration of SRS contamination.” Staff Water Use Impacts Presentation at 20; see also Tr. at M-1735.

4.29 In connection with saltwater intrusion, the staff obtained a permitting plan report issued by the State of Georgia that identified Burke County, where the VEGP site is located, as one of nineteen counties that do not contribute substantially to the development or extent of saltwater intrusion in coastal areas. See FEIS 1B, at 7-12. The staff also determined that the quality of water withdrawn from Burke County wells indicated that it is not impacted by saltwater intrusion. See Tr. at M-1735; Staff Water Use Impacts Presentation at 21. In addition, the staff noted in the FEIS that an SNC request for a modification of its current groundwater use permit for utilizing groundwater relative to proposed Units 3 and 4 would be subject to State review to ensure “aggressive and practical conservation and reuse principles.” FEIS 1B, at 7-12.

4.30 Regarding these three groundwater quality issues, the staff concluded that any impacts from groundwater production would be SMALL. See Tr. at M-1731, M-1735 to -1736. Further, Dr. Kincaid concluded his testimony by repeating the staff’s conclusion in the FEIS that groundwater impacts would be SMALL based on the staff’s evaluations of all these four topic areas. See Tr. at M-1736.

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e. Board Findings Related to Cumulative Water Use Impacts

4.31 After reviewing the staff's evaluation of the cumulative water use impacts, the Board finds it to be adequate to support the staff's conclusion that the cumulative impacts would be SMALL.

4.32 Based on the DEIS, the Board had been concerned about whether the staff had included adequate conservatism in choosing 3800 cfs as the river flow on which the NEPA evaluation would be based. This concern was motivated by the recent severe drought conditions, and the resulting restrictions in the amount of water being released from the Thurmond Dam. The FEIS, however, expanded the analysis in this area, and additional data and testimony were provided at the mandatory hearing, as well as at the contested hearing where the flow rate was also an issue, albeit in a different context. See LBP-09-7, 69 NRC at ___ (slip op. at 42-47). The staff provided data that showed that the river flow rate has rarely dropped below 3800 cfs since the Thurmond Dam came into operation in the early 1950s. This has been true even during periods of severe drought. The Board finds that the use of 3800 cfs is well-supported as a conservative, yet reasonable, flow rate for the staff's evaluation. The Board also finds that the staff's consideration of flow rates as low as 3000 cfs and 2000 cfs provided valuable context when considering severe drought conditions, but agrees with the staff that flow rates that low would be extremely unlikely, and that using them as the ultimate basis for their NEPA evaluation would not be appropriate.

4.33 With respect to groundwater impacts, the Board finds that the impacts to groundwater have been well characterized in FEIS sections 5.3.2.2 and 7.3.2.2. The parameters used to characterize the impacts are well-calibrated against extensive on-site measurements. The withdrawal rates are defined in the AP1000 DCD and, while the latest revision of the DCD is not yet finalized, the Board finds that the projected deep aquifer

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withdrawal rate of one percent for the operation of the new Units 3 and 4 is well founded. In this regard, the FEIS states that the maximum groundwater demand from DCD revision 16 is about eleven percent lower than from revision 15, which was the basis for the current analysis. See FEIS 1B, at 5-17.

4.34 Overall, the Board concludes that the staff has adequately considered and analyzed the cumulative water use impacts, and that the staff's evaluation that the cumulative impacts would be SMALL for both surface water and groundwater is well supported by the data and analyses in the record.

2. Radiological Impacts

a. Introduction

4.35 The potential release of radioactive materials is a key consideration in evaluating both the safety and environmental impacts of nuclear power plant operation. As one of the staff witnesses observed, the NEPA-driven environmental review is more outward looking and involves a one-time impacts evaluation emphasizing a "reasonableness" approach. See Tr. at M-1860. The environmental impacts of radiological releases for proposed Vogtle Units 3 and 4 were discussed in various portions of the FEIS. FEIS chapter 2 includes a discussion of the groundwater hydrology of the site as well as interactions between the site surface and groundwater and between aquifers. See FEIS 1A, at 2-21 to 2-31. Section 5.9 describes the radiological impacts of normal operations, reviewing liquid pathways, gaseous pathways, and direct exposure pathways through which members of the public might be exposed to radiation. See FEIS 1B, at 5-63 to -75. Section 5.9 also describes impacts to biota other than humans. See id. at 5-74 to -75. Radiation doses from accidents are discussed in section 5.10. See id. at 5-75 to -91. Design basis accident (DBA) impacts are discussed in section 5.10.1, while severe accidents are discussed in section 5.10.2. See id. at 5-77 to -91. The staff also

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evaluated cumulative radiological impacts of both normal operations and accidents in section 7.8 of the FEIS. See id. at 7-27 to -29.

4.36 In contrast, according to one of the staff witnesses, the AEA-driven safety review, which is both more inward looking and ongoing, takes a “conservative” approach. See Tr. at M-1859 to -1860. Radiological impacts likewise are discussed in various sections of the FSER. Section 2.4.13 analyzes accidental releases of radioactive liquid effluents into ground and surface water. See FSER at 2-158 to -174. Chapter 11 discusses radiological consequences of normal operations, through gaseous and liquid effluents. See id. at 11-1 to -7. Chapter 15 outlines the radiological impacts of DBAs. See id. at 15-1 to -6.

4.37 The Board asked the applicant and the staff to review at the mandatory hearing their environmental and safety evaluations of radiological impacts, with an emphasis on how the parameters used in the analyses were related to on-site measurements, and how the staff assured itself that the results were adequately conservative. See Licensing Board Safety Questions at 3; Licensing Board Environmental Questions at 2-3.

b. Witnesses and Evidence Presented

4.38 Relative to the issue of radiological impacts, during the March 2009 mandatory/uncontested evidentiary hearing regarding proposed Vogtle Units 3 and 4, lead party SNC presented two witnesses, while four individuals appeared on behalf of the staff. At the evidentiary hearing, these witnesses provided oral testimony, in conjunction with their prefiled slide presentations that were admitted as exhibits. See Tr. at M-1737 to -1885; Exhs. SNC000070 ([SNC] Vogtle ESP Mandatory Hearing Presentation #2, Environmental Topic #2: Radiological Impacts) [hereinafter SNC Radiological Impacts (Environmental) Presentation]; SNCR00073 ([SNC] Vogtle ESP Mandatory Hearing Presentation #2 and #3, Safety Topic #2 and #3: Accidental Release & Transport of Radioactive Liquid Effluents &

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Potential Groundwater Impacts) [hereinafter SNC Radiological Impacts (Safety) and Groundwater Impacts Presentation]; NRC000060 (NRC Staff Presentation Topic #2, Radiological Impacts) [hereinafter Staff Radiological Impacts Presentation).

i. SNC Witnesses

4.39 Philip L. Young, a certified health physicist with Tetra Tech, Inc., was involved in the preparation of the ER for the Vogtle ESP application. He has a B.S. in Radiation Health (Health Physics) from Oregon State University, an M.S. in Health Physics from Georgia Tech, and over seventeen years of experience in assessing environmental impacts of nuclear facilities, managing the preparation of NEPA documents, and performing radiological health and ecological risk assessments, including involvement in the preparation of ERs for license renewals of eighteen nuclear power plants. See Tr. at M-1751; Exh. SNC000071 (Philip L. Young CV).

4.40 Dr. Angelos N. Findikakis is a registered professional engineer and a Bechtel fellow with the Bechtel Corporation. He has a Ph.D. in civil engineering from Stanford University and over thirty-five years experience working in the areas of groundwater flow and transport, modeling, environmental hydraulics and hydrology, and water resources. See Tr. at M-1777; Exh. SNC000074, at 1-2 (Angelos N. Findikakis CV).

4.41 At the hearing, Mr. Young presented testimony on the environmental aspects of radiological impacts, while Dr. Findikakis focused on the safety-related aspects of such impacts.

ii. Staff Witnesses

4.42 The staff presented testimony from Dr. Charles Kincaid and Dr. Hosung Ahn on the safety-related aspects of radiological impacts, and from Michael Smith and James Van Ramsdell, Jr., on the environmental aspects of such impacts. Additionally, the staff panel on radiological impacts included Mark Notich (environmental) and Christian Araguas (safety).

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4.43 Dr. Kincaid's background and expert qualifications are discussed in section IV.1.b. supra.

4.44 Dr. Ahn is a Hydrologist in the Hydrologic Engineering Branch, NRC/NRO/SERD. See Exh. NRC000077, at 1 ([CV] for Hosung Ahn) [hereinafter Ahn CV]; Tr. at M-1821. He has an M.S. and a Ph.D. in Hydrology from Colorado State University and over twenty-four years of experience in the areas of water resources management, ecosystem restorations, power plant siting, and reactor licensing. See Ahn CV at 1. He has also reviewed the site safety analysis report (SSAR) portions of new reactor license applications, focusing on potential extreme hydrologic hazards, such as flood, drought, dam breaks, tsunamis, and subsurface radionuclide contamination, and has worked on three ESP applications. See id.

4.45 Mr. Smith, a scientist and certified health physicist with the PNNL Radiological Science and Engineering Group, received a B.S. in Nuclear Engineering from Kansas State University and M.S. degrees in Nuclear Engineering and Environmental Science from Ohio State University. Before joining PNNL, Mr. Smith worked for five years at the Southwest Research Institute (SRI), on projects involving the proposed Yucca Mountain high-level waste (HLW) repository facility. While with PNNL, he has been involved in environmental reviews for a number of NRC COL and ESP proceedings. See Exh. NRC000076, at 1 (CV for Michael A. Smith).

4.46 Mr. Ramsdell is a Senior Technical Researcher with the Radiological Sciences and Engineering Group at PNNL. See Exh. NRC000075, at 1 ([CV] for James V. Ramsdell, Jr.) [hereinafter Ramsdell CV]. He has a B.S. in General Sciences and an M.S. in Meteorology from Oregon State University, graduate experience in Atmospheric Studies at the University of Washington and the Joint Center for Graduate Study, Richland, Washington, and has been with PNNL since 1967, with thirty-nine years of experience conducting environmental reviews. See

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id.; Staff Radiological Impacts Presentation at 27. He was the program manager for updating the ESRPs, and he conducted EIS accident analyses for several ESP environmental reviews. See Ramsdell CV at 2-3; Staff Radiological Impacts Presentation at 27.

4.47 Mr. Notich's background and expert qualifications are discussed at section IV.1.b supra.

4.48 Mr. Araguas earned a B.S. in Electrical Engineering from the Pennsylvania State University. See Exh. NRC000074, at 1 ([CV] for Christian J. Araguas) [hereinafter Araguas CV]. He is currently employed in the Division of New Reactor Licensing, NRC/NRO, as a Lead Project Manager for the Vogtle ESP application. See id. Specifically, he was the Safety Project Manager for the review of the Vogtle ESP application and LWA request. See Tr. at M-2120. He has worked at the NRC for approximately six years. See Araguas CV at 1.

4.49 Based on the foregoing, the Board finds each of these SNC and staff witnesses qualified to testify as an expert in their respective areas regarding the radiological impacts associated with the proposed Vogtle Units 3 and 4.

c. Regulations and Guidance Relating to Radiological Impacts

4.50 Potential radiological impacts of the proposed units have both environmental and safety aspects. On the safety side, 10 C.F.R. § 52.17 specifies that an application must contain "[a] description and safety assessment of the site" that includes "an analysis and evaluation of the major structures, systems, and components of the facility that bear significantly on the acceptability of the site under the radiological consequence evaluation factors identified in paragraphs (a)(1)(ix)(A) and (a)(1)(ix)(B) of this section." 10 C.F.R. § 52.17(a)(1)(ix). That section requires that "[t]he applicant . . . perform an evaluation and analysis of the postulated fission product release . . . to evaluate the offsite radiological consequences." Id. Under 10 C.F.R. § 52.17, individuals located at the boundary of the exclusion area cannot be exposed

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to more than twenty-five rem total effective dose equivalent (TEDE) in any two-hour period, and any individual located at the outer boundary of the low population zone cannot be exposed to more than twenty-five rem TEDE during the entire period of any radioactive release. See id. § 52.17(a)(1)(ix)(A)-(B).

4.51 Additionally, 10 C.F.R. § 52.18 directs the staff to review applications “according to the applicable standards set out in 10 CFR part 50 and its appendices and 10 CFR part 100.” Id. § 52.18. Section 50.34a, in turn, directs an applicant to describe “equipment to be installed to maintain control over radioactive materials in gaseous and liquid effluents produced during normal reactor operations, including expected operational occurrences,” and, for applications filed after January 2, 1971, directs the applicant to identify design objectives and means to maintain levels of radioactive effluents “as low as is reasonably achievable [(ALARA)].” 10 C.F.R. § 50.34a(a). Part 50, Appendix I, sets forth numerical guidelines for meeting the ALARA standard. See id. Part 50, app. I. Further, Part 100 instructs the staff to consider physical characteristics of the site, specifically noting that “[f]actors important to hydrological radionuclide transport . . . must be obtained from on-site measurements.” Id. § 100.20(c)(3). Finally, Part 20 sets out numerical limits for radiation exposure, including occupational dose limits and radiation dose limits for members of the public. See id. §§ 20.1201 to .1302. The staff also follows guidance in RS-002 and Regulatory Guide 1.113.¹²

4.52 On the environmental side, the EPA has established radiation exposure standards under 40 C.F.R. Part 190, the applicability of which the Commission has acknowledged in Part 20 of the agency's regulations. See 10 C.F.R. § 20.1003 (defining

¹² See [NRR, NRC], Processing Applications for [ESPs], RS-002 (May 3, 2004), available at <http://www.nrc.gov/reactors/new-licensing/esp/esp-public-comments-rs-002.html> [hereinafter RS-002]; Office of Standards Development (OSD), [NRC], Regulatory Guide 1.113, Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I (rev. 1 Apr. 1977) (ADAMS Accession No. ML003740390).

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"generally applicable environmental radiation standards" as the "standards issued by the [EPA]"; id. § 20.1301(e) (providing that "licensee[s] subject to the provisions of EPA's generally applicable environmental radiation standards in 40 CFR part 190 shall comply with those standards"). Additionally, the staff evaluates individual and population exposure under the 10 C.F.R. Part 20 and the ALARA standards discussed above in connection with safety. In analyzing the environmental aspect of radiation impacts, the staff follows Regulatory Guides 1.109, 1.111, 1.112, 1.113, as well as ESRP sections 4.5 (Radiation Exposure to Construction Workers) and 5.4 (Radiological Impacts of Normal Operation).¹³

4.53 For radiological impacts of accidents, the staff follows Regulatory Guides 1.145 and 1.183,¹⁴ as well as ESRP sections 7.1 (Design Basis Accidents) and 7.2 (Severe Accidents), see ESRP at 7.1-1 to 7.2-7, Standard Review Plan (SRP) chapter 15,¹⁵ and the NRC Safety Goal Policy set forth in 51 Fed. Reg. 30,028 (Aug. 21, 1986).

¹³ See [OSD, NRC], Regulatory Guide 1.109, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I (rev. 1 Oct. 1977) (ADAMS Accession No. ML003740384); [OSD, NRC], Regulatory Guide 1.111, Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors (rev. 1 July 1977) (ADAMS Accession No. ML003740354); Office of Nuclear Regulatory Research (RES), [NRC], Regulatory Guide 1.112, Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Light-Water-Cooled Power Reactors (rev. 1 Mar. 2007) (ADAMS Accession No. ML070320241); ESRP at 4.5-1 to 4.5-8, 5.4-1 to 5.4.4-5, 5.7-1 to 5.7-14.

¹⁴ See [RES, NRC], Regulatory Guide 1.145, Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants (rev. 1 Nov. 1982) (ADAMS Accession No. ML003740205); [RES, NRC], Regulatory Guide 1.183, Alternative Radiological Source Terms for Evaluating [DBAs] at Nuclear Power Reactors (July 2000) (ADAMS Accession No. ML003716792).

¹⁵ See [NRR, NRC], Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, [Light Water Reactor (LWR)] ed., NUREG-0800, ch. 15 (revs. 0-3 July 2000-Mar. 2007), available at <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0800/> [hereinafter NUREG-0800 or SRP].

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d. Evidentiary Presentations

4.54 The environmental impacts of potential radiological releases were evaluated for both normal operations and postulated accident conditions. The applicant's witnesses reviewed the radiological impacts analysis in the ER, while the staff witnesses presented the staff's review and independent verification of the radiological impacts as documented in the FEIS.

i. Radiological Impacts from Normal Operations

4.55 SNC witness Mr. Young described the applicant's analysis of radiological impacts from normal operations. Pursuant to the regulations and regulatory guides, the applicant analyzed two types of exposure scenarios. The first is the maximum dose that could be received by an individual residing at the site boundary, the so-called maximally exposed individual (MEI) (i.e., the hypothetical individual who, due to proximity, activities, or living habits, could receive the maximum possible dose of radiation). See Tr. at M-1751; SNC Radiological Impacts (Environmental) Presentation at 4. The second is the dose to the population living within a fifty-mile radius of the facility. See Tr. at M-1752; SNC Radiological Impacts (Environmental) Presentation at 5. The applicant used effluent release source terms specified in the AP1000 DCD revision 15 and considered the radiation exposure pathways specified in NRC guidance. See Tr. at M-1754; SNC Radiological Impact (Environmental) Presentation at 6-13. Mr. Young also stated at the hearing that he believed that pending DCD revisions 16 and 17 did not have changes that would produce dose calculations different from those based on DCD revision 15. See Tr. at M-1755, M-1760.

4.56 As outlined by Mr. Young, the sources of potential exposure are liquid effluent releases, gaseous effluent releases, and direct radiation from the facility. See Tr. at M-1752. For liquid effluents, the exposure pathways for the MEI include ingestion of aquatic food, ingestion of drinking water, and direct radiation exposure from shoreline activities. See Tr.

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at M-1752 to -1753; SNC Radiological Impacts (Environmental) Presentation at 7. For the population dose calculations, the exposure pathways are the same, except ingestion of drinking water was not included because the most recent land-use census showed no use of the Savannah River for drinking water within 100 miles downstream of the site. See Tr. at M-1753 to -1754; SNC Radiological Impacts (Environmental) Presentation at 8. For gaseous effluents, the exposure pathways include immersion in the radioactive plume, direct exposure from deposited radioactivity, inhalation, ingestion of garden fruit and vegetables, and ingestion of beef. The dose from milk ingestion was not evaluated because the most recent land-use census indicated that no milk cows existed within five miles of the VEGP site. If, however, milk cows are moved within the vicinity of the site at some future date, Mr. Young indicated the annual land use census would identify it and any necessary changes would be made to the offsite dose calculation manual. See Tr. at M-1757 to -1758; SNC Radiological Impacts (Environmental) Presentation at 11.

4.57 Relative to these pathways, dose calculations were performed using NRC-sanctioned computer codes and methodologies. Liquid pathway doses were calculated using the LADTAP-II computer program, while gaseous pathway releases were calculated with the GASPAR-II program. See Tr. at M-1754, M-1759; SNC Radiological Impacts (Environmental) Presentation at 9, 13. Mr. Young presented the MEI dose results from liquid and gaseous effluents, and showed that they were all well below the 10 C.F.R. Part 50, app. I, design objectives. See SNC Radiological Impacts (Environmental) Presentation at 15; see also FEIS 1B, at 5-69 (tbl. 5-9). He also presented the direct radiation dose calculated for the population within fifty miles, and showed that it was about one thousandth of the natural background dose, i.e., the population dose was calculated to be 1.837 person-rem/year, while

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the same population would receive 2430 person-rem/year from natural background. See Tr. at M-1761 to -1762; SNC Radiological Impacts (Environmental) Presentation at 16.

4.58 According to Mr. Young, to evaluate the potential direct radiation exposure from the normal operation of Units 3 and 4, SNC reviewed the radiation doses measured during the operation of Units 1 and 2. To estimate the fifty-mile radius population dose, thermal luminescent dosimeter (TLD) measurements were used. See Tr. at M-1762. Because the measurements would not have any contribution from direct radiation emanating from the site, SNC collected control data reflecting the background radiation at stations more than ten miles from the site boundary. See id.; FEIS 1B, at 5-75. SNC also collected data from indicator stations located at the site perimeter given these measurements would include background plus any radiation contribution from the site. See Tr. at M-1762 to -1763. Based on data taken from 1992-2001, the range of average annual doses from the control stations was 48.4 to 54.4 millirem. The corresponding range of doses from the indicator stations was 48.0 to 54.4 millirem. This data, according to Mr. Young, indicates there is no dose contribution at the site boundary due to direct radiation from the Unit 1 and 2 operations. See Tr. at M-1763; SNC Radiological Impacts (Environmental) Presentation at 18.

4.59 Finally, Mr. Young presented cumulative dose results that included the combined releases from VEGP Units 1 through 4, the DOE SRS, and the planned mixed oxide (MOX) facility at SRS. The cumulative MEI dose was calculated to be 2.9 millirem per year, while the population dose was calculated to be thirty person-rem/year, which represents an average exposure to each person of only a small fraction of one millirem per year. See Tr. at M-1766 to -1767; SNC Radiological Impacts (Environmental) Presentation at 19.

4.60 Staff witness Mr. Smith presented evidence he asserted showed that the staff carefully reviewed the applicant's dose calculations and performed independent calculations to

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verify the accuracy of the applicant's results, which included reviewing all of the input parameters to ensure they were reasonable. See Tr. at M-1865. Mr. Smith stated that, although the release source terms were based on the AP1000 DCD revision 15, he had examined the DCD revision 17 source terms and found that they did not differ significantly from the revision 15 source terms used in the analysis. See Tr. at M-1865, -1867. According to Mr. Smith, these independent staff calculations produced results that were virtually identical to those presented by the applicant, with the exception of the population doses. The staff's calculated population doses were about twenty percent higher than the applicant's because the staff used a population projection for the year 2013, while the applicant used the year 2000 population. See Tr. at M-1866. There were also slight differences between some of the applicant's and staff's calculations for a few categories of gaseous effluents, but according to Mr. Smith those differences were due to the staff's use of a different source term and not rounding off values from the AP1000 DCD. See Tr. at M-1868 to -1869.

4.61 Staff witness Mr. Smith also testified that the LADTAP-II and GASPAR-II computer programs used to perform the dose calculations had been extensively benchmarked and used accepted methodologies referred to in NRC Regulatory Guides. See Tr. at M-1867 to -1870. Mr. Smith concluded that, based on the staff's review, the radiological impacts during the construction and operation of the new units, as well as the cumulative radiological impacts and the radiological impacts from the associated uranium fuel cycle activities, would be SMALL. See Staff Radiological Impacts Presentation at 25.

ii. Radiological Impacts from Postulated Accidents

4.62 SNC witness Mr. Young also testified regarding the applicant's analysis of radiological impacts from both DBAs and postulated severe accidents. He stated that the DBA analysis was based on the AP1000 DCD revision 15, while the source term methodology was

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from Regulatory Guide 1.183. See Tr. at M-1768. The DCD doses are applied to the Vogtle site by scaling the atmospheric dispersion factors (i.e., Chi over Q or Chi/Q factors) used in the DCD analysis to the Chi/Qs determined from Vogtle site data. Mr. Young testified that the Chi/Q methodology employed was from Regulatory Guide 1.145. See Tr. at M-1760, M-1768 to -1769. The DBA dose at the exclusion area boundary (EAB) was calculated as a two-hour dose, while the DBA dose for the low population zone (LPZ) was calculated for the entire term of the accident, or approximately thirty days. See Tr. at M-1769. By referring to FEIS Table 5-14, Mr. Young concluded that the doses at the EAB and within the LPZ would all be considerably smaller than NRC review criteria, and that the environmental impact from such doses would be SMALL. See SNC Radiological Impacts (Environmental) Presentation at 21.

4.63 Mr. Ramsdell provided evidence that the staff again performed extensive consistency checks and confirmatory calculations on the applicant's DBA radiological impacts analysis. He stated that the staff followed ESRP section 7.1 and SRP chapter 15 in conducting the review. This included reviewing the applicant's atmospheric dispersion factors, accident selection, and dose calculations. See Tr. at M-1876. According to Mr. Ramsdell, the staff verified that the DBA doses were less than ten to fifteen percent of the safety criteria set forth in SRP section 15.0.3. See Tr. at M-1877. He further testified that the staff concluded that the Vogtle site is suitable for the operation of two new reactors falling within the parameters of the AP1000 DCD revision 15 design. See Tr. at M-1878.

4.64 SNC witness Mr. Young testified that the evaluation of doses from severe accidents (those beyond DBAs that could result in substantial reactor core damage or containment degradation) is based on a generic probabilistic risk assessment model in the AP1000 DCD. To apply this model to the VEGP site, site specific parameters, such as meteorology and population distributions, were used. Mr. Young testified that the applicant's

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site-specific analysis presented in ER section 7.2 was bounded by the DCD results. See Tr. at M-1770 to -1771. He further stated that these calculations were carried out using the MACCS2 computer program, which is a standard analytical tool for calculating the doses from atmospheric releases, including through direct exposure to the plume, exposure to material deposited on ground surfaces and the skin, inhalation of material in the plume, and ingestion of contaminated food and water. The MACCS2 code was used to analyze three areas of consequences: human health, economic costs, and land affected by contamination. Mr. Young also testified that the results presented in FEIS Table 5-16 confirmed that the VEGP severe accident risks are well below the safety goal policy values. See SNC Radiological Impacts (Environmental) Presentation at 23-24; Tr. at M-1771 to -1773; see also FEIS 1B, at 5-84 (tbl. 5-16). Finally, he stated that the human health risks for all risk categories from severe accidents were determined to be SMALL. See Tr. at M-1772 to -1773.

4.65 Mr. Ramsdell stated that the staff again performed an independent check on the parameters used in the applicant's severe accident analysis calculations, as well as conducted confirmatory independent calculations. See Tr. at M-1881 to -1882. According to Mr. Ramsdell, accepting the MACCS2 computer code as an appropriate tool for performing severe accident dose calculations was appropriate because the code was specifically developed for this purpose, and was endorsed in the SRP. See Tr. at M-1879. Mr. Ramsdell also presented the severe accident risk estimates, which were 2.8×10^{-4} person-sieverts per reactor year, with fatality estimates of 1.9×10^{-10} person-sieverts per reactor year, economic costs of \$48.00 per reactor year, and 3.6×10^{-4} hectares of farm land requiring decontamination per reactor year. He concluded that the risk (including the cumulative risk) was well below the Commission's Safety Goal Policy Statement, see 51 Fed. Reg. at 30,028, and less than ten percent of the severe accident risk associated with an existing unit. See Staff Radiological Impacts

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Presentation at 36-37. Overall, the staff concluded that the environmental impact of probability-weighted consequences of a severe accident for an AP1000 unit at the VEGP site would be SMALL. See id. at 39.

e. Presentations on Safety Impacts

4.66 On the safety side, SNC witness Dr. Findikakis provided extensive information regarding the relevant site hydrology, including a characterization of the three aquifers that underlie the site, the location of liquid effluent release points, the transport pathways, and the characteristics that affect radionuclide transport, including how these characteristics were based on site specific data. See Tr. at M-1777.

4.67 According to Dr. Findikakis, the Savannah River lies north and east of the VEGP site, with local streams flowing into the river. To the north of the site sits Mallard Pond, which flows into an unnamed creek that flows into the Savannah River. Three aquifers -- the Water Table aquifer, Tertiary aquifer, and Cretaceous aquifer -- underlie the site, with the Tertiary and Cretaceous aquifers hydraulically isolated from the Water Table aquifer by the Blue Bluff marl, which separates the Water Table and Tertiary aquifers. See Tr. at M-1778; SNC Radiological Impacts (Safety) and Groundwater Impacts Presentation at 6-7.

4.68 Dr. Findikakis provided evidence that the aquifers had been characterized through onsite measurements. See Tr. at M-1778 to -1780. He presented a site hydrology model developed by the applicant and calibrated against site-specific groundwater levels measured in monitoring wells. See Tr. at M-1780 to -1786. The hydraulic parameters used in the model, such as the hydraulic conductivity, were also based on extensive site-specific measurements. See Tr. at M-1784 to -1785. The model was developed using MODFLOW, which Dr. Findikakis declared is the standard model in the industry. See Tr. at M-1787 to -1788. According to Dr. Findikakis, the groundwater model included modifications to account for the

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relevant changes that would be introduced by the construction of the new units, particularly changes to the recharge distribution due to changes in grading and surface cover. See Tr. at M-1799; SNC Radiological Impacts (Safety) and Groundwater Impacts Presentation at 18-20.

4.69 Dr. Findikakis testified that the hydrology model predicted that liquid effluent releases from proposed Units 3 and 4 would move to the north, where they would enter the surface water system at Mallard Pond, which is within the site boundary. They would be diluted during transport to the pond, while in the pond, and while in a stream that runs from the pond to the Savannah River. See Tr. at M-1801 to -1802; SNC Radiological Impacts (Safety) and Groundwater Impacts Presentation at 21. He also presented results for a postulated accident chosen to release the highest concentrations of radionuclides. This accident scenario involved the instantaneous release of eighty percent of the liquid effluent from a 22,400 gallon holdup tank in the basement of the auxiliary building. See Tr. at M-1801, M-1804; SNC Radiological Impacts (Safety) Presentation at 21. Dr. Findikakis likewise presented evidence that a number of very conservative assumptions had been used in the analysis. For example, SNC assumed that the released effluents were instantaneously transported into the water table, taking no credit for the building's drain system, the six-foot concrete base-mat and membrane under the floor, or the passage through the approximately twenty-five feet of unsaturated zone from the bottom of the building to the groundwater. See Tr. at M-1802. Dr. Findikakis testified that, using the compliance point for the analysis as the location in the stream where it passes outside the site boundary, despite the conservatism in the analysis all of the radionuclide concentrations at the compliance point were calculated to be much smaller than the effluent concentration limits (ECLs) prescribed in 10 C.F.R. Part 20. See Tr. at M-1804 to -1805.

4.70 Dr. Findikakis described an additional transport path where the same effluent release was assumed instantaneously to pass into the Tertiary aquifer. See Tr. at M-1813.

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This analysis took no credit for the sixty feet of practically impermeable Blue Bluff marl over the Tertiary aquifer. With the compliance point for this analysis being the nearest discharge point from the aquifer into the Savannah River, he testified that this very conservative analysis again predicted that the radionuclide concentrations would be much smaller than the ECLs. See Tr. at M-1814.

4.71 Relative to the staff's review efforts, Dr. Kincaid provided evidence that the staff performed an extensive evaluation of the applicant's radiological impacts analyses. This included site audits, issuing a number of requests for additional information (RAIs), reviewing the site-specific model parameters, proposing alternative conceptual groundwater models, and performing several independent calculations and sensitivity analyses based on post-construction groundwater recharge distributions. See Staff Radiological Impacts Presentation at 4; Tr. at M-1821 to -1858. The staff evaluation also included checking that the most current light detection and ranging (LiDAR) and digital elevation model (DEM) data were used, as well as checking the hydraulic conductivities and recharge rates used in SNC's models. See Tr. at M-1824 to -1828; Staff Radiological Impacts Presentation at 5-6. Dr. Kincaid also provided evidence that the staff's evaluation incorporated adequate conservatism, including examining multiple pathways, neglecting dispersion in the groundwater, applying the lowest measured distribution coefficients, and using low-discharge-year catchment flows. See Tr. at M-1851. Specifically, he noted that the staff identified a second drainage pathway toward Daniels Branch, rather than Mallard Pond, that it determined would be plausible but unlikely. See Tr. at M-1842 to -1843. The staff confirmed the applicant's conclusion that the standard of 10 C.F.R. Part 20, app. B, tbl. 2, can be met for both the Mallard Pond catchment and the Daniels Branch catchment. See Tr. at M-1851; Staff Radiological Impacts Presentation at 20-21.

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f. Board Findings Related to Radiological Impacts

4.72 The Board finds that the site hydrology has been well characterized, and that the parameters used to evaluate the transport of liquid effluents were based on an extensive set of onsite measurements. We also find that the analytical methodologies and computer programs used in the radiological evaluation are those specified and/or endorsed in NRC regulations and associated guidance (e.g., the LADTAP-II, GASPAR-II, and MACCS2 computer programs). The Board also finds that the staff was thorough in its review and evaluation of the applicant's analyses in this area. The staff not only reviewed the analytical tools and input parameters, but performed many independent calculations to verify the applicant's results. The staff ensured that key hydrological parameters were based on adequate site-specific measurements, and that the models and parameters incorporated an adequate level of conservatism. The Board finds that the applicant's analyses showing that the doses from radiological releases (both for routine operations and postulated accidents) are well below regulatory standards, and have been adequately reviewed and confirmed by the staff. The Board thus finds that the applicant's and staff's conclusions that the radiological impacts will be SMALL and will not pose an undue risk to public health and safety are well supported by the record of this proceeding.

3. Groundwater Impacts on Safety-Related Structures

a. Introduction

4.73 Another safety issue related to site hydrology is the impact that groundwater could have on subsurface portions of safety-related structures, systems, and components (SSCs). The main issue is whether or not the groundwater could reach the foundation level of safety-related SSCs and so negatively impact them.

4.74 SNC addressed the relationship of groundwater to the design basis for the AP1000 design in SSAR section 2.4.12. See Exh. SNC000075, at 2.4.12-1 to -98 ([SNC],

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Vogle [ESP] Application, pt. 2, [SSAR] (rev. 5 Dec. 2008)). In reviewing SNC's SSAR, the staff had questions regarding the applicant's original hydrological model, leading to open item 2.4-2 in the draft safety evaluation report (DSER). See Tr. at M-1893. Open item 2.4-2 requested that SNC provide "an improved and complete description of the current and future local hydrological conditions, including alternate site models, [and a demonstration that] the design basis related to groundwater induced loadings on sub-surface portions of the safety related SSCs would not be exceeded." Id. In response to this open item, SNC provided a groundwater model of the Water Table aquifer (discussed above in the Radiological Impacts section, see supra section IV.A.2), which was independently evaluated by the staff. See id.; FSER at 2-157. After an exchange of RAIs between SNC and the staff and the amendment of the application, the staff determined that SNC's "site characteristic value for the maximum ground-water elevation at the VEGP site [is] acceptable. This elevation will be far enough below the site grade so as to not represent a safety concern for the plant fitting within the bounding parameters proposed in the application." FSER at 2-157. Thus, the staff closed open item 2.4-2. See id.

4.75 After the staff issued the ASER for review by the Advisory Committee on Reactor Safeguards (ACRS), the Board asked SNC and the staff to address this topic area at the mandatory hearing, including post-construction site hydrology, the relationship between evaluation parameters and onsite measurements, and how the staff assured itself that the analysis in the SER was conservative. See Licensing Board Safety Questions at 3.

b. Witnesses and Evidence Presented

4.76 To address the issue of groundwater impacts on safety-related structures, lead party SNC presented one witness while the staff put forth three witnesses. At the evidentiary hearing, these witnesses provided oral testimony in conjunction with prefiled slide presentations

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that were admitted as exhibits. See Tr. at M-1886 to -1906; SNC Radiological Impacts (Safety) and Groundwater Impacts Presentation; NRC000061 (NRC Staff Presentation Topic #3, Groundwater Impacts on Safety-Related Structures) [hereinafter Staff Groundwater Impacts Presentation].

i. SNC Witness

4.77 Dr. Angelos Findikakis, whose background and expert qualifications are discussed at section IV.A.2.b.i supra, appeared on behalf of SNC. See Tr. at M-1886, M-1888 to -1891, M-1905 to -1906.

ii. Staff Witnesses

4.78 Dr. Hosung Ahn, Mr. Christian Araguas, and Dr. Charles Kincaid appeared on behalf of the staff. See Tr. at M-1892 to -1906. Dr. Ahn's and Mr. Araguas' backgrounds and expert qualifications are discussed at section IV.A.2.b.ii supra. Dr. Kincaid's background and expert qualifications are discussed at section IV.A.1.b supra.

4.79 Based on the foregoing, the Board finds each of these witnesses qualified to testify as an expert regarding the groundwater impacts on safety-related structures associated with proposed Vogtle Units 3 and 4.

c. Regulations and Guidance Related to Groundwater Impacts on Safety-Related Structures

4.80 Among other things, pursuant to section 52.17(a)(1) the SSAR submitted with an ESP application must contain "[t]he seismic, meteorological, hydrologic, and geologic characteristics of the proposed site" and "[a] description and safety assessment of the site on which a facility is to be located." 10 C.F.R. § 52.17(a)(1)(vi), (ix). In addition, section 100.20 states that the Commission, "in determining the acceptability of a site for a stationary power reactor," will consider the "[p]hysical characteristics of the site, including seismology, geology, meteorology, and hydrology." 10 C.F.R. § 100.20(c).

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4.81 Section 2.4.1 of RS-002 guides the staff's review of an ESP applicant's hydrologic description of a proposed site. See RS-002, at 2.4.1-1. RS-002 states that the application should provide sufficient detail of the surface and subsurface characteristics of the site and region "to assess acceptability of the site and the potential for those characteristics to influence the design of structures, systems, or components of a nuclear power plant or plants . . . that might be constructed on the proposed site." RS-002, at 2.4.1-2. This information, if provided in sufficient detail, will be used to support a finding regarding whether the requirements in Parts 52 and 100 have been met, and whether there is "reasonable assurance that the hydrologic characteristics of the site and potential hydrologic phenomena would pose no undue risk to the type of facility . . . proposed for the site." Id. Regulatory guidance is also provided in SRP section 2.4.1, see SRP at 2.4.1-1 to -15, and section 2.4.13 of Regulatory Guide 1.70, see, e.g., [OSD, NRC], Regulatory Guide 1.70, Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, LWR ed., at 2-24 (rev. 3 Nov. 1978) (pt. I, ADAMS Accession No. ML011340072).

d. Evidentiary Presentation

4.82 In his testimony on behalf of SNC, Dr. Findikakis stated that the preconstruction groundwater model used in this evaluation was the same model discussed in the topic area of Radiological Impacts. See supra section IV.A.2. He reiterated that the model was based on, and calibrated against, site specific parameters and measurements. See Tr. at 1889. The model was then modified to account for post-construction changes. The key changes in this regard were in the area of groundwater recharge, and accounted for such impacts as site grading, building placement, and the placement of paved or graveled areas. The model also took into account the extensive placement of backfill material under the power block area. See SNC Radiological Impacts (Safety) and Groundwater Impacts Presentation at 33; cf. also Tr.

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at M-1888 to -1889. This model was then used to predict groundwater conditions following the construction of Units 3 and 4. See SNC Radiological Impacts (Safety) and Groundwater Impacts Presentation at 33. Dr. Findikakis testified that the parameters used in the post-construction model were conservative, and were based on onsite measurements. See Tr. at M-1889. According to Dr. Findikakis, the model was also evaluated using a sensitivity analysis, which determined that the level of groundwater was not very sensitive to changes in the combinations of parameters used, exhibiting differences “well within the order of about two to five feet at most.” Tr. at M-1890.

4.83 Dr. Findikakis testified that the model was used to predict the surface elevation contours of the water table as well. The model predicted groundwater levels between 150 and 160 feet above mean sea level (MSL) in the area of Units 3 and 4. See Tr. at M-1890. According to Dr. Findikakis, the grade level is about 220 feet MSL in this area, and the base of the lowest safety-related structure is at 180.5 feet MSL. See Tr. at M-1890; SNC Radiological Impacts (Safety) and Groundwater Impacts Presentation at 39; FSER at 2-156. Although the AP1000 DCD requires that the maximum groundwater level be at least two feet below the final site grade, see SNC Radiological Impacts (Safety) and Groundwater Impacts Presentation at 38; FSER at 2-156, the groundwater in this instance is about sixty feet below the surface, about fifty-eight feet below the DCD requirement, and about twenty feet below the base of any of the structures. Based on these circumstances, Dr. Findikakis concluded there would be no issue of hydrostatic loading on safety-related structures. See Tr. at M-1891; SNC Radiological Impacts (Safety) and Groundwater Impacts Presentation at 38-39. Dr. Findikakis also pointed out that the future groundwater level predictions were similar to current groundwater levels, which indicated that groundwater levels would not be significantly altered by site construction. See Tr. at M-1891.

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4.84 Dr. Kincaid discussed the staff's review of this topic area, with a focus on how the staff assured that the groundwater evaluations in the SER were conservative. See Tr. at M-1892. He presented the staff's extensive review of the site hydrology model, including the staff's development of alternate conceptual models of the site, calibration of the model against hydraulic heads measured in observation wells at the site, and comparison with USGS data. He concluded that the preconstruction and post-construction results independently calculated by the staff were "very comparable" to those calculated by the applicant. Tr. at M-1900; see Tr. at M-1893, M-1898; FSER at 2-154; Staff Groundwater Impacts Presentation at 11. He thus agreed with SNC that the proposed model is the best model. See Tr. at M-1897.

4.85 Dr. Kincaid also presented evidence that the staff's and the applicant's results were conservative. See Staff Groundwater Impacts Presentation at 16. He testified that the preconstruction model yielded conservative, or high, estimates of the water table as compared to measurements from observation wells, and that the post-construction model was likely to do the same. See Tr. at M-1901; see also Tr. at M-1897 to -1898; Staff Groundwater Impacts Presentation at 12. The high estimates were likely due to the hydraulic conductivity value used, or the higher rates of recharge to groundwater from precipitation applied. See Tr. at M-1897. Dr. Kincaid identified as a conservatism in the post-construction model the fact that it incorporates no regions of zero recharge to groundwater from precipitation (i.e., all areas were assumed to have recharge from precipitation), which ignores the presence of structures, parking lots, and other paved areas for which there typically would be no recharge. See Tr. at M-1900, M-1902; Staff Groundwater Impacts Presentation at 11. As another example of conservatism, Dr. Kincaid indicated that, based on the literature reviewed, the staff determined that the "plausible cases" for recharge rates in the cooling tower and power block areas were one-quarter of average annual precipitation and one-eighth of average annual precipitation,

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respectively. Using these values, the staff calculated groundwater elevations of 166.5 feet MSL in the cooling tower area and 162.4 feet MSL in the power block area, which were comparable to the applicant's respective calculated values of 166.1 feet MSL and 162.6 feet MSL. The staff therefore determined that the post-construction water table would be predicted to be below 165 feet MSL. See Tr. at M-1898 to -1902; Staff Groundwater Impacts Presentation at 13, 15-16.

4.86 Dr. Kincaid concluded that the applicant's site characterization value of the highest groundwater level, 165 feet MSL, is supported by current observations and post-construction simulations. See Tr. at M-1903 to -1905. Given that the lowest elevation for a safety-related structure is 180.5 feet MSL, Dr. Kincaid concluded that the maximum groundwater level would present no undue threat to safety-related structures. See Tr. at M-1903. Further, in response to a question from the Board regarding the staff's level of confidence in its analysis, Dr. Kincaid declared that even when adding the range of observed fluctuation in the Water Table aquifer (4 feet MSL) to either the highest preconstruction water table elevation measured in the proposed power block (157.24 feet MSL) or the preconstruction elevations predicted by the applicant or the staff (approximately 161 feet MSL, after accounting for 1 to 1.5 feet of conservatism), the resulting groundwater level would still not exceed 165 feet MSL. See Tr. at M-1903 to -1905; see also Staff Groundwater Impacts Presentation at 17.

e. Board Findings Related to Groundwater Impacts on Safety-Related Structures

4.87 The Board finds that the site groundwater model developed for this evaluation was adequately detailed, and well calibrated against site-specific data. We also find that the staff was thorough in its independent evaluation of the model and its application in predicting postconstruction groundwater levels. This included the staff's examination of alternative models, the exploration of a range of hydraulic conductivities and recharge rates, and the

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independent review comparisons to onsite data. The Board finds that the prediction of a maximum groundwater level of 165 feet MSL is well supported by measurements and calculations and concurs with SNC's and the staff's conclusion that groundwater at the site presents no undue threat to the safety-related structures.

4. Environmental Impacts of Alternatives

a. Introduction

4.88 The FEIS discussion of alternatives is found in chapter 9, Environmental Impacts of Alternatives, and chapter 10, Comparison of the Impacts of the Proposed Action and the Alternative Sites. See FEIS 1B, at 9-1 to -103, 10-1 to -9. Chapter 9 discusses the no action alternative (section 9.1), energy alternatives (section 9.2), system design alternatives (section 9.3), and alternative sites (sections 9.4 to .7). See FEIS 1B, at 9-1. Chapter 10 compares the proposed and alternative sites and concludes that, although there would be some differences in environmental impacts at the different sites, none of the alternative sites is environmentally preferable and therefore none is obviously superior to the VEGP site. See FEIS 1B, at 10-7. Chapter 10 also discusses the no-action alternative. See id. at 10-7 to -8.

4.89 After reviewing the FEIS, the Board sought further information regarding the staff's review of the key environmental impacts of alternatives to the proposed nuclear power units. The information was to focus on alternative energy sources and sites and was not to include discussion of the dry cooling alternative, which was a subject of the contested hearing. See Licensing Board Environmental Questions at 3; see also LBP-09-7, 69 NRC at __-__ (slip op. at 90-113). The Board sought to verify that the alternatives analysis included in the FEIS adequately evaluated potential environmental impacts from the construction and operation of the proposed plants as compared with the environmental impacts of alternatives.

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b. Witnesses and Evidence Presented

4.90 To address the Board's review of the alternatives assessment, SNC, which was the lead party relative to this issue, put forth one witness and the staff proffered four witnesses to make oral presentations at the hearing, in conjunction with their prefiled slide presentations that were admitted as exhibits, and/or to provide responses to Board questions. See Tr. at M-1927 to -2020; Exh. SNC000076 ([SNC] Vogtle ESP Mandatory Hearing Presentation #4, Environmental Topic #3: Alternative Site Selection Process) [hereinafter SNC Alternatives Presentation]; Exh. NRC000062 (NRC Staff Presentation Topic #4: Environmental Impact of Alternatives) [hereinafter Staff Alternatives Presentation].

i. SNC Witness

4.91 SNC presented one witness, Thomas C. Moorer, on the topic of alternatives analyses. Mr. Moorer is the Project Manager-Environmental for SNC. See SNC000014, at unnumbered p. 2 (Thomas C. Moorer [CV]).¹⁶ He has a B.S. in Environmental Science from Auburn University and a B.S. in Civil/Environmental Engineering from the University of Alabama and over thirty years of experience in electric utility environmental management, including over eighteen years in the nuclear area and fifteen years in NEPA matters. See id.

ii. Staff Witnesses

4.92 For the staff, Paul L. Hendrickson and Lance W. Vail gave oral presentations at the evidentiary hearing. The staff's panel on alternatives analyses also included Dr. Christopher B. Cook and Mark D. Notich. Mr. Hendrickson is a staff scientist in the Radiological Science and Engineering Group, Energy and Environment Directorate, at PNNL. See Exh. NRC000078, at 1 (CV for Paul L. Hendrickson). He has a B.S. in Chemical Engineering from the University of Washington, a Juris Doctor degree (J.D.) from the University of Washington Law School, and an

¹⁶ Mr. Moorer was also a witness for the contested portion of this proceeding. See, e.g., Tr. at 610, 612, 966, 1291. As a result, his CV also was filed as a contested hearing exhibit.

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M.S. in Industrial Management from Purdue University. Id. He has been with PNNL for thirty-six years and has done EIS support work for NRC for the last eleven years. See Tr. at M-1972. The qualifications of Dr. Cook, Mr. Notich, and Mr. Vail were previously discussed in connection with the staff's water impacts presentation. See supra section IV.A.1.b.

4.93 Based on the respective qualifications and experience of the proffered witnesses, the Board finds that each of these individuals is qualified to testify as an expert regarding the alternatives analyses relative to the Vogtle ESP application.

c. Regulations and Guidance Relating to Alternatives Analysis

4.94 NEPA section 102(2)(C)(iii) requires that an EIS address alternatives to the proposed action. See 42 U.S.C. § 4332(2)(C)(iii). NRC's regulations implementing this NEPA provision require an applicant for an ESP to file an ER, see 10 C.F.R. § 51.50(b), addressing the following factors:

- (1) impact of proposed action on the environment;
- (2) unavoidable adverse environmental impacts;
- (3) alternatives to the proposed action;
- (4) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and
- (5) irreversible and irretrievable commitments of resources.

10 C.F.R. § 51.45(b)(1)-(5). If the proposed siting of a plant slated for an ESP involves unresolved conflicts concerning alternative uses of available resources, then this discussion must be sufficiently complete to allow the staff to develop and to explore appropriate alternatives to the ESP pursuant to NEPA section 102(2)(E). See id. § 51.45(b)(3). The ER must also include "an evaluation of alternative sites to determine whether there is any obviously superior alternative to the site proposed." Id. § 51.50(b)(1).

4.95 Additionally, 10 C.F.R. § 51.45(b)(3) and 10 C.F.R. Part 51, app. A(5), call for a presentation of alternatives in an applicant's ER and in an NRC EIS, respectively, in

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comparative form. All reasonable alternatives are to be identified. See Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1), CLI-91-2, 33 NRC 61, 71 (1999). The staff must prepare an EIS during review of an ESP application, see 10 C.F.R. § 52.18, and this EIS “must include an evaluation of alternative sites to determine whether there is any obviously superior alternative to the site proposed.” Id. § 51.75(b). The EIS must be prepared in accordance with 10 C.F.R. § 51.71, which, inter alia, considers and weighs the environmental impacts of alternatives to the proposed action and alternatives available for reducing or avoiding adverse environmental effects. See id. § 51.71(d). In addition, with regard to alternative sites, the Commission has recently emphasized that the staff must evaluate “both the process (i.e., methodology) used by the applicant and the reasonableness of the product (e.g., potential sites) identified by that process.” North Anna ESP, CLI-07-27, 66 NRC at 223-24 (quoting ESRP at 9.3-8); see also id. at 228-32 (finding FEIS discussion of alternative sites insufficient but independently reviewing record on greenfield, competitors' brownfield, noncompetitors' brownfield, and applicant's other nuclear sites to conclude that the staff's underlying alternative site review was adequate).

4.96 ESRP chapter 9 provides guidance to the staff in its alternatives analysis. See Staff Alternatives Presentation at 3; see also ESRP at 9.1-1 to 9.4.3-14. Pursuant to ESRP section 9.3, the staff's evaluation of alternative sites proceeds in two steps. First, the staff, using “reconnaissance-level information” on a “full suite of environmental issues,” determines whether any alternative sites identified by the applicant are environmentally preferable to the proposed site. Thereafter, if the staff identifies environmentally preferable sites, the staff examines economic, technological, and institutional factors to determine whether any of those sites are obviously superior to the proposed site. See FEIS 1B, at 9-1; ESRP at 9.3-5. Additional guidance is provided in chapters 9 and 10 of Regulatory Guide 4.2, see

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Exh. NRC000007, at 9-1 to 10-4 ([OSD, NRC], Regulatory Guide 4.2, Preparation of Environmental Reports for Nuclear Power Stations, NUREG-0099 (rev. 2 July 1976)), and in Regulatory Guide 4.7, see Exh. NRC000008 (Office of Nuclear Regulatory Research (RES), [NRC], Regulatory Guide 4.7, General Site Suitability Criteria for Nuclear Power Stations (rev. 2 Apr. 1998)); see also FEIS 1B, at 9-1.

d. Evidentiary Presentation

i. No-Action Alternative

4.97 With respect to the analysis of the no-action alternative, which assumes that the ESP is denied, resulting in a COL not being issued, SNC witness Mr. Moorer indicated that the initial impact would be a loss of generation margin. Given the need for baseload generation in the near future, however, environmental impacts would not be avoided entirely in that they would occur for an alternate generation source, possibly at an alternate site. See Tr. at M-1935 to -1936; SNC Alternatives Presentation at 5. In response to a Board inquiry about the impact of electricity consumption-moderating demand side management (DSM) on the shifted environmental impact for the no-action alternative, Mr. Moorer indicated that “there’s just not enough demand side possibility to fill the need for 2400 megawatts of baseload.” Tr. at M-1936.

4.98 The staff presentation regarding the no-action alternative basically mirrored the applicant’s discussion indicating that a failure to obtain an ESP and LWA for the Vogtle site would eliminate impacts at that site, but might result in impacts occurring at an alternate site. See Tr. at M-1974. Staff witness Mr. Hendrickson also pointed out that site-related non-LWA construction work would be an avoided impact, but such work could proceed without NRC approval in any event. See id.

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ii. Energy Alternatives Analysis

4.99 Staff witness Mr. Hendrickson stated that ESP applicants are not required to include an analysis of energy alternatives in their ER, having been notified of this in a June 2003 letter. Nonetheless, since SNC chose to include an energy alternatives discussion in its ER, the staff's EIS also considered energy alternatives. See Tr. at M-1974 to -1975; Staff Alternatives Presentation at 5.

4.100 SNC witness Mr. Moorer indicated "that this alternative[]s analysis is predicated on an understanding that we're comparing alternatives to 2234 megawatts of baseload generation." Tr. at M-1936; see also Exh. SNC00001P, at 9.2-5 ([SNC], [ER] for [SNC]'s Vogtle [ESP] Application, ch. 9 (rev. 2 Apr. 2007)) [hereinafter ER 1P]. He also indicated there are two types of energy alternatives: those requiring new generating capacity and those that do not. See Tr. at M-1936; SNC Alternatives Presentation at 6.

(1) Energy Alternatives Not Requiring New Generation

4.101 Relative to the category of energy alternatives that do not require new generation, the options that SNC included were DSM, purchased power agreements, license renewal and power uprates of existing nuclear units, and a combination of these options. See Tr. at M-1937; SNC Alternatives Presentation at 7. SNC witness Mr. Moorer indicated that "these alternatives, while they're important, they do not rise to the level of replacing the baseload." Tr. at M-1937 to -1938. He testified that all three SNC nuclear plants have already been uprated and two out of three have had their licenses renewed, with the existing units at the Vogtle plant currently in the license renewal process. See id. Mr. Moorer concluded that the non-generation options, both individually and in combination, are insufficient to meet forecast baseload demand growth. See Tr. at M-1939.

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4.102 Similarly, staff witness Mr. Hendrickson stated that “[i]n the EIS, the Staff considered energy alternatives that would require new generation, and alternatives that would not require new generation. And the EIS also uses the same target value of 2234 megawatt electric baseload power that Southern used in their ER.” Tr. at M-1975. The staff independently examined essentially the same options as the applicant, as well as re-activation of retired power plants. See Tr. at M-1975 to -1977. Mr. Hendrickson indicated that “the Staff’s general conclusion in this area of alternatives not requiring new generation was that the options not requiring new generation are not reasonable alternatives to a new baseload nuclear power plant.” Tr. at M-1977. In response to Board questions about the basis for the megawatt target value, Mr. Hendrickson and Mr. Moorer indicated that the Georgia Public Service Commission (PSC), after reviewing the Georgia Power Company Integrated Resource Plan, approved 2234 megawatts electric (MWe) of nuclear powered baseload generation. See Tr. at M-1977 to -1978.

(2) Energy Alternatives Requiring New Generation

4.103 With respect to energy alternatives involving increased generating capacity, Mr. Moorer identified a list of ten alternative energy sources and an option associated with combining energy generation alternatives to achieve the MWe target. See Tr. at M-1938; SNC Alternatives Presentation at 8. The combined option selected was four 530-MWe combined cycle gas plants and 120 MWe of wind power. Mr. Moorer explained that the combined cycle plants could load-follow to accommodate the intermittent nature of the wind power. He then stated that the environmental impacts of a combination of gas-fired combined cycle generation and wind-powered generation did not compare favorably to two nuclear units, nor did a coal/gas alternative. See Tr. at M-1939 to -1941, M-1945; SNC Alternatives Presentation at 10. Mr. Moorer indicated that “when you look at the air impacts, and land use impacts, and the

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combination of all the impacts compared to nuclear, nuclear, very clearly, is a better choice from an environmental impact standpoint.” Tr. at M-1940 to -1941. Replying to a Board question, Mr. Moorer indicated that building one nuclear plant in combination with combined cycle and wind would not alter this conclusion. See Tr. at M-1941 to -1942.

4.104 The Board also asked about the need to perform a new alternatives analysis if only one of the two proposed nuclear units were built, i.e., for 1117 MWe instead of 2234 MWe of new generating capacity. See Tr. at M-1942 to -1943. Mr. Moorer responded that the outcome would probably be the same, “[b]ut I will say that if we were to downsize from two units to one unit, we would certainly treat that as new information, and would go through the process of vetting that in the COL.” Tr. at M-1943. In response to another Board question regarding the effects of the current economic recession on the need for power in the future and the impact on this project, Mr. Moorer indicated that the likely effect would be to push out the schedule for construction, not eliminate the need altogether. See Tr. at M-1943 to -1944. Further, in answering a Board question regarding whether consideration was given to carbon dioxide-associated impacts in performing any of these alternatives comparisons, Mr. Moorer indicated that this was not analyzed because, as an unknown that was hard to quantify, it was not considered to be appropriate at this time and, in any event, would clearly favor the nuclear option if it were considered. See Tr. at M-1945 to -1946.

4.105 Mr. Hendrickson presented the staff’s analysis of alternative generation sources. According to Mr. Hendrickson, the staff independently examined the same alternatives as SNC, as well as wood and biomass. See Tr. at M-1980; Staff Alternatives Presentation at 8. The staff considered coal generation and natural gas combined cycle generation as the principal alternatives, the impacts of which they found to be greater than the nuclear plant impacts. The other alternatives of oil, wind, solar, geothermal, and fuel cells were also evaluated and were

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found not to be reasonable alternatives for a variety of reasons such as capacity, resource limitations, and excessive cost. See Tr. at M-1980 to -1985; Staff Alternatives Presentation at 10-13. Mr. Hendrickson indicated that the staff also looked at what it determined to be a representative combination of alternative energy sources for the southeastern United States, which “would be a combination of natural gas combined cycle, wind energy, biomass, and municipal solid waste, hydro power, and conservation.” Tr. at M-1986; see also Staff Alternatives Presentation at 14. The staff evaluated the environmental impacts of the combination option against the nuclear, coal, and natural gas options and found the nuclear option to have a smaller environmental impact. See Tr. at M-1989 to -1990; Staff Alternatives Presentation at 16-17. Finally, in response to Board questions, Mr. Hendrickson indicated that the environmental impact comparisons would likely have to be re-done if the baseload plant size were associated with construction of one nuclear plant instead of two. See Tr. at M-1994.

iii. Analysis of Alternative Sites

4.106 With respect to the analysis of alternative sites, SNC witness Mr. Moorer indicated that the process followed by SNC was driven by guidance in section 9.2 of Regulatory Guide 4.2 and ESRP section 9.3, as well as Regulatory Guide 4.7, which is a siting guide. See Tr. at M-1948; SNC Alternatives Presentation at 11. The purpose of the process that SNC used to identify and analyze alternative sites is to demonstrate that there is no obviously superior alternative site to the proposed site. See Tr. at M-1932 to -1933; ER 1P, at 9.3-1.

4.107 Mr. Moorer indicated that a key element of SNC’s alternative site analysis was defining its “relevant service area” and “region of interest.” Tr. at M-1934; SNC Alternatives Presentation at 4. For current alternatives analyses, both must be considered. Mr. Moorer defined the relevant service area (RSA) as the area in which electricity from the new Vogtle units would be sold. See Tr. at M-1934. Although Mr. Moorer indicated that previously the RSA

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might have been the focus of the VEGP alternative sites analysis, under current practice that focus has been expanded to include the SNC region of interest (ROI), which is a four-state area that comprises SNC's power generating territory, i.e., Georgia, Alabama, Mississippi, and part of the Florida panhandle. See Tr. at M-1934 to -1935.

4.108 Mr. Moorer then described at length the site selection process used by SNC. SNC first identified all potential sites within its ROI that had existing SNC electrical generation units of 1000 megawatts or greater with adequate land and cooling water availability, as well as large greenfield sites currently owned by SNC. This led to the identification of twelve generating plants and two greenfield sites. These fourteen potential alternative sites eventually were narrowed down to three candidate sites (in addition to the VEGP site), with the greatest potential – two existing nuclear sites and one greenfield site. Those three candidate sites and the VEGP site were then evaluated for environmental impacts, consistent with Regulatory Guide 4.2, through “reconnaissance-type investigations.” The result of the selection process was that none of these alternative sites was found to be obviously superior to the VEGP site. See Tr. at M-1947 to -1959; SNC Alternatives Presentation at 11-23.

4.109 Mr. Hendrickson indicated that the definition of the ROI used by the staff, which is found on page 9-1 of Regulatory Guide 4.2, is a broad definition, and that the ROI chosen by SNC is consistent with the staff's definition. See Tr. at M-1994 to -1995, M-2004. When asked by the Board to elaborate on the extent of the staff review of the alternative site selection process, Mr. Hendrickson responded that, based on the guidance in ESRP section 9.3, the staff looks “to see that the applicant has a reasonable process to go from region of interest, to candidate area, to potential sites, to candidate sites, to the proposed site. We want to see that that process is a reasonable one that can be justified and backed up.” Tr. at M-2000. When questioned further about the extent of the staff's review, Mr. Hendrickson explained that “[i]f the

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Staff is satisfied that the process appears to be okay, then the Staff's focus of providing examination of the sites is limited to the four candidate sites." Tr. at M-2002. He further indicated that "[t]he Staff did their own review of the four candidate sites, and the Staff's review was an independent review." Tr. at M-2003. The staff concluded that "Southern's site selection process was reasonable, and resulted in candidate sites that are among the best that could be reasonably found in the region of interest." Tr. at M-2004.

4.110 Mr. Hendrickson then provided the Board with details of the staff's comparative review of the four candidate sites with respect to construction and operational impacts. See Tr. at M-2004 to -2006; Staff Alternatives Presentation at 22-27. As a result of the review,

the Staff's conclusion regarding site selection[] is that while there are some differences between the Staff's characterization of environmental impacts at the proposed site, and at the alternative ESP sites, none of the differences is sufficient for the Staff to conclude that any of the alternative sites would be environmentally preferable to the proposed Vogtle ESP site. And given that none would be environmentally preferable, it would follow that none would be obviously superior to the proposed Vogtle ESP site.

Tr. at M-2006; see also Staff Alternatives Presentation at 28.

iv. Alternative Cooling Systems Analysis

4.111 With respect to alternative cooling systems, Mr. Moorer indicated that SNC "looked at all of the available cooling technologies that we were aware of, and that included once-through cooling, mechanical draft wet towers, natural draft wet towers, dry towers, wet/dry hybrid towers, cooling ponds, and spray canals." Tr. at M-1962; see also SNC Alternatives Presentation at 24. With the exception of the dry cooling system that was the subject of the contested hearing in this proceeding, see LBP-09-07, 69 NRC at __-__ (slip op. at 90-113), Mr. Moorer provided a brief overview of the evaluation that was done for each of the alternative cooling systems, that resulted in the decision to utilize a natural draft wet cooling system. He indicated that the decision to use natural draft towers was driven by SNC's prior experience

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with, and its operators' preference for, natural draft towers, as well as a judgment that the natural draft towers would have a smaller aesthetic impact given the presence of the two existing natural draft towers at the VEGP site. With regard to wet versus wet/dry hybrid towers, Mr. Moorer indicated that the greater land requirements and efficiency loss from hybrid towers led SNC to conclude that they were not preferable to wet towers despite the reduction in water use and associated impacts for hybrid towers. Once-through cooling was not an option due to the amount of water required, and other technologies, such as cooling ponds, require large amounts of land and are not as efficient. Thus, SNC concluded that none of the alternative cooling systems would be preferable to the proposed closed-cycle wet cooling system with natural draft cooling towers. See Tr. at M-1962 to -1966.

4.112 Mr. Vail discussed the staff's evaluation of cooling system alternatives. He indicated that the primary impact areas evaluated by the staff were associated with water quality, water use, and aquatic ecosystems. See Tr. at M-2010. In addition to the proposed natural draft wet cooling system, the staff evaluated once-through cooling, hybrid wet/dry cooling and cooling ponds. Once-through cooling was immediately ruled out because of water availability, and cooling ponds were ruled out because the site relief made them impractical. The hybrid wet/dry cooling system had some advantages and disadvantages with respect to the proposed wet cooling system. See Tr. at M-2010 to -2012; Staff Alternatives Presentation at 29. Overall, however, "the Staff concluded that given the environmental disadvantages of the alternative cooling systems considered, that there would be no environmentally preferable alternative to the proposed wet cooling system." Tr. at M-2012.

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e. Board Findings Related to Environmental Impact of Alternatives

i. No-Action Alternative

4.113 The Board finds that a denial of the ESP request, and by extension any future COL, while having the short term effect of eliminating the environmental impacts discussed in the FEIS, would result in an undesirable loss of generation margin and, given the State-determined need for near-term baseload generation, would still require additional generation. Consequently, the environmental impacts would still occur via an alternative generation source, perhaps at an alternative site. For these reasons, the Board finds that the staff had a reasonable basis for reaching this same conclusion in its analysis of the no-action alternative.

ii. Energy Alternatives

4.114 The Board concludes that it is appropriate for the energy alternatives analysis to compare the alternatives to 2234 megawatts of baseload generation and that both generation and non-generation alternatives should be considered.

(1) Energy Alternatives Not Requiring New Generation

4.115 The Board finds that the non-generation energy options evaluated by SNC, and independently evaluated by the staff, were appropriate and support the conclusion that the non-generation options, both individually and in combination, are insufficient to meet forecast baseload demand growth. Based on its independent review of energy alternatives not requiring new generation, including the re-activation of retired power plants, the staff reasonably concluded that non-generation options are not reasonable alternatives to the proposed baseload nuclear power units.

(2) Energy Alternatives Requiring New Generation

4.116 The Board finds that the individual alternative generation sources and the combination of sources considered by SNC and, independently, by the staff were appropriate.

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The staff review included the same individual energy sources as SNC's analysis, with the addition of wood and biomass. The combined sources evaluated by SNC included natural gas combined cycle and wind energy, and the independent review by the staff added biomass, municipal solid waste, hydro power, and conservation to these sources. The staff determined that, from an environmental perspective, none of the viable energy alternatives is clearly preferable to construction of a new baseload nuclear power plant.¹⁷ We find that the staff had a reasonable basis for its conclusions, and that the record is sufficient with respect to the analysis of energy generation alternatives.

4.117 The Board also finds that, in the event SNC chooses to build only one of the two proposed nuclear units, this potentially would be considered new and significant information requiring a re-evaluation of the analysis of energy alternatives, both generation and non-generation, as well as the combination of these alternatives.

iii. Region of Interest and Alternative Site-Selection/Evaluation

4.118 The Board finds that the ROI chosen by SNC is consistent with the staff's definition and that SNC had a reasonable process to go from ROI, to candidate area, to potential sites, to candidate sites, to the proposed site. The Board also finds that the staff, based on its independent review, had a reasonable basis for concluding that the applicant's ROI was appropriate for consideration and analysis of potential ESP sites, and that SNC did not arbitrarily exclude desirable candidate ESP locations. In addition, it is clear that once the staff

¹⁷ Although not extensively relied upon by applicant SNC as an alternatives analysis justification for its proposed facilities, see Tr. at M-1945 to -1946, the staff did make mention in its FEIS cost/benefit analysis summary that, as compared to coal and natural gas, "operation of a nuclear power plant does not result in any emissions of air pollutants associated with global warming and climate change (e.g., nitrogen oxides, sulfur dioxide, carbon dioxide) or methyl mercury," FEIS 1B, at 11-18, see id. at 11-20 (tbl. 11-3), a matter about which the Commission has indicated it may have more to offer regarding the need for a NEPA "carbon footprint" analysis in new reactor licensing proceedings, see Tennessee Valley Authority (Bellefonte Nuclear Power Plant, Units 3 and 4), CLI-09-3, 69 NRC __, __ n.2 (slip op. at 2 n.2) (Feb. 17, 2009).

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was satisfied that the ROI and the selection process were acceptable, the staff then did its own independent review of the four candidate sites. In that regard, the Board finds that the staff had a reasonable basis for concluding that the SNC site selection process resulted in candidate sites that are among the best that could be reasonably found in the ROI, and that, since none of the alternative sites would be environmentally preferable to the proposed Vogtle ESP site, none would be obviously superior.¹⁸ We thus find that the staff's conclusions in this regard were reasonable and that the record is sufficient with respect to the SNC site selection and evaluation process and results.

¹⁸ Although the staff's ESRP indicates that "all nuclear power plant sites within the identified region of interest having an operating nuclear power plant or a construction permit issued by the NRC should be compared with the applicant's proposed site," ESRP at 9.3-7, in light of the Commission's holding in the North Anna ESP proceeding that brownfield sites (i.e., a site on which an existing facility is located) owned by companies other than the applicant may reasonably be excluded as alternative sites, see North Anna ESP, CLI-07-27, 66 NRC at 231-32, and the relatively confined ROI in this instance (at least as compared to the ROI in the North Anna proceeding, see North Anna ESP, LBP-07-9, 65 NRC at 642 (app. B, showing ROIs of applicant Dominion Nuclear North Anna, LLC (Dominion) and SNC)), it does not appear, as a practical matter, that the alternative site analysis relative to the Vogtle ESP application was inadequate because SNC did not list in its initial selection of candidate sites any non-SNC-owned brownfield sites.

The Board also is aware that the Commission in the North Anna ESP proceeding indicated that Dominion's initial consideration of DOE's Portsmouth, Ohio, and SRS sites as alternative sites was reasonable as part of its alternative site analysis. See North Anna ESP, CLI-07-27, 66 NRC at 232. Nonetheless, we find both SNC's alternative site analysis and the staff's review of that analysis to be reasonable despite their non-inclusion of the DOE Portsmouth and SRS facilities. Two factors support our conclusion in this regard. First, SNC's ROI, which is significantly smaller than Dominion's, does not include either DOE site, with Portsmouth being located many miles to the northwest of the VEGP. See id. at 232 n.94 (noting non-inclusion of DOE's Idaho Falls, Idaho site in alternative sites analysis, which was "far outside Dominion's region of interest"); see also North Anna ESP, LBP-07-9, 65 NRC at 588, 642 (app. B, showing Dominion's ROI, which appears to include both SRS and Portsmouth). Second, although the Commission found Dominion's inclusion of the DOE sites to be reasonable in the context of the North Anna ESP proceeding, it does not seem to follow from the Commission's decision that non-inclusion of those sites would necessarily be unreasonable, particularly in light of potential considerations such as existing ownership/land acquisition issues, site environmental conditions (e.g., contamination), or transmission line siting issues. See FEIS 1B, at 9-28.

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iv. System Design Alternatives

4.119 The Board finds that SNC considered all of the available cooling technologies including once-through cooling, mechanical draft wet towers, natural draft wet towers, dry towers, wet/dry hybrid towers, cooling ponds, and spray canals. In addition to the proposed natural draft wet cooling system, the staff independently evaluated once-through cooling, hybrid wet/dry cooling, and cooling ponds. In evaluating each of these alternative cooling systems with respect to its environmental impacts, the staff conducted an independent analysis of each of the alternative heat dissipation systems and concluded there was no environmentally preferable alternative to the proposed closed-cycle wet cooling system. Based on the above, and in light of our finding in the contested portion of this proceeding relative to the dry cooling alternative that was also evaluated by the staff, see LBP-09-7, 69 NRC at __-__ (slip op. at 90-113), we find that the staff's conclusions regarding system alternatives were reasonable, that the record is sufficient to support that determination, and that the staff satisfied its responsibility under NEPA section 102(2)(E) with respect to the analysis of alternative cooling systems.

5. Limited Work Authorization and Site Redress Plan

a. Introduction

4.120 In conjunction with its ESP application, SNC has requested that it be allowed to conduct certain site-preparation activities at the VEGP site as authorized by the LWA provisions of 10 C.F.R. §§ 50.10, 52.17(c). Section 3.8 of the SSAR for the ESP application discusses the scope of the LWA foundation work and provides a description of the various items needed to prepare the nuclear island base slab, see Exh. SNC000081, at 3.8-1 to 3.8-4 ([SNC], Vogtle [ESP] Application, pt. 2, [SSAR] (rev. 5 Dec. 2008)), while Part 4 of the ESP application describes (1) the safety-related activities that may occur after the NRC issues an ESP with the LWA authorization sought by SNC for the VEGP site, but before NRC issues a COL; and (2) the

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site redress activities in the event SNC terminates construction. See Exh. SNC000082 ([SNC], Vogtle [ESP] Application, pt. 4, [SReP] (rev. 4 Mar. 2008)) [hereinafter SReP]. The extent and impacts of the requested LWA activities, as well as SNC's SReP, are addressed in section 4.11 of the FEIS. See FEIS 1A, at 4-72 to -74. In addition, the Board sought further information regarding the activities that would be undertaken either as prerequisites to, or as activities under, the requested LWA; the anticipated impacts of those activities on the VEGP site; and the specific activities that would be implemented under the SReP to mitigate those impacts in the event the SReP were required to be implemented. See Licensing Board Environmental Questions at 3.

b. Witnesses and Evidence Presented

4.121 To address the Board's request for further information on the LWA and SReP processes associated with the Vogtle ESP, in conjunction with their prefiled slide presentations that were admitted as exhibits, lead party SNC presented one witness, while the staff presented three witnesses. See Tr. at M-2020 to -2070; Exh. SNC000077 ([SNC] Vogtle ESP Mandatory Hearing Presentation #5, Environmental Topic #5: LWA and Site Redress Plan) [hereinafter SNC LWA Presentation]; Exh. NRC000063 (NRC Staff Presentation Topic #5: LWA and Site Redress Plan) [hereinafter Staff LWA Presentation].

i. SNC Witnesses

4.122 On behalf of SNC, Dale L. Fulton provided an oral presentation and answered questions from the Board regarding the SNC LWA and SReP submissions. Mr. Fulton, who has a B.S. in Geology from Auburn University, currently serves as an SNC Environmental Specialist. He has over ten years experience in environmental consulting, including NEPA assessments and the preparation of NEPA documents associated with the license renewal for Vogtle Units 1 and 2. See SNC LWA Presentation at 2; Exh. SNC000078 (Dale L. Fulton [CV]).

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ii. NRC Witnesses

4.123 Dr. Michael R. Sackschewsky made the staff's presentation on the LWA request. Also, as part of the staff panel on this subject matter, Christian J. Araguas answered questions from the Board, and Mark D. Notich also was available to answer questions. Dr. Sackschewsky, a Senior Research Scientist in the Ecology Group at PNNL and the team leader for the Vogtle ESP EIS, has a B.A. in Biology from the University of Colorado and a Ph.D. in Botany from Washington State University. He has nearly twenty years of professional experience in performing environmental and ecological assessments, including fifteen years experience with NRC environmental reviews. See Staff LWA Presentation at 2; Exh. NRC000079, at 1-2 (Michael R. Sackschewsky Resume). The qualifications of Mr. Araguas and Mr. Notich previously were discussed in connection with, respectively, the topics of radiological impacts and water use impacts. See supra sections IV.A.2.b.ii, IV.A.1.b.

4.124 Based on the respective qualifications and experience of the proffered witnesses, the Board finds each of these individuals qualified to testify as an expert witness regarding the LWA and SReP associated with the Vogtle ESP application.

c. Regulations and Guidelines Relating to LWAs

4.125 Section 50.10 of title 10 of the Code of Federal Regulations provides the terms for requesting and issuing an LWA, which authorize an applicant to perform certain site-preparation activities that would otherwise only be permitted following the issuance of a 10 C.F.R. Part 50 construction permit or a 10 C.F.R. Part 52 COL. See 10 C.F.R. § 50.10(d)-(g). As discussed above, see supra sections III.A, III.C.3, section 52.17(c) allows an ESP applicant to request that a section 50.10 LWA be issued in conjunction with an ESP. Section 50.10(a)(1) identifies LWA construction activities,¹⁹ while section 50.10(a)(2) identifies

¹⁹ Under section 50.10(a)(1), activities constituting construction, and thus requiring an
(continued...)

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activities that can be performed without an LWA (i.e., as “pre-construction” activities that do not require NRC approval).²⁰ An LWA allows for the performance of these LWA construction activities prior to issuance of a COL, see 10 C.F.R. § 50.10(d)(1) (LWA authorizes activities “for which either a construction permit or [COL] is otherwise required”), but the LWA application must include a plan for site redress that provides for restoration if the project is cancelled, the LWA is revoked, or a construction permit or COL is denied. See id. § 50.10(d)(3)(iii). The SReP also remains in effect for an ESP applicant even if the ESP with which the LWA is issued is not referenced in a construction permit or COL application during the period that the ESP remains valid. See 10 C.F.R. § 52.25.

4.126 The current provisions of section 50.10(d) are the product of an agency rulemaking process that concluded in an October 2007 final rule. See Limited Work Authorizations for Nuclear Power Plants, 72 Fed. Reg. 57,416, 57,432-33 (Oct. 9, 2007). Among other things, the new rule modified the scope of activities that are considered construction for which an LWA is required. See id. As is discussed above, see supra section IV.A.5.a, in response to the October 2007 rule, Southern submitted a revised SReP that is part of its current ESP application. Additionally, because the rule revision occurred between

¹⁹(...continued)

LWA, are the driving of piles; subsurface preparation; placement of backfill, concrete, or permanent retaining walls within an excavation; installation of foundations; or in-place assembly, erection, fabrication, or testing that are for safety-related structures, systems, or components (SSCs). Also included are construction activities associated with onsite emergency facilities necessary to comply with section 50.47 and 10 C.F.R. Part 50, app. E. See 10 C.F.R. § 50.10(a)(1).

²⁰ Under section 50.10(a)(2), “construction” is defined as not including site exploration; preparation of the site for construction, including site clearing, grading, and installation of environmental mitigation measures; erection of fences and other access control measures; excavation; erection of support buildings for use in connection with construction; building of service facilities, such as paved roads, parking lots, railroad spurs, exterior lighting systems, potable water systems and sewerage treatment facilities, and transmission lines; and procurement or offsite fabrication of facility components. See id. § 50.10(a)(2).

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the staff's issuance of the DEIS and the FEIS for Vogtle Units 3 and 4, only the FEIS reflects the October 2007 LWA rule and Southern's revised SReP.

d. Evidentiary Presentation

i. LWA and Non-LWA Activities

4.127 Mr. Fulton testified that, subsequent to the agency's adoption of the new LWA rule that allows non-safety-related activities to be conducted without NRC authorization, SNC updated its LWA request in November 2007 to address the safety-related activities that would be covered under an LWA. See Tr. at M-2028. The updated request includes the engineered backfill, mud mats, mechanically-stabilized earth wall, waterproof membrane, and lean concrete fill. See id. Mr. Fulton declared that the LWA work for Unit 3 is expected to be completed by February 2011, with Unit 4 starting concurrently with Unit 3 and lagging by six to twelve months. See Tr. at M-2029; SNC LWA Presentation at 4.

4.128 Mr. Fulton also indicated that preconstruction activities have already begun at the site and will continue through 2009 for Unit 3 and 2010 for Unit 4. See Tr. at M-2028 to -2029. He explained that the major preconstruction (non-LWA) activity is the excavation of the power block for each of the units. See Tr. at M-2030. Other non-LWA activities, according to Mr. Fulton, include road and rail construction, utility installation, temporary construction facilities, clearing, grading and grubbing activities, installing environmental controls, and underground pipe installation. See Tr. at M-2029 to -2030; SNC LWA Presentation at 5.

4.129 Mr. Fulton provided details regarding the proposed LWA activities, showing slides illustrating the proposed excavation and stabilization associated with preparing for post-COL facility containment construction, including placement of the engineered backfill, mud-mats, and retaining walls. The backfill extends to the Blue Bluff marl layer, which is the load bearing layer for Vogtle Units 3 and 4. See Tr. at M-2031 to -2032; SNC LWA Presentation

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at 7-10. Mr. Fulton provided excavation illustrations showing that the nuclear island foundation will be approximately forty feet below grade, with the grade elevation at approximately 220 feet MSL, meaning the bottom of the nuclear island will be at approximately 180 feet MSL, and the bottom of the excavation at 130 feet MSL. See Tr. at M-2033; SNC LWA Presentation at 9. He explained that, because the groundwater in the Water Table aquifer is at approximately 160 feet MSL, see Tr. at M-2033, the depth of the excavation relative to the groundwater elevation will require dewatering and groundwater monitoring during construction, see Tr. at M-2038 to -2039.

4.130 On behalf of the staff, Dr. Sackschewsky noted that, in response to the changes in the LWA rules, SNC revised its LWA request between the issuance of the DEIS and the FEIS so that the staff's FEIS analysis covered a different set of activities. See Tr. at M-2044. Following issuance of the FEIS, SNC asked to withdraw the rebar installation from its list of LWA activities. See Tr. at M-2045; Staff LWA Presentation at 5. Dr. Sackschewsky confirmed that this did not impact the environmental review conclusions. See Tr. at M-2045. In response to a Board question regarding whether the removal of the rebar from the LWA activity scope was related to site redress concerns, Mr. Araguas indicated that guidance from the staff was the reason behind the removal of rebar from the LWA request, in that the rebar requirements depend on the reactor base mat design, and the staff was not able to approve the base mat design per the LWA issuance schedule because of the differences in design between revisions 15 and 16 of the AP1000 certified design. See Tr. at M-2058.

4.131 Further, in response to Board questions regarding the inspection of site LWA activities, Mr. Araguas indicated that the construction inspection program would include the LWA work and would be implemented on a regional level from the NRC Region II office in Atlanta, Georgia. See Tr. at M-2068. The Board also inquired regarding the verification of discharge pipe conformance to thermal plume analysis design assumptions, in response to

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which Dr. Sackschewsky indicated that, although the NRC would not be involved in that review because it is a preconstruction activity, a local and/or state permitting agency would likely be performing an inspection of the approved design documented in the agency's permit. See Tr. at M-2069. Additionally, in response to a Board question regarding whether cooling tower construction is considered a pre-construction activity, Dr. Sackschewsky clarified that the term preconstruction "doesn't mean that that activity is done before construction," but rather is better defined as "non-safety-related construction," which would permit cooling tower construction prior to LWA issuance. See Tr. at M-2051 to -2052.

ii. Construction and Preconstruction Impacts

4.132 Mr. Fulton testified that the environmental impacts associated with preconstruction and LWA construction activities were included in the ESP ER impact evaluation for construction. See Tr. at M-2034. In this regard, Mr. Fulton indicated that "[t]he impacts evaluated for the construction activities incorporated the impacts associated with pre-construction and activities covered under the LWA." SNC LWA Presentation at 11. Mr. Fulton explained that SNC used "the cumulative approach for the environmental analysis, where the impacts associated with the LWA and construction are analyzed as a whole." Tr. at M-2034. He also indicated that this is a bounding analysis, because the impacts associated with combining LWA and construction activities would be greater than those associated with the LWA activities alone. See Tr. at M-2034. Mr. Fulton noted that "[i]n evaluating the environmental impacts, SNC also identified necessary environmental controls that need to be in place to minimize and mitigate the identified impacts." Tr. at M-2035. These controls included obtaining regulatory permits, groundwater monitoring, installing settling basins, dams, site drainage, and other storm water controls, and providing for dust suppression and for the containment of spills. See Tr. at M-2035; SNC LWA Presentation at 11.

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4.133 Dr. Sackschewsky confirmed that the staff also evaluated the impacts of preconstruction, LWA, and construction activities in a cumulative manner because “[w]e found that the LWA activities were hard to separate in terms of defining the actual impacts. In many resource areas, the environmental impact of the actual construction, compared to the preconstruction, is pretty minimal, especially in areas such as land use, and ecology, historic and culture resources” Tr. at M-2056; see also Staff LWA Presentation at 13. In contrast, Dr. Sackschewsky indicated that impacts on socioeconomics, transportation, and non-radiological health can be somewhat different for preconstruction and construction when construction includes LWA activities. See Tr. at M-2056. Nonetheless, he testified that the “impacts of the LWA activities would be bounded by the overall cumulative construction impacts,” most of which were found to be SMALL, except in the area of cultural resources, where they were found to be MODERATE. See Tr. at M-2057; Staff LWA Presentation at 14. He also indicated that the MODERATE cultural resource impacts were entirely due to preconstruction-related activities. See Tr. at M-2057. Several socioeconomic subareas, such as demography, taxes, and transportation, would also be moderately impacted, but “the LWA portion of those moderate impacts would be relatively small compared to the rest of the construction activities.” Id.; see also Staff LWA Presentation at 14.

iii. LWA Prerequisites

4.134 Mr. Fulton indicated that the quality assurance (QA) program, the fitness-for-duty (FFD) program, and the problem, identification & resolution (PI&R) program (which is actually part of the QA Program) would all be in place prior to the start of the LWA activities. See Tr. at M-2032; SNC LWA Presentation at 7.²¹ The FEIS also provides a list of “prerequisites to

²¹ In the context of its LWA review, the staff reviewed SNC's description of its QA program and found that it adequately describes the authority and responsibility of the appropriate personnel and provides adequate guidance to perform verification and

(continued...)

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LWA activities that must be fulfilled before performing such activities.” FEIS 1A, at 4-72 to -73; see also Tr. at M-2035. Mr. Fulton indicated that “[t]hese prerequisites are practical matters to be performed prior to initiating the LWA activities.” Tr. at M-2035. Included in the prerequisite list are such items as the documentation of existing site conditions through an ongoing process of environmental impact evaluations; coordination of agreements between the site's co-owners and SNC to perform licensing and construction activities; coordination of the movement of the existing VEGP site protected area (PA) boundary, although there is no need to adjust the PA boundary to support LWA activities; movement, demolition, or ownership transfer of existing VEGP site buildings and structures within the Units 3 and 4 site; and obtaining the necessary permits to perform preconstruction and LWA activities. See Tr. at M-2035 to -2036; SNC LWA Presentation at 12.

4.135 Dr. Sackschewsky testified that these prerequisites “are not items that are NRC required items. They’re not something that Southern would have to prove before they got their ESP, or their LWA. But they’re items that would be expected to be done before they could do that.” Tr. at M-2045. This statement prompted a number of Board questions in response to which Dr. Sackschewsky explained that there are no actual safety implications associated with these items and that, while there may be legal implications for the applicant associated with

²¹(...continued)

self-assessment functions without undue influence from those directly responsible for costs and schedule as well as adequate guidance to apply the program to activities that are important to safety and to establish controls. See FSER at 1-1, 1-5, 17-1 to -13. Also relative to its LWA review, the staff performed an evaluation of the SNC FFD program, which included review of the persons to whom the program applied, written policy and procedures, drug and alcohol testing, fitness monitoring, behavioral observation, sanctions, review process, audits, recordkeeping and reporting, and suitability and fitness evaluations. See FSER at 1-1, 1-5, 13-152 to -159. The Board did not inquire further into the QA and FFD programs during the evidentiary hearing portion of this proceeding, having found from its consideration of the relevant FSER sections that the staff's review formed a reasonable basis for its conclusions that these programs, as currently constituted, meet the requirements of the AEA and the agency's regulations. See infra section IV.B.

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them, they are not something for which the staff requires documentation. See Tr. M-2045 to -2046. He further emphasized that any licenses or permits associated with these prerequisite items are issued by state or local entities other than the NRC; that “compliance would be monitored by the other agencies”; and that “if there are any conditions on those permits, it would be placed and enforced by the other agencies, and not by the Staff.” Tr. at M-2046 to -2047. In response to a Board question concerning the precedential basis for his statements, Mr. Sackchewsky indicated that “[t]here is an . . . almost identical list in the Clinton ESP FEIS, and a very similar type list in the North Anna ESP FEIS,” Tr. at M-2047, both of which he indicated also had been the subject of LWA applications, see Tr. at M-2048.

iv. Site Redress Plan

4.136 Relative to the SReP associated with the LWA, Mr. Fulton described the redress plan and indicated that it will ensure that the site will be returned to an “unattended environmentally stable, and aesthetically acceptable condition in the event Vogtle 3 and 4 [are] not completed” in accordance with applicable land use requirements and zoning. Tr. at M-2041; see also SNC LWA Presentation at 13. For LWA excavation area activities at approximately ninety feet below grade, “SNC’s preferred method of redress would be burial in place.” Tr. at M-2041. The burial in place plan would assure that no significant amount of degradable material would remain below grade, but would be removed and properly disposed of. See id. The plan would be discussed with the Georgia Environmental Protection Division (GEPD) and, if the GEPD did not approve the burial in place, “SNC would demolish and remove the LWA structures in accordance with Georgia requirements.” Id. The final site redress would also include regrading to mitigate storm erosion. See Tr. at M-2041 to -2042; SNC LWA Presentation at 13. In addition, SNC would evaluate possible future alternative uses for the land area before implementing redress work. If improvements would allow for an alternative

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industrial use, the site redress efforts would be commensurate with that use. See Tr. at M-2042. Similar environmental controls to those used during preconstruction and LWA construction would be implemented as part of the site redress activities. See id.

4.137 Dr. Sackschewsky confirmed that the main objective of the SReP is as defined by SNC. See Tr. at M-2057; Staff LWA Presentation at 15. He clarified that the SReP is applicable only to LWA activities, and so does not cover preconstruction activities, and reiterated that the redress work would have to be in accordance with applicable land use and zoning requirements. See Tr. at M-2057. He also confirmed the SNC testimony regarding the use of burial in place with surface regrading and revegetation as the preferred redress approach, with inert material removal, transportation, and disposal elsewhere if burial in place is not permitted. See Tr. at M-2058 to -2059; Staff LWA Presentation at 16.

4.138 Dr. Sackschewsky also discussed the possibility that there might be the identification of an alternative acceptable use for any part of the site that had been the subject of LWA activities, thereby making that portion of the site not subject to redress except to the extent needed to conform to the alternative use. See Tr. at M-2059; Staff LWA Presentation at 16. In response to a Board question regarding who would determine if an alternative use is acceptable, Dr. Sackschewsky indicated, and Mr. Fulton agreed, that SNC would make that determination. See Tr. at M-2059 to -2060. Mr. Fulton added, however, that the alternative use would need to follow any applicable federal, State, and local requirements governing that use. See Tr. at M-2060.

4.139 Dr. Sackschewsky also testified that the redress activities would have environmental impacts similar to those that would result from the preconstruction or LWA activities. See Tr. at M-2060 to -2061; Staff LWA Presentation at 17. In that regard, under the SReP, SNC would have to implement a set of measures and controls that would mitigate

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impacts from noise, traffic, erosion and sedimentation, air quality, and potential releases of pollutants. See Staff LWA Presentation at 17. In response to a Board inquiry about whether the NRC monitors site redress, Dr. Sackschewsky indicated that he believed the NRC would have a role in conjunction with any other permitting agencies. See Tr. at M-2061.

4.140 Finally, in summary, Dr. Sackschewsky declared that the staff found that the LWA activities requested by SNC are all allowed under 10 C.F.R. § 50.10(d); that the SReP activities would adequately redress the LWA impacts: and that implementation of the SReP would not have adverse environmental impacts. See Tr. at M-2064; Staff LWA Presentation at 18.

e. Board Findings Relating to LWA and SReP²²

4.141 The LWA would allow applicant SNC to undertake limited construction activities, including the placement of engineered backfill, a concrete mudmat, a waterproofing membrane, an MSE retaining wall, and temporary drains. The Board concurs with the applicant and the staff that the staff's LWA review needs only to address those aspects of the AP1000 design that are within the scope of the LWA request.

4.142 SNC's evaluation of construction impacts, and the staff's independent review of these impacts, included both the impacts associated with preconstruction (non-LWA) activities and activities covered under the LWA. The Board finds that this cumulative approach to the environmental analysis was appropriate because we concur that the impacts associated with combining LWA and non-LWA preconstruction activities would be greater than those associated

²² Notwithstanding the provisions of section 51.105(c)(3) indicating that a presiding officer should issue a separate partial initial decision regarding an LWA request, see 10 C.F.R. § 51.105(c)(3), just as the staff reviewed the SNC LWA request in the context of its ESP review, see FSER at 1-1, we find no practical or logical basis in this instance for separating our consideration of the adequacy of the SNC LWA request from our determination regarding the ESP with which it is associated. Nonetheless, to the extent such separate consideration is warranted, we note it would consist of no more than an amalgamated restatement of the LWA-related findings we have made in sections III.C.3, IV.A.5, IV.A.7, and V of this decision.

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with the LWA activities alone, and that it would be difficult to separate the impacts from these activities.

4.143 SNC and the staff also provided information on the seismic analysis of LWA activities and ITAAC related to the LWA in the context of their seismic presentations. See infra section IV.A.7. Based on the information provided in those presentations, the Board finds that the staff's review was sufficient to conclude that SNC met the LWA requirements related to stability of subsurface materials and foundations at the VEGP site and that SNC's proposed ITAAC related to LWA activities are adequate to ensure that the installation of the foundation for the nuclear island will be in accordance with NRC regulations and guidance and will provide adequate margins of safety.

4.144 The Board notes that any incompatibilities between the design information approved in an LWA and the design information submitted in a COL application would need to be reviewed by the staff at the COL stage.

4.145 The staff included a permit condition in the FSER requiring "that the Applicant shall either remove and replace, or shall improve, the soil directly above the Blue Bluff Marl for soil under or adjacent to Seismic Category 1 structures, to eliminate any liquefaction potential." FSER at 2-438, A-2. The Board finds that SNC's LWA request encompasses activities that, when completed, will satisfy this permit condition.

4.146 In sum, the Board finds the record before it is sufficient to conclude that the staff made a reasonable determination, based upon its review of the SNC LWA and SReP submissions, that the requested LWA activities should be authorized and that the SReP would adequately redress any LWA impacts.

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6. Site Emergency Plan

a. Introduction

4.147 SNC provided a complete and integrated emergency plan in part 5 of the ESP application. See Exh. SNC000085 ([SNC], Vogtle [ESP] Application, pt. 5, Emergency Plan (rev. 4 Mar. 2008)). Information related to emergency planning is also provided in section 13.3 of the ESP application SSAR. See Exh. SNC000088, at 13.3-1 to 13.3A-59 ([SNC], Vogtle [ESP] Application, pt. 2, [SSAR], ch. 13, Conduct of Operations (rev. 5 Dec. 2008)). The staff evaluation of this information is in section 13.3 of the FSER. See FSER at 13-1. While the emergency plan includes the two existing and two proposed units, the staff limited its review to proposed Units 3 and 4 and to the common features of the plan. See Tr. at M-2152 to -2153. During the review of the SNC emergency plan, the staff identified seven emergency planning permit conditions that needed to be imposed, six of which address the emergency action level (EAL) scheme, and one that addresses the Technical Support Center (TSC) location. See Tr. at M-2139; FSER at 13-120 to -121; NRC000064, at 3 (NRC Staff Presentation Topic #6, Site Emergency Plan) [hereinafter Staff Site Emergency Plan Presentation]. The staff also outlined a chart of inspections, tests, analyses, and acceptance criteria, i.e., ITAAC, to be completed in connection with emergency planning. See FSER at 13-122 to -147. The staff ultimately concluded that the SNC emergency plan met the applicable regulations and was consistent with regulatory guidance. See FSER at 13-120. Pursuant to 10 C.F.R. § 50.47(a), the staff found that “subject to the required conditions and limitations of the full-power license and satisfactory completion of the ITAAC, there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at the VEGP site, and that emergency preparedness at Vogtle Units 3 and 4 is adequate to support full-power operations.” FSER at 13-120.

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4.148 In addition to asking various questions regarding aspects of SNC's site emergency plan prior to the evidentiary hearing, the Board requested that the staff and SNC provide a presentation on the topic at the hearing. The Board was interested in a discussion by the parties regarding the key elements of the site emergency plan, with an emphasis on how the control rooms of each of the four reactor units will interact with the proposed common TSC and with each other under emergency conditions. See Licensing Board Safety Questions at 3, app. A at 3-5.

b. Witnesses and Evidence Presented

4.149 To address the Board's review of the site emergency plan, as the lead party addressing this topic, SNC presented one witness, and the staff presented two witnesses. At the evidentiary hearing, these witnesses provided oral testimony, in conjunction with the parties' prefiled slide presentations that were admitted as exhibits. See Tr. at M-2070 to -2119, M-2128 to -2187; Exhs. SNCR00083 (Vogtle ESP Mandatory Hearing Presentation #6, Safety Topic #4, Site Emergency Plan) [hereinafter SNC Site Emergency Plan Presentation]; Staff Site Emergency Plan Presentation.

i. SNC Witness

4.150 Mr. Theodore Amundson, a consultant for EP Consulting, testified on behalf of SNC. See Tr. at M-2077 to -2119. Mr. Amundson earned a B.S. in Mechanical Engineering with an Aeronautical Option and an M.S. in Mechanical Engineering from North Dakota State University. See Exh. SNC000084, at 2 (Theodore E. Amundson [CV]) [hereinafter Amundson CV]. He has over thirty-two years of experience in the commercial nuclear industry. See Tr. at M-2077. Over the course of his career he has worked in the area of emergency preparedness, serving as an exercise controller and evaluator and scenario developer. He was also qualified as an emergency director and emergency manager. See id. at M-2078. Mr.

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Amundson assisted in the preparation of the site emergency plan for the SNC ESP application, developing the ITAAC for emergency planning. See Amundson CV at 1.

ii. Staff Witnesses

4.151 Christian Araguas and Bruce J. Musico provided testimony on behalf of the staff. See Tr. at M-2128 to -2186.

4.152 Mr. Araguas' background and expert qualifications are discussed in section IV.A.2.b supra.

4.153 Mr. Musico earned a B.S. in Nuclear Engineering from University of Michigan, and a J.D. from Franklin Pierce Law Center. See Exh. NRC000080, at 1 ([SPQ] for Bruce J. Musico) [hereinafter Musico SPQ]. Mr. Musico has over twenty years of experience working on emergency planning issues. See id.; Tr. at M-2128. He is currently employed as a Senior Emergency Preparedness Specialist, Division of Preparedness and Response, Office of Nuclear Security and Incident Response (DPR/NSIR), NRC. See Musico SPQ at 1. He has been the principal staff reviewer for the emergency planning information submitted in the Vogtle ESP application. See id.

4.154 Based on the foregoing, the Board finds each of these witnesses qualified to testify as an expert regarding the site emergency plan relative to the Vogtle ESP application.

c. Regulations and Guidance Relating to the Site Emergency Plan

4.155 The SSAR filed with the ESP application must include information that "identif[ies] physical characteristics of the proposed site, such as egress limitations from the area surrounding the site, that could pose a significant impediment to the development of emergency plans." 10 C.F.R. § 52.17(b)(1). If the applicant determines that there are physical characteristics "that could pose a significant impediment to the development of emergency

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plans, the application must identify measures that would, when implemented, mitigate or eliminate the significant impediment.” Id.

4.156 In addition, an ESP applicant has the option of either proposing a complete and integrated emergency plan or proposing major features of the emergency plan “for review and approval by NRC, in consultation with the Department of Homeland Security (DHS).” 10 C.F.R. § 52.17(b)(2)(i), (ii). The regulations provide that either option should be proposed in accordance with the “pertinent” or “applicable” standards in 10 C.F.R. § 50.47 and the requirements of Appendix E to 10 C.F.R. Part 50. Id. Section 50.47(b) contains sixteen planning standards related to the emergency preparedness function, and Appendix E to 10 C.F.R. Part 50, establishes minimum requirements for emergency plans. See 10 C.F.R. § 50.47(b); 10 C.F.R. Part 50, app. E. Among other requirements in Part 50 Appendix E, section IV outlines the content of emergency plans, while section V specifies provisions for submitting emergency implementing procedures to the NRC for review, and section VI sets forth provisions for the Emergency Response Data System (ERDS). See 10 C.F.R. Part 50, app. E, §§ IV-VI.

4.157 SNC chose to submit a complete and integrated emergency plan with its ESP application. See Tr. at M-2081. Complete and integrated emergency plans “must include the proposed inspections, tests, and analyses that the holder of a combined license referencing the [ESP] shall perform, and the acceptance criteria that are necessary and sufficient” to support a finding of “reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will be operated in conformity with the emergency plans, the provisions of the Act, and the Commission’s rules and regulations.” 10 C.F.R. § 52.17(b)(3). The ITAAC associated with emergency planning reflect those aspects of the emergency plan that cannot be described or completed until the plant is

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further along in the licensing and construction process. See Tr. at M-2132. They are essentially place-holders that reflect requirements that could not be addressed under Part 52 prior to physical construction of the plant.²³ See Tr. at M-2133.

4.158 NRC's general intent was to make the Part 52 licensing process compatible with the Part 50 licensing process. See 72 Fed. Reg. at 49,353-54; see also Tr. at M-2141. Moreover, in the context of emergency planning, staff witness Mr. Musico explained that under Part 50, if the NRC determines that the onsite emergency plan is adequate, the then-licensee is permitted to operate up to five percent of rated power until FEMA determines that the offsite exercise objectives are met. See Tr. at M-2139 to -2142. In this Part 52 proceeding, if the onsite plan is determined to be adequate, then the staff would allow operation at up to five percent of rated power through the use of a license condition that references the five percent of rated power threshold until FEMA determines that the offsite objectives are met. See Tr. at M-2142. If an applicant chooses to submit a complete and integrated emergency plan, that applicant also is required to make a good faith effort to obtain a certification from federal, state, and local governmental agencies with emergency planning responsibilities that "(i) [t]he proposed emergency plans are practicable; (ii) [t]hese agencies are committed to participating in any further development of the plans, including any required field demonstrations; and (iii) [t]hat these agencies are committed to executing their responsibilities under the plans in the event of an emergency." 10 C.F.R. § 52.17(b)(4).

²³ During the staff's discussion of the components of its review, which, as discussed above, includes the review of the emergency plan ITAAC, the Board requested that the staff provide an example of an ITAAC that would be part of the staff's review. See Tr. at M-2133. The staff provided an example that concerned the size of the TSC. The staff explained that there is a requirement that the TSC size be consistent with NUREG-0696 or, specifically, 2175 square feet (Vogtle ITAAC 5.1.1), which cannot be determined until the TSC is constructed. See Tr. at M-2135 to -2137; see also FSER at 13-123.

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4.159 Regulatory guidance utilized by the applicant in preparing the application, and by the staff in reviewing the application, is provided in a number of documents. Regulatory Guide 1.101, Emergency Response Planning and Preparedness for Nuclear Power Reactors, outlines the methods that the “staff considers acceptable” for complying with Part 50 Appendix E and the standards in section 50.47(b). It also endorses the use of other guidance documents. See, e.g., Office of Nuclear Reactor Research, Regulatory Guide 1.101, Emergency Response Planning and Preparedness for Nuclear Power Reactors, at 3-5 (rev. 5 June 2005) (ADAMS Accession No. ML050730286) [hereinafter Reg. Guide 1.101].

4.160 One such document endorsed by Regulatory Guide 1.101 is NUREG-0654/FEMA-REP-1, which is a document that was jointly prepared by NRC and FEMA as guidance for state and local government agencies and applicants and licensees in the development and assessment of emergency plans. See [NRC], [FEMA], Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, NUREG-0654/FEMA-REP-1, at 1-2 (rev. 1 Nov. 1980; addenda Mar. 2002), available at <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0654/>. Supplement 2 to NUREG-0654 provides guidance specifically for emergency plans associated with ESP applications. For complete, integrated emergency plans that are submitted with an ESP application, Supplement 2 refers to the original document, NUREG-0654/FEMA-REP-1. See [NRC], [FEMA], Criteria for Emergency Planning in an Early Site Permit Application, NUREG-0654/FEMA-REP-1, at 1, 6 (rev. 1, supp. 2, Apr. 1996) (ADAMS Accession No. ML050130188); see also Tr. at M-2129. Regulatory guidance is also provided in NUREG-0696, Functional Criteria for Emergency Response Facilities, and NUREG-0737, Supplement 1, Clarification of TMI Action Plan Requirements: Requirements for Emergency Response Capability, both of which are related to the function, capabilities, and design of emergency

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response facilities such as the TSC and the Operational Support Center (OSC); NUREG/CR-6863, Development of Evacuation Time Estimate Studies for Nuclear Power Plants; and NUREG/CR-6864, Identification and Analysis of Factors Affecting Emergency Evacuations.²⁴

4.161 Other documents endorsed by Regulatory Guide 1.101 are those produced through work sponsored by the Nuclear Energy Institute (NEI), NUMARC/NESP-007 and NEI-99-01,²⁵ which the staff has found acceptable as alternatives to NUREG-0654/FEMA-REP-1 for the development of EALs. See Reg. Guide 1.101, at 4. EALs are the criteria used to determine the notifications that need to be made to federal, state, and local authorities and to determine the appropriate protective responses to a particular set of emergency conditions. See 10 C.F.R. Part 50, app. E, § IV.B. NEI has proposed NEI-07-01 for endorsement by the staff. Like NEI-99-01, NEI-07-01 involves the methodology for developing EALs, but unlike NEI-99-01, it incorporates consideration of advanced passive reactor design features (like those in the AP1000). NEI-07-01 is currently under review by the NRC. See Tr. at M-2080.

²⁴ See Office of Inspection and Enforcement, NRC, Functional Criteria for Emergency Response Facilities, NUREG-0696 (Feb. 1981), available at <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0696/sr0696.pdf>; [NRR, NRC], Clarification of TMI Action Plan Requirements: Requirements for Emergency Response Capability, NUREG-0737 (supp. 1 Jan. 1983), available at <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0737/sup1/sr0737sup1.pdf>; Sandia National Laboratories [(Sandia)], Development of Evacuation Time Estimate Studies for Nuclear Power Plants, NUREG/CR-6863 (Jan. 2005) (ADAMS Accession No. ML050250240); 1 & 2 [Sandia], Identification and Analysis of Factors Affecting Emergency Evacuations, NUREG/CR-6864 (Jan. 2005), available at <http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/cr6864/>.

²⁵ See [NEI], Methodology for Development of Emergency Action Levels, NEI-99-01 (rev. 4 Jan. 2003) (ADAMS Accession No. ML041470143) [hereinafter NEI-99-01]; Nuclear Management and Resources Council, Inc., Methodology for Development of Emergency Action Levels, NUMARC/NESP-007 (rev. 2 Jan. 1992) (ADAMS Accession No. ML041120174). NEI-99-01 states that it is the successor to NEI-97-03, which was the successor to NUMARC/NESP-007. See NEI-99-01, at iv-v.

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4.162 If an applicant submits a complete and integrated emergency plan in conjunction with an ESP application, the staff must find “that the emergency plans provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency.” 10 C.F.R. § 50.47(a)(1)(iii). The staff’s review focuses primarily on the applicant-prepared onsite provisions of the plans, which include the evacuation time estimate provided by the applicant, and the ITAAC. See 10 C.F.R. § 50.47(b), (d); Tr. at M-2132, M-2151. The offsite provisions, which generally are the responsibility of state and local governments, are reviewed by FEMA.²⁶ See 10 C.F.R. § 50.47(b), (d). For the Vogtle ESP, the offsite emergency plan consists of the Georgia and South Carolina state plans, and county plans for Aiken, Allendale, and Barnwell counties in South Carolina, and Burke County in Georgia. FEMA performs its evaluation independently of the NRC, also using NUREG-0654/FEMA-REP-1, and provides its review findings to the NRC. See Tr. at M-2138 to -2139; Staff Site Emergency Plan Presentation at 3-5. The staff must take into account FEMA’s findings, as section 50.47(a)(2) provides:

[t]he NRC will base its finding on a review of the [FEMA] findings and determinations as to whether State and local emergency plans are adequate and whether there is reasonable assurance that they can be implemented, and on the NRC assessment as to whether the applicant’s onsite emergency plans are adequate and whether there is reasonable assurance that they can be implemented.

10 C.F.R. § 50.47(a)(2); see also Tr. at M-2150 to -2151. Moreover, FEMA’s finding “constitute[s] a rebuttable presumption on questions of adequacy and implementation capability” in NRC licensing proceedings. 10 C.F.R. § 50.47(a)(2). Ultimately, the reasonable assurance

²⁶ As staff witness Mr. Musico explained at the hearing, the staff uses the 16 planning standards in section 50.47(b) to evaluate the adequacy of the SNC emergency plans. FEMA utilizes 15 of the 16 planning standards, but does not use the second standard referring to the onsite organization. He also explained that the 16 standards in section 50.47(b) are also the 16 planning standards in NUREG 0654/FEMA-REP-1. See Tr. at M-2149; Staff Site Emergency Plan Presentation at 6-7.

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finding for complete and integrated plans includes the successful completion of ITAAC and resolution of any permit conditions. See Tr. at M-2151.

d. Evidentiary Presentation

4.163 By way of background, SNC witness Mr. Amundson explained that the site emergency plan was developed from the plan for the currently operating units and revised to accommodate the new AP1000 units. See Tr. at M-2081 to -2082. The base plan and its appendices reflect the common elements among all four units. See Tr. at M-2082. Separate annexes were developed to account for unique design differences between the units. A new evacuation time estimate study was performed and new certifications by twenty-one State and local agencies were obtained in support of the site emergency plan. See Tr. at M-2085; SNC Site Emergency Plan Presentation at 7-8; Exh. SNC000087 (Evacuation Time Estimates for the Vogtle Electric Generating Plant (Apr. 2006)) [hereinafter Evacuation Time Estimate Study]. According to Mr. Amundson, offsite emergency planning is for the most part unchanged with the addition of the two additional units at the Vogtle site. See Tr. at M-2153 to -2154. Mr. Amundson also stated that because a separate proceeding will be required to gain approval for the emergency plan for existing Vogtle Units 1 and 2, SNC intends to submit the plan for approval approximately one year prior to the scheduled full participation exercise for Unit 3. See Tr. at M-2082. Staff witness Mr. Musico pointed out that the Vogtle ESP application is the first of a kind. "It's the first application that has been submitted under the new Part 52 licensing process with a complete and integrated emergency plan. That's very unique." Tr. at M-2130. Applicants for previous ESPs submitted only major features emergency plans. See id.

4.164 Mr. Amundson asserted that the emergency plan "complies with all 16 planning standards of 10 CFR 50.47(b) and the associated requirements found in 10 CFR 50, Appendix E." Tr. at M-2086. His presentation only focused on "a few selected key elements" of

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the planning standards considered to be risk significant insofar as they are of key importance to the regulator and the public, which he delineated as emergency classifications; notifications; accident assessment and protective response; emergency communications; and emergency facilities and equipment. See Tr. at M-2086; SNC Site Emergency Plan Presentation at 9. He then proceeded to describe the SNC approach to each of these elements in more detail in his testimony. See Tr. at M-2086 to -2119.

4.165 With regard to the TSC location, a matter of particular interest to the Board, Mr. Amundson indicated that “[b]ased on an analysis of methods to effectively implement the emergency plan at multiple unit sites, it was decided to build a new [TSC] within the protected area boundary.” Tr. at M-2082 to -2083. The new TSC, which will be common to all four units with the equipment and facilities to accommodate all four, will be activated approximately one year prior to fuel load on Unit 3. See SNC Site Emergency Plan Presentation at 5-6; Tr. at M-2096. The TSC will be located in the Communication Support Center, about 1700 feet from the Unit 4 control room (Unit 4 being the farthest distance from the new TSC), within what will become the common protected area for all four units. See Tr. at M-2083; Exh. SNC000089 (Vogtle Electric Generating Plant Permanent Buildings and Facilities Site Plan). According to Mr. Amundson, “it would take approximately ten minutes to walk between the TSC and the Unit 4 control room, however, as a compensatory measure, we are planning to have motorized vehicles to be available for personnel to use for transit between the TSC and the site control rooms.” Tr. at M-2084. He also noted that SNC currently plans to convert the existing TSC into the OSC for Units 1 and 2. See Tr. at M-2104.

4.166 With respect to the TSC location, staff witness Mr. Musico pointed out that part of the pending Westinghouse rulemaking proposal to amend the AP1000 certified design involves a change in the characteristics of the TSC location. He explained that “[i]n the current certified

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design, the TSC location is identified as a Tier 1 ITAAC," which means that if any application deviates from the TSC location, it would need to be accompanied by an exemption request. Tr. at M-2167. On the other hand, if the TSC location is characterized as a Tier 2-Star, which is the intent of the Westinghouse proposed revision, then an exemption request would not be necessary. Instead, the COL or ESP applicant for a complete integrated emergency plan would merely have to ask for prior NRC approval to change the TSC location. See Tr. at M-2166 to -2167. Mr. Musico further testified that "[the NRC staff is] utilizing the tool of a permit condition here to facilitate a review at the COL stage to address the on-going review that the NRC is in with respect to its endorsement review of [NEI 07-01] as well as the on-going rulemaking associated with AP 1000." Tr. at M-2171. According to Mr. Musico, if the rulemaking results in a change of the TSC location to a Tier 2-Star designation, then the proposed ESP permit condition (PC) that applies to TSC location, PC-8, is satisfied because NRC approval has been given. If not, then an exemption request and approval would be required to satisfy the permit condition. See Tr. at M-2173.

4.167 Mr. Amundson testified that the OSC for Units 3 and 4 will be located in the Control Support Area, which is adjacent to the respective control rooms. See Tr. at M-2096. This area, he noted, is actually the location of the TSC in the currently approved AP1000 DCD revision 15. See Tr. at M-2104. According to Mr. Amundson, the OSC "is where [the] reserve operators, . . . craft people, craft leaders, health physics technicians, and so on congregate and meet." Tr. at M-2104. He gave the example of establishing a repair team, which would be assembled in the OSC and provided with the appropriate equipment before beginning repair activities. See Tr. at M-2104 to -2105.

4.168 Also impacted by the potential addition of two more units to the VEGP site is the existing Emergency Operations Facility (EOF), which is located in the SNC corporate

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headquarters in Birmingham, Alabama. According to Mr. Amundson, it will be modified to accommodate the additional two units at Vogtle. Mr. Amundson explained that “the primary function of the EOF is to provide technical assistance to the TSC, coordinate off-site assistance and response to state and local agencies and to provide direction and control and assessment of off-site radiological monitoring.” Tr. at M-2097. He also indicated that the Birmingham, Alabama EOF will continue to accommodate emergencies on all three Southern Nuclear sites, including the two new units at Vogtle. The consolidated EOF for the existing SNC sites was approved by the NRC in February 2005. See id.; see also Exh. SNC000090, at 1-2 (SECY-04-0236, Policy Issue, Notation Vote, [SNC’s] Proposal to Establish a Common Emergency Operating Facility at Its Corporate Headquarters (Dec. 23, 2004)). In response to a Board question regarding the length of time necessary for having the TSC and EOF functioning during an emergency, Mr. Amundson stated that the TSC and EOF have an activation time requirement of sixty minutes following “activation of the emergency response organization.” Tr. at M-2098.

4.169 In terms of communication capability, Mr. Amundson indicated that each control room is able to communicate directly with the TSC, EOF, and OSC via dedicated circuits. In addition, each control room contains circuits from the Emergency Notification Network, which is part of the State and local system, and Emergency Notification System, which is part of the Federal Telecommunications System. Although the control rooms are not expected to communicate directly with each other during an event, they can do so with existing telephones and radios if there is a particular reason. See Tr. at M-2094 to -2095; SNC Site Emergency Plan Presentation at 14.

4.170 The Board questioned whether there would be any problems with a single TSC for all four units, and raised a concern about the absence of face-to-face communication when

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the TSC is farther from the control room. Earlier in his testimony, Mr. Amundson had explained that

[i]ndustry experience over the past 25 years indicates that close proximity of the TSC and the control room is not important. Following TMI, it was anticipated that the decision makers would need frequent, face-to-face communication with the control room for technical and data exchanges. But with the advent of advanced communication systems that provide detailed voice and data information, these anticipated face-to-face communication sessions seldom, if ever, occur during drills and exercises.

Tr. at M-2096. In responding to the Board's TSC-related concerns, Mr. Amundson indicated that, given the current high level of communications and data processing capabilities that exist, this configuration is actually superior for the multi-unit site at Vogtle. It provides consistent planning and execution as well as a single point of contact across all units onsite and so is less confusing to implement. See Tr. at M-2099 to -2101. Mr. Amundson pointed out that the command center area is 3700 square feet and has conference rooms to accommodate face-to-face meetings of a large number of people within a very short distance from the control rooms and adjacent to the command center. See Tr. at M-2102 to -2103. Mr. Amundson asserted that the new TSC "meets or exceeds the guidance of NUREG 0696 and NUREG 0737, Supplement 1, with the exception of the guidance to locate the TSC within two minutes of the control room." Tr. at M-2095.

4.171 The question of the importance of face-to-face communication was also addressed by Mr. Musico in his testimony for the staff. He noted that while NUREG-0696 specifies a two-minute walking time requirement from the control room to the TSC, as was discussed above, the walking time from the Unit 4 control room to the TSC is estimated at about ten minutes. Mr. Musico acknowledged that, as a consequence of this discrepancy, in reviewing SNC's emergency plan the staff re-examined the NUREG-0696 guidance and identified two key reasons for having the location of the TSC near the control room: (1) to

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facilitate management interaction and technical information exchange, i.e., communications; and (2) to provide TSC access to control room data. See Tr. at M-2175 to -2176. According to Mr. Musico, in then reviewing the communication strategy that has been proposed in support of Vogtle Units 3 and 4, the staff found the SNC communication capabilities are redundant, dedicated, and diversified and reflected an upgrade to the communication capabilities generally available in 1979 that led to the generic two-minute walking time standard. See Tr. at M-2181; Staff Site Emergency Plan Presentation at 15. Mr. Musico noted that, with respect to data capabilities, there is the Protection and Monitoring System (PMS) and the Qualified Data Processing System (QDPS), which is a subset of the PMS system, as well as the Safety Parameter Display System (SPDS) and the Emergency Response Data System (ERDS) that links to the PMS system as well as to the NRC. According to Mr. Musico, these multiple data capabilities are improvements to what existed at the time of the Three Mile Island accident. See Tr. at M-2182; Staff Site Emergency Plan Presentation at 19. The staff evaluation thus found that “advanced communication capability would be acceptable to relax the two-minute walking distance,” Tr. at M-2176, and that these communication capabilities could be used “to satisfy the two-minute travel time.” Tr. at M-2177.

4.172 Mr. Musico noted, however, that in addition to the improvements in communications and data availability, the staff identified a number of other factors that supported approval of the common TSC, which were listed in the slides provided in support of his testimony and included the increased efficiency of a common facility; elimination of duplication of systems/equipment; fulfills TSC habitability requirements; moderate distance from all control rooms; eliminates staffing confusion and need to staff multiple TSCs for multi-unit events; permits coordinated response among all site units; provides centralized site support point and single offsite support point of contact; increased separation from control rooms

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addresses post-9/11 security concerns; allows former Units 1 and 2 TSC to be backup TSC; and is consistent with March 2007 approval of an alternate TSC location for the Clinton plant that has a walking time of approximately fifteen minutes. See Tr. at M-2183 to -2184; Staff Site Emergency Plan Presentation at 22-23. The staff thus “approved the common TSC that is located further away, subject to final resolution of the rulemaking associated with the AP1000 to ensure that the final outcome of that does not result in any inconsistencies with respect to the staff’s approval in the context of the ESP application.” Tr. at M-2183.

4.173 In terms of EALs, which inform the responses that are made to an emergency situation, Mr. Amundson stated that the EALs for the Vogtle emergency plan will be developed in the future to conform to proposed guidance document NEI-07-01, the guidance for development of EALs associated with passive reactors. See Tr. at M-2087. “It is anticipated that detailed EALs will be submitted to the NRC for final confirmation, approximately 18 months prior to fuel load. In addition, EALs will be required to be in place to complete ITAAC 1.1.2.” Tr. at M-2088. Regarding the EALs, staff witness Mr. Musico testified, and illustrated with the slides accompanying his testimony, how six of the permit conditions (PCs) imposed in the ESP are EAL-related permit conditions (PCs) and reflect a concern over details associated with EAL development that are not known at the ESP stage. Thus, in the case of PC-4 and PC-5, they reflect the fact that the EALs are potentially affected by the pending DCD revision amendments, while PC-6 and PC-7 are based on as-built plant conditions and instrumentation and PC-2 and PC-3 address the EALs associated with NEI-07-01. See Tr. at M-2165; Staff Site Emergency Plan Presentation at 12. Further, in response to a Board question regarding differences in the EALs resulting from the pending AP1000 design amendment and NEI-07-01, Mr. Amundson indicated that “[t]he difference lies primarily in the area of instrument and controls, digital [control] rooms versus analog [control] rooms, particularly in relationship to annunciator

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systems.” Tr. at M-2118. “In addition, there are certain aspects of the electrical design that are different in the sense that they’re not all required. AC power isn’t required for safety parameters in the passive designs. So we made some modifications to the EALs in regards to AC power, particularly off-site power.” Tr. at M-2118 to -2119.

4.174 Staff witness Mr. Musico also discussed the subject of the emergency planning zones (EPZ) for the VEGP site, including the ten-mile plume exposure pathway EPZ and the fifty-mile ingestion control pathway EPZ that are the basic constructs used in emergency planning. See Tr. M-2145 to -2146; Staff Site Emergency Plan Presentation at 4. Mr. Musico indicated that the ten-mile EPZ on the South Carolina side of the Savannah River is almost entirely encompassed by the SRS, a facility under the purview of DOE, which makes the situation unique relative to that at other plants. He indicated that there is a memorandum of agreement (MOA) between DOE and SNC regarding emergency response in the event of an accident at either the VEGP site or the SRS. Under the MOA, DOE would take full responsibility for emergency response and protection of its people at the SRS. See Tr. at M-2146 to -2147; Staff Site Emergency Plan Presentation at 5. According to Mr. Musico, “[t]he staff did not review the emergency plans that DOE has for that site” because it is not within the scope of the staff’s review. Tr. at M-2147. The staff did, however, review the MOA and was “satisfied that it adequately represented the existing agreement between . . . DOE and the [SRS] and Southern.” Tr. at M-2147. He stated that consistent with the staff’s guidance in the SRP, “where an applicant at an existing site incorporates by reference and utilizes the existing features associated with an emergency plan into the application, there is a presumption of adequacy of those aspects of the incorporated emergency plan[,] and hence the NRC doesn’t need to look at it in detail.” Tr. at M-2147. In response to a Board inquiry about how the NRC ensures that a site evacuation at the SRS will not conflict with a Vogtle evacuation if the NRC did not review

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the SRS emergency plan, Mr. Musico responded that the MOA between SNC and DOE addresses in detail communication and coordination between the Vogtle site and SRS. See Tr. at M-2147 to -2148.

4.175 Mr. Musico also discussed the evacuation time estimate (ETE) updated by SNC in April 2006. The ETE provides an estimate of the time to evacuate the ten-mile EPZ. He indicated that the ETE serves as an information resource in making the decision whether sheltering or evacuation is appropriate. Using this information, the projected time that a release might occur, which the offsite authorities would obtain from the applicant, and other factors, the State authorities would decide whether it would be appropriate to shelter or to evacuate. The ETE applies to all four units and was reviewed by the staff, with the assistance of PNNL staff. See Tr. at M-2154 to -2156; Staff Site Emergency Plan Presentation at 11; see also Evacuation Time Estimate Study at 1. Mr. Musico stated that the ETE was updated to support the application, even though there was no requirement to do so. See Tr. at M-2163. In this regard, after exchanging requests for additional information with SNC, the staff determined that “the updated ETE in support of the emergency plan was adequate.” Tr. at M-2164. Mr. Musico also informed the Board that the ETE “was subsequently shared with the off-site authorities to make sure the results of that updated ETE were reflected in the off-site plans to ensure they recommend the appropriate protective action recommendations.” Tr. at M-2164.

4.176 As the Board indicated in its original request for a site emergency plan presentation, the Board was seeking additional information relative to the aspects of the emergency plan that related to emergency coordination on a multi-unit site. See Licensing Board Safety Questions at 3. In response to one Board question, Mr. Amundson explained that the emergency plan is not necessarily limited to one reactor unit at a time, but involves “a site-level response to the emergency.” Tr. at M-2156. In response to another Board question

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regarding the ability of the emergency response facilities to handle emergencies simultaneously at more than one unit at a time (such as might occur with a common mode event, e.g., high winds), Mr. Amundson declared that the "TSC is designed to handle an accident on more than one unit at a time." He explained further that "you could have something going on in Unit 1 and something else going on in Unit 4. And the TSC is designed to handle that situation. As is the EOF in Birmingham. In fact, that was demonstrated as part of the EOF approval process for the centralized EOF facility." Tr. at M-2157.

4.177 On behalf of the staff, Mr. Musico indicated that the classification of an emergency situation at one unit, multiple units, or site-wide would be established to encompass the worst case. In this way, if there were an unusual event at one unit and an alert at another unit, the classification with the higher severity (i.e., alert) would apply to the entire emergency response organization. See Tr. at M-2157 to -2158. With respect to a site level emergency (i.e., an event affecting multiple units simultaneously), in response to a Board inquiry Mr. Amundson stated that while it was not yet clear who would be the emergency director in the sixty minutes prior to the activation of the TSC and EOF, such details were considered at the level of the implementing procedures that are currently under development, taking into account best practices in the industry and experience from other multi-unit sites. See Tr. at M-2159 to -2161. Mr. Musico likewise agreed that such details are at the level of the implementing procedures, stating that the staff has not reviewed such procedures yet since, in accord with ITAAC being imposed, they are not scheduled to be submitted for review until 180 days prior to fuel load. See Tr. at M-2162. In addition, Mr. Musico testified that a table in NUREG-0654/FEMA-REP-1 addresses onsite staffing, identifying "major functional areas, locations, major tasks, position, title, or expertise, the number of staff on shift, capabilities for additional staff, 30 minutes and 60 minutes." Id. According to Mr. Musico, the staff reviewed

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the comparable staffing table that SNC provided with the ESP application and, after exchanging requests for additional information, was satisfied that the SNC table was consistent with that in NUREG-0654/FEMA-REP-1. See Tr. at M-2162 to -2163.

4.178 Finally, with regard to the ITAAC that have been imposed relating to emergency planning, see FSER IC, at A-33 to -57, as staff witness Mr. Musico noted, these ITAAC, which relate to a number of different planning standards, including the emergency classification system, emergency communications, emergency facilities and equipment (in particular, establishing a TSC), accident assessment, protective response, and exercises and drills, are derived from generic ITAAC developed by the staff based on an assessment of what they perceived could not reasonably be addressed under Part 52 prior to physical construction of a plant. See Tr. at M-2132 to -2136. And in this regard, all but one of these emergency planning ITAAC are to be resolved prior to fuel load. The only emergency planning ITAAC that does not end at the time of fuel load is an ITAAC that involves the offsite exercise of the emergency plan, which is reviewed by the Federal Emergency Management Agency (FEMA). See Tr. at M-2139 to -2141. This provision, ITAAC 8.1.3, states that “[t]he exercise is completed within the specified time periods of Appendix E to 10 CFR Part 50, offsite exercise objectives have been met, and there are either no uncorrected offsite deficiencies, or a license condition requires offsite deficiencies to be corrected prior to operation above 5% of rated power.” FSER at 13-135, 13-147.

4.179 Mr. Musico concluded the staff’s site emergency presentation by stating that “the NRC and FEMA findings[,] subject to the permit conditions [and] the ITAAC[,] have found that the on-site and off-site plans are adequate and that there is reasonable assurance that they can be implemented” and “the finding by the staff . . . pursuant to 10 CFR 50.47(a) is that there is reasonable assurance that adequate protective measures can and will be taken in the event of

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a radiological emergency, subject of course, to the permit conditions and the ITAAC." Tr. at M-2186.

e. Board Findings Relating to Site Emergency Plan

4.180 The Board finds that the staff's independent review of the proposed complete and integrated emergency plan and information provided by SNC, including the ETEs and the emergency planning-related ITAAC, was sufficient to conclude that the emergency plan provides an adequate basis for an acceptable state of onsite and offsite emergency preparedness, and that there is a reasonable assurance that the plan can be implemented without any significant impediments, provided that the permit conditions are adequately addressed and the ITAAC are met.

4.181 The Board concurs that the staff's decision to limit its review to proposed Units 3 and 4 and to the common features of the plan was appropriate. The Board also concurs that, given the high level of communications and data processing capabilities that exists today, the use of a centrally located TSC for all four units is acceptable for the multi-unit site and that the proximity of the TSC to each of the control rooms still would facilitate face-to-face communications if necessary. The Board notes that the staff performed an independent review of the proposed communication and data capabilities and found them to be redundant, dedicated, and diversified.

4.182 The staff identified seven permit conditions that are meant to address those aspects of the emergency plan that might be impacted by the agency's review of NEI-07-01 and the ongoing AP1000 design certification revision rulemaking proceeding. The Board finds that the proposed permit conditions are necessary to allow the development of EAL schemes for Vogtle Units 3 and 4 that reflect the approved version of NEI-07-01, the final AP1000 design, and as-built plant conditions and instrumentation, and to resolve differences between the

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proposed Vogtle Units 3 and 4 common TSC location and the TSC location specified in the AP1000 DCD.

4.183 The Board further finds that the staff performed an adequate review of the local, State, and federal governmental agencies' emergency planning responsibilities certifications provided by SNC as part of the complete and integrated emergency plans. The staff found that SNC submitted the required certifications that indicate that the proposed emergency plans are practicable; that these agencies are committed to participating in any further development of the plans, including any required field demonstrations; and that these agencies are committed to executing their responsibilities under the plans in the event of an emergency.

4.184 The Board finds that the ITAAC associated with emergency planning for both Vogtle Units 3 and 4, which include ITAAC concerning EALs; communication among response organizations; emergency facilities and equipment; accident assessment methods, systems and equipment; development of protective actions; a full participation exercise; and emergency plan implementing procedures, will provide reasonable assurance of acceptable onsite and offsite emergency preparedness by assuring that the requirements of the emergency plan have been effectively implemented. The Board notes that the full participation exercise ITAAC, which is the only ITAAC that is not to be completed prior to fuel load, requires as a prerequisite to operation above five percent of rated power that there are no uncorrected offsite exercise deficiencies.

7. Seismic Evaluation

a. Introduction

4.185 One of the crucial issues associated with an ESP is the evaluation of the seismic suitability of a site for the construction and operation of any proposed nuclear units. In this instance, applicant SNC provided its initial seismic evaluation in its SSAR,²⁷ and the staff

²⁷ See Exhs. SNC00080A ([SNC], Vogtle [ESP] Application, pt. 2, [SSAR] § 2.5.1, (continued...))

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conducted a review of seismic matters in SER sections 2.5 and 3.7 to cover the seismic implications of both the SNC ESP and LWA requests, see FSER §§ 2.5, 3.7. The SNC SSAR evaluation of tectonic features in chapter 2.5.1 included a literature review, contact with local researchers, air photo interpretation, aerial reconnaissance, review of seismicity, seismic reflection profiles, and geomorphic analysis of river terraces. See SSAR 80A, at 2.5.1-50; Tr. at M-2239; see also Exh. SNC000091, at 8 (Vogtle ESP Mandatory Hearing Presentation #7, Seismic Evaluation) [hereinafter SNC Seismic Evaluation Presentation]. The staff's FSER for Vogtle Units 3 and 4 evaluates SNC's ESP application relative to geologic, seismic, and geotechnical engineering, as well as provides the safety analysis for the LWA request, in chapters 2.5, 3.7, and 3.8 of the FSER. See FSER at 2-178 to -449, 3-5 to -24.

4.186 After issuing RAIs to SNC, the staff generated its DSER, released in August 2007. Among its forty open items, twenty-two related to seismic matters. See [NRO/NRC], Safety Evaluation of the [ESP] Application in the Matter of [SNC] for the Vogtle [ESP] Site at 1-5 to -7 (Aug. 2007) (ADAMS Accession No. ML072250471) [hereinafter DSER]. By the time the ASER was released for ACRS review in November 2008, these seismic-related open items had been closed. See ASER at 1-5. The analysis in the SSAR had shown that the Vogtle site ground motion response spectra (GMRS), which is equivalent to the safe shutdown earthquake for the site, see FSER at 2-317, had exceeded the AP1000 DCD, revision 15 certified seismic design response spectra (CSDRS) in certain frequency ranges, see id. at 3-7. As a result, SNC

²⁷(...continued)

at 2.5.1-1 to -96 (rev. 5 Dec. 2008)) [hereinafter SSAR 80A]; SNC00080B ([SNC], Vogtle [ESP] Application, pt. 2, [SSAR] § 2.5.1, at 2.5.1-97 to -116 (rev. 5, Dec. 2008)); SNC00080C ([SNC], Vogtle [ESP] Application, pt. 2, [SSAR] § 2.5.1, at 2.5.1-117 to -131 (rev. 5 Dec. 2008)) [hereinafter SSAR 80C]; SNC00080D ([SNC], Vogtle [ESP] Application, Pt. 2, [SSAR] § 2.5.1, at 2.5.1-132 to -162 (rev. 5 Dec. 2008)); SNC00080E ([SNC], Vogtle [ESP] Application, pt. 2, [SSAR] § 2.5.2 (rev. 5 Dec. 2008)) [hereinafter SSAR 80E]; SNC00080F ([SNC], Vogtle [ESP] Application, pt. 2, [SSAR] § 2.5.4 (rev. 5 Dec. 2008)); SNC00080G ([SNC], Vogtle [ESP] Application, pt. 2, [SSAR] app. 2.5E (rev. 5 Dec. 2008) (Westinghouse Elec. Co. LLC, AP1000 Vogtle Site Specific Seismic Evaluation Report (rev. 4 Oct. 2008)) [hereinafter SSAR 80G].

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provided a site-specific analysis to demonstrate the suitability of the site. See id. This analysis was reviewed by the ACRS, and was an issue in its report to the Commission. See FSER at E-2 (Letter from William J. Shack, Chairman, ACRS, to NRC Chairman Dale E. Klein (Dec 22, 2008)).

4.187 Because of the importance of the seismic evaluation as a factor in constructing and operating a facility in a safe and environmentally sound fashion, the Board asked SNC and the staff to review the seismic evaluation at the mandatory hearing, including outlining the staff's rationale for concluding that SNC's site-specific analysis met applicable agency requirements. See Licensing Board Safety Questions at 2-3. The SNC and staff mandatory hearing presentations were organized around the key topic areas in section 2.5, Geology, Seismology and Geotechnical Engineering, and section 3.7, Seismic Design, in the SNC SSAR and the staff's SER.

b. Witnesses and Evidence Presented

4.188 SNC, as the lead party, and the staff presented a total of ten witnesses during the March 2009 evidentiary hearing on the mandatory/uncontested portion of this ESP proceeding in support of their respective positions on the adequacy of the SER seismic evaluation discussion and analysis relative to proposed Vogtle Units 3 and 4. At the evidentiary hearing, each of these witnesses provided oral testimony, in conjunction with the parties' prefiled slide presentations that were admitted as exhibits. See Tr. at M-2225 to -2364; SNC Seismic Evaluation Presentation; Exh. NRC000065 (NRC Staff Presentation Topic #7, Seismic Evaluation) [hereinafter Staff Seismic Evaluation Presentation].

i. SNC Witness

4.189 SNC presented one witness regarding the seismic evaluation issue, Donald P. Moore. Mr. Moore, an SNC Consulting Engineer, provided overall technical oversight of SSAR

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section 2.5 that comprises the geology, seismology, and geotechnical portions of the ESP and LWA applications. Mr. Moore, who received a B.S. in Civil Engineering from the University of Alabama and an M.S. in Engineering from the University of Alabama at Birmingham, has forty years of experience in the commercial nuclear power plant industry in the areas of civil, structural, and seismic analysis and design, soil dynamic behavior, and seismic qualification of structures, systems, and components. He is a registered professional engineer and his consulting engineer position is the highest SNC engineering technical classification. Mr. Moore has been a member of various national standards and code committees on seismic analysis and design of nuclear facilities, and seismic qualification of electrical and mechanical equipment, including American Society of Civil Engineers Standard 43, which is the basis for the methodology used to develop the Vogtle site specific ground motion response analysis. See Tr. at M-2234 to -2235; Exh. SNC000092 (Donald P. Moore CV).

ii. Staff Witnesses

4.190 The staff presented five witnesses in support of its ESP-related evaluation of the seismic and geologic characteristics of the Vogtle Units 3 and 4 site: Dr. Gerry Stirewalt, Senior Geologist, Division of Site and Environmental Reviews, NRC/NRO/SERD; Sarah Gonzales, NRC/NRO/SERD, Laurel Bauer, Geologist/Paleoseismologist, NRC/NRO/SERD; Bret Tegeler, Senior Structural Engineer, NRC/NRO/Division of Engineering (DE); and Dr. Carl Constantino, Professor Emeritus from the City University of New York. See Tr. at M-2297 to -2333. In addition, Mr. Tegeler, Dr. John Ma, NRC/NRO/DE, Dr. Constantino, and Christian J. Araguas, NRC Lead Project Manager for the Vogtle Units 3 and 4 ESP application, presented evidence regarding the staff's seismic evaluation of the SNC LWA request.²⁸ See Tr. at M-2334 to -2361

²⁸ Dr. Weijun Wang, Senior Geotechnical Engineer, NRC/NRO/SERD, see Exh. NRC000084 (CV of Weijun Wang), also was seated and sworn in as a witness as part of the staff panel on seismic matters, but did not provide any oral testimony relative to this subject. (continued...)

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4.191 Dr. Stirewalt received a Bachelor of Arts (B.A.) degree in Geology and Mathematics from Catawba College and a Ph.D. in Structural Geology from the University of North Carolina at Chapel Hill. His professional experience includes four years of teaching geology at the university level, six years with Ebasco Overseas Corporation and Ebasco Services, Inc., on geologic and geotechnical site characterization projects for siting nuclear and fossil-fuel power plants, nine years with Battelle Memorial Institute providing support for DOE efforts associated with siting a HLW repository; fourteen years with SRI and Mandex, Inc., providing support to the staff regarding, among other things, the geologic, tectonic, and volcanic characteristics of the potential DOE HLW repository site at Yucca Mountain, Nevada; and four years with the staff engaged in stakeholder outreach efforts associated with the Yucca Mountain licensing process and, most recently, leading teams involved in the geologic and geotechnical safety reviews of ESP and COL applications. See Tr. at M-2297; Exh. NRC000083 (Gerry L. Stirewalt, Ph.D., P.G., SPQ).

4.192 Ms. Gonzalez has a B.S. in Geological Sciences from Canterbury University, New Zealand, and an M.S. in Geophysics from San Diego State University. Before joining the NRC, Ms. Gonzalez worked for three years as a seismologist with the SRI where, among other things, she provided support for staff reviews regarding earthquake hazards and seismic design criteria for the potential HLW repository at Yucca Mountain, Nevada. Since joining the NRC in 2006, she has been responsible for reviewing ESP and COL applications and preparing SER sections related to vibratory ground motion and seismic instrumentation. See Tr. at M-2303; Exh. NRC000082 (Sarah H. Gonzalez SPQ).

²⁸(...continued)

In addition, Mark D. Notich, Environmental Project Manager for the Vogtle ESP application, whose background and credentials have previously been described in section IV.A.1.b supra, was sworn and presented testimony regarding the environmental impact review process as it relates to seismic matters, which he indicated were deferred to the safety review process. See Tr. at M-2362 to -2363.

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4.193 Ms. Bauer has a B.A. in Anthropology, a B.S. in Geology, and an M.S. in Earth Sciences, all from the University of Memphis. Prior to joining the NRC, Ms. Bauer worked as a USGS contract geologist responsible for coordinating and assisting on paleoseismology and earthquake hazard studies in the central United States. Since joining the NRC in 2007, she has been responsible for reviewing ESP and COL applications and preparing SER sections related to regional and site geology, surface faulting, and paleoseismology. See Tr. at M-2306 to -2307; Exh. NRC000081 (Laurel M. Bauer SPQ).

4.194 Mr. Tegeler has a B.S. in Mechanical Engineering from the University of Maryland, College Park, and an M.S. in Structural Engineering from George Washington University. Prior to joining the staff in 2002, Mr. Tegeler had some eleven years experience with the United States Navy, the United States Secret Service, and private consultant DLL Omni Engineering, analyzing blast effects and designing ships and vehicles to account for such effects. While with the NRC, Mr. Tegeler served for five years with RES providing technical guidance on the effects of aircraft impacts and terrorist attacks on nuclear power plant structures and spent fuel pools and, most recently, has worked in NRO reviewing seismic design parameters and seismic system analyses associated with applications for new reactor design certifications, ESPs, and COLs. See Tr. at M-2315, M-2334; Exh. NRC000087 (Bret Andrew Tegeler, P.E., SPQ).

4.195 Dr. Constantino holds a Bachelor of Civil Engineering degree from City College of New York, a Master of Civil Engineering degree from Columbia University, and a Ph.D. in Soil Mechanics and Foundations from the Illinois Institute of Technology. He has served as a consultant to both NRC and DOE for the last forty years on a variety of seismic issues and has been involved in the development of standards associated with the seismic response of reactor and underground waste storage facilities as well as with seismic safety evaluations and audits

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of particular facilities, including new and existing reactor facilities, the Waste Isolation Pilot Project, the Yucca Mountain facility, and the SRS. See Exh. NRC000085 (Carl J. Costantino CV).

4.196 Dr. Ma has B.S., M.S., and Ph.D. degrees in Civil Engineering from, respectively, Chung Yang University, Taiwan, China, the University of Missouri at Rolla, and the University of Texas. Since 1974, first for the Atomic Energy Commission and subsequently for the NRC, Dr. Ma has been involved in the review, audit, and inspection of nuclear power plant structures. See Exh. NRC000086 (Resume of John S. Ma).

4.197 The qualifications of Mr. Araguas were summarized previously in connection with the hearing presentation on radiological impacts. See supra section IV.A.2.b.

4.198 Based on the foregoing, and the respective background and experience of the proffered witnesses, the Board finds that each of these witnesses is qualified to testify as an expert witness on the subject of the seismic evaluations associated with the ESP and LWA applications for proposed Vogtle Units 3 and 4.

c. Regulations and Guidance Relating to Seismic Evaluation

4.199 Under 10 C.F.R. § 52.17(a)(1)(vi), an applicant's SSAR must include

[t]he seismic . . . and geologic characteristics of the proposed site with appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area and with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.

In providing this information, applicants must conform to the requirements of 10 C.F.R.

§ 100.23, which stipulates that the information provides

the principal geologic and seismic considerations that guide the Commission in its evaluation of the suitability of a proposed site and adequacy of the design bases established in consideration of the geologic and seismic characteristics of the proposed site, such that, there is a reasonable assurance that a nuclear power plant

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can be constructed and operated at the proposed site without undue risk to the health and safety of the public.

Among other things, this provision, in conjunction with Appendix A to 10 C.F.R. Part 100, sets forth in detail the geologic, seismic, and engineering characteristics as well as the siting factors and criteria that govern an applicant's seismic suitability showing. Additionally, the staff provides further guidance in the form of Regulatory Guides 1.70, 1.165, 1.208, and SRP section 2.5.1, that detail the matters that generally must be addressed in, and how the staff will conduct its review of, an applicant's seismic evaluation of a proposed nuclear power reactor site.²⁹

- e. Evidentiary Presentation Regarding ESP Seismic Evaluation
 - i. Seismic-Related Background

4.200 The proposed Vogtle Units 3 and 4 site is located near Waynesboro, in Burke County, Georgia, just to the southwest of the Savannah River. See FSER at 2-1. The Vogtle Unit 3 site is approximately 1700 feet west of Vogtle Unit 2. According to SNC witness Mr. Moore, the geology and geotechnical soil conditions associated with proposed Vogtle Units 3 and 4 are identical in all material respects to the conditions for Vogtle Units 1 and 2. Moreover, Mr. Moore indicated, the VEGP site is directly across the river from DOE's SRS, where there have been a significant number of geological, seismological, and geotechnical studies performed, including multiple deep borings and fault identification studies. Much of its site information, Mr. Moore testified, was shared with SNC as part of the Vogtle ESP site

²⁹ See [OSD, NRC], Regulatory Guide 1.70, Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, LWR ed., § 2.5 (rev. 3 Nov. 1978) (pt. I, ADAMS Accession No. ML011340072); [RES, NRC], Regulatory Guide 1.165, Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion (Mar. 1997) (ADAMS Accession No. ML003740084); [RES, NRC] Regulatory Guide 1.208, A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion (Mar. 2007) (ADAMS Accession No. ML070310619); NUREG-0800, § 2.5.1 (rev. 4 Mar. 2007) (ADAMS Accession No. ML070730464).

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investigation and proved to be very useful in supporting the Vogtle ESP. See Tr. at M-2238 to -2239. Further, Mr. Moore testified that, due to the technical complexity of the matters at issue in section 2.5 of the SSAR, SNC formed a Review and Advisory Panel of distinguished outside experts to review the work at key stages and to provide comments and recommendations. See Tr. at M-2237.

ii. Pen Branch Fault

4.201 A tectonic feature of significant concern during the seismic assessment associated with the Vogtle ESP application was a long underground fault, called the Pen Branch fault, that was known to underlie the SRS and was expected to extend under the Vogtle site. See FSER at 2-204 to -205. Although the fault previously had been determined not to be a capable seismic source relative to the SRS, see Tr. at M-2240, both SNC and the staff considered it important to assess its potential impact on the Vogtle site.

4.202 According to SNC witness Mr. Moore, SNC performed a seismic reflection survey to pinpoint the location of the Pen Branch fault under the Vogtle site. See id.; SNC Seismic Evaluation Presentation at 9-10. The fault exists in the deep bedrock at the interface between the crystalline basement rock to the northwest, and the Triassic basin rock to the southeast. See Tr. at M-2240 to -2241. The upper surface of these rock structures are about a thousand feet below the Vogtle site grade, and the upper tip of the fault fracture line is several hundred feet below grade. See Staff Seismic Evaluation Presentation at 6. Staff witness Dr. Stirewalt testified that the SNC survey shows that the stratigraphic layers above the fault, such as the Blue Bluff marl layer, have not been deformed by the fault. Moreover, according to Dr. Stirewalt, since it is known from radiometric dating that these strata are about 33.7 million years old, this provides strong evidence that the most recent fault movement happened more than 33.7 million years ago. See Tr. at M-2300.

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4.203 Staff witness Dr. Stirewalt also testified that Regulatory Guide 1.208 specifies that faults that have not moved within the last 1.8 million years (the cutoff for the Quaternary Period in age) are defined to be non-capable. See id. He testified as well that SNC's careful mapping of the site surface, backed by its own field investigation, showed no deformation or distortion in the area where the fracture line would have intersected the surface. According to Dr. Stirewalt, this also provided good evidence that the Pen Branch fault is in fact pre-Quaternary in age, and therefore not a capable fault. See M-2301 to -2302.

iii. Vibratory Ground Motion

4.204 SNC witness Mr. Moore outlined the approach used by SNC to develop the site-specific probabilistic seismic hazard analysis (PSHA) utilized to determine the safe shutdown earthquake (SSE) vibratory ground motion. See Tr. at M-2264 to -2268; SNC Seismic Evaluation Presentation at 18; see also FSER at 2-236 to -239. SNC followed procedures recommended in Regulatory Guide 1.165, albeit while developing the SSE GMRS using the performance-based approach described in Regulatory Guide 1.208 (rather than the reference-probability approach in Regulatory Guide 1.165). Per Regulatory Guide 1.165, SNC used the 1986 Electric Power Research Institute (EPRI) seismic source and ground motion models for the central and eastern United States as the basis for their ground motion calculations. Given that the EPRI models were based on data taken up through 1984, Regulatory Guide 1.165 also recommends a review and update, if necessary, of both models to account for data taken since that time. See FSER at 2-236. After a review, SNC opted to update both models. The major effort involved updating the so-called Charleston Seismic Source. See Tr. at M-2264 to -2265. The Charleston seismic zone is centered near the east coast of South Carolina, see SNC Seismic Evaluation Presentation at 19, about 100 miles from the Vogtle site, and is the dominant seismic source for the site. See Tr. at M-2265, M-2269.

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SNC updates to the EPRI source model, which are summarized in FSER section 2.5.2.2.2, see FSER at 2-240 to -248, involved significant changes in geometry, maximum magnitudes, and the recurrence interval for maximum magnitude earthquakes. The recurrence interval was reduced from several thousand years to less than one thousand years, which has the effect of increasing the seismic hazard. See Tr. at M-2265 to -2266; Staff Seismic Evaluation Presentation at 9.

4.205 Staff witnesses sought to provide evidence that the staff had carefully reviewed SNC's updating of the EPRI source model. Specific staff questions about the model resulted in several open items in the DSER. See DSER at 1-5, 1-6. For example, the staff questioned whether SNC had provided adequate paleoliquefaction evidence to rule out the occurrence of large inland earthquakes. The staff was also concerned whether one of the teams providing input into the original EPRI source model had adequately characterized the hazard. Finally, the staff questioned whether the potential impact of the Eastern Tennessee Seismic Zone (ETSZ) had been properly accounted for. According to the staff witnesses, based on additional information and analyses provided by SNC, and in the case of the ETSZ, additional sensitivity studies performed by the staff, the open items were all closed. See Tr. at M-2309 to -2313; Staff Seismic Evaluation Presentation at 13-18.

4.206 With respect to upgrading the ground motion model, Mr. Moore testified that SNC used an updated version developed by a 2004 EPRI sponsored study. See Tr. at M-2265. This model was used to propagate the ground motion from the Charleston source, through the deep bedrock to the Vogtle site. Since Vogtle is a deep soil site, where the hard bedrock is more than a thousand feet below grade, site amplification factors were determined and used to calculate the uniform hazard spectra at the site surface. See Tr. at M-2265, M-2267. Ultimately, according to Mr. Moore, SNC calculated the SSE surface GMRS using the

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methodology specified in Regulatory Guide 1.208. See Tr. at M-2268. The horizontal and vertical GMRS results, which are set forth in Figure 2.5.2-44b in the SSAR, see SSAR 80E, at 2.5.2-153; SNC Seismic Evaluation Presentation at 23, show that the peak surface ground acceleration at 100 hertz (Hz) is 0.266 g. See Tr. at M-2271.

4.207 The staff witnesses testified that, following its review, the staff concluded that the Vogtle GMRS was an adequate representation of the regional and local seismic hazard and met the applicable requirements of 10 C.F.R. Parts 52 and 100. Further, the staff found that the GMRS values are within those that new reactor designs are generally engineered to withstand, but noted that the appropriateness of the specific design proposed for the Vogtle site will be determined at the COL stage when the detailed design of safety systems is available. See Tr. at M-2313 to -2314; Staff Seismic Evaluation Presentation at 20.

4.208 Additionally, when the GMRS calculated for the site is compared to the AP1000 CSDRS, it was found that the GMRS is not bounded by the CSDRS. See SSAR 80G, at 14 (fig. 3-4). This is an issue for consideration relative to the LWA application, as is discussed in section IV.A.7.f below.

iv. Surface Faulting

4.209 SNC's evaluation of potential surface faulting is provided in section 2.5.3 of the SSAR, while the staff's review of this topic is in section 2.5.3 of the FSER. See FSER at 2-326. Based on its detailed review, the staff concluded that SNC had provided a thorough and accurate characterization of surface and near-surface faulting and nontectonic deformation as required by 10 C.F.R. § 100.23(c)-(d). The staff also stated that the SSAR provided an adequate basis to conclude that there is no evidence that surface faulting and deformation present a hazard for the site area. See FSER at 2-343.

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4.210 During the mandatory hearing, staff witness Dr. Stirewalt made note of a DSER open item relating to what were referred to as injected sand dikes at the site. See Tr. at M-2318; Staff Seismic Evaluation Presentation at 21. As Dr. Stirewalt indicated, the staff determined that SNC initially failed to demonstrate that these features were not associated with seismically-induced liquefaction. In response, SNC provided field evidence to demonstrate that the dikes were most likely formed by sediment collapse overlying minor dissolution features. The staff subsequently determined this evidence was sufficient to close the open item. See Tr. at M-2318 to -2320.

v. Stability of Subsurface Materials

4.211 Information on the stability of subsurface materials, i.e., those materials located directly under the proposed new Vogtle units, and SNC efforts to address stability issues regarding those materials, is presented in section 2.5.4 of the SSAR and SER. See FSER at 2-344. SNC witness Mr. Moore testified at the hearing that this information was required for developing the PHSA, see Tr. at M-2270, as well as to support the LWA and COL applications. See Tr. at M-2248 to -2249.

4.212 SNC witness Mr. Moore described four major layers that underlie the Vogtle site. The top layer, referred to as the upper sands or the Barnwell Group, extends down an average of ninety feet from the surface. These sands are quite variable, ranging from very loose to very dense. Near the bottom of these sands is what is called the Utley limestone. It is very porous, with cavities caused by dissolution. The layer below the Barnwell Group is called the Blue Bluff marl or the Lisbon Formation. It has an average thickness of seventy-six feet. It is a very hard, slightly sandy, cemented, calcareous silt/clay layer. The third layer down is called the lower sands or the Coastal Plain Deposits and consists of about 900 feet of dense sands. The bottom layer is the Dunbarton Basin bedrock, the top of which is about 1050 feet below the surface.

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See Tr. at M-2249 to -2250; SNC Seismic Evaluation Presentation at 12-14; SSAR 80C, at 2.5.1-124 (fig. 2.5.1-41).

4.213 To improve the stability of the materials at the foundation level of the nuclear island for each facility, Mr. Moore testified that SNC plans to excavate the upper sands under Units 3 and 4 all the way down to the Blue Bluff marl layer. The excavated material would then be replaced with an engineered compacted granular backfill. This was also done in connection with the construction of existing Units 1 and 2. Mr. Moore testified that the reason for removing the Barnwell Group layer was to eliminate potential subsurface stability problems, and the potential for seismic liquefaction. See Tr. at M-2250 to -2252; SNC Seismic Evaluation Presentation at 13.

4.214 Also in this regard, SNC witness Mr. Moore described the construction of a test pad at which twenty feet of a hill at the site was excavated and backfilled employing the same material and placement procedures used in the construction of Units 1 and 2. Tests were then performed to document the static and dynamic properties of the backfill, including an important test that involved measuring the shear wave velocity, which is considered a good indicator of adequate soil. See Tr. at M-2257, M-2259. The AP1000 DCD requires a minimum shear wave velocity of at least 1000 feet per second (ft/sec) at the foundation depth (i.e., forty feet below the surface for Units 3 and 4). Mr. Moore testified that measurement results indicated the 1000 ft/sec requirement can be achieved. See Tr. at M-2258 to -2260; SNC Seismic Evaluation Presentation at 17. He also stated that ITAAC have been established to ensure that the actual backfill to be emplaced for Units 3 and 4 will meet the design requirements necessary to ensure this minimum shear wave velocity requirement is reached. See Tr. at M-2260.

4.215 The staff witnesses also sought to present extensive evidence at the hearing regarding the staff's review of the SNC analysis and its conclusions relating to subsurface

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materials stability. At the time the DSER was released in August 2007, the staff had included open items relating to field and laboratory testing of subsurface materials, the measurements of shear-wave velocity and the development of soil degradation and damping ratio curves. See Tr. at M-2321 to -2322, M-2325 to -2328; Staff Seismic Evaluation Presentation at 22. The staff felt that SNC had not initially provided sufficient field data and laboratory tests to determine the reliability of the subsurface soil index properties. See Staff Seismic Evaluation Presentation at 23. SNC performed additional field and laboratory investigations to address the staff's concerns. See Tr. at M-2323 to -2324; Staff Seismic Evaluation Presentation at 23-26. Staff witness Dr. Costantino provided examples of the types of additional tests performed. He testified that, while there were only fourteen borings performed originally, SNC ultimately conducted 174, including forty-two borings that extended down through the Blue Bluff marl layer and into the dense sands below. According to Dr. Consantino, SNC more than doubled the number of cone penetrometer tests (CPTs) to provide additional velocity information for material that could be used as backfill material. See Tr. at M-2323 to -2324; SNC Seismic Evaluation Presentation at 24. Dr. Consantino indicated the staff also was concerned that SNC had not provided sufficient shear-wave velocity measurements, nor performed dynamic testing to verify dynamic material property curves, both leading to open items in the DSER. SNC carried out sufficient additional testing and analyses to close these open items. See Tr. at M-2325 to -2328; Staff Seismic Evaluation Presentation at 25, 27. The subsurface material testing and analyses are summarized in FSER section 2.5.4.1. See FSER at 2-344 to -356.

4.216 The staff ultimately concluded that SNC had adequately determined the engineering properties of subsurface soils, provided sufficient information to characterize the shear-wave velocity profiles, demonstrated static and dynamic stability of the site and structural

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backfill materials, and determined that subsurface soils and backfill materials are not subject to liquefaction. See Tr. at M-2331 to -2333; Staff Seismic Evaluation Presentation at 35.

4.217 The staff had also identified twelve COL action items in the DSER. See Staff Seismic Evaluation Presentation at 22. All of these action items were resolved through the additional information SNC provided in support of the LWA request as SSAR revisions. See Tr. at M-2330; Staff Seismic Evaluation Presentation at 30.

f. Geotechnical and Structural Engineering Review of Limited Work Authorization

4.218 As set forth in its August 2007 LWA request, the scope of the LWA involves soil foundation (engineered backfill) work, placement of a concrete mud mat and waterproofing membrane and placement of a mechanically stabilized earth (MSE) wall. See Staff Seismic Evaluation Presentation at 40; FSER at i. The concrete floor of the nuclear island structure is to be poured directly on the mud mat, while the subsurface portion of the walls will be poured up against the MSE wall. See Tr. at M-2276 to -2277; SNC Seismic Evaluation Presentation at 25.

4.219 With regard to the engineered backfill, the staff witnesses indicated that there are two ITAAC to ensure that the as-built backfill will meet certain seismic specifications. First, the backfill must meet a compaction criterion of ninety-five percent modified Proctor compaction. See Staff Seismic Evaluation Presentation at 47-49; see also Tr. at M-2340 to -2341. Second, the as-built backfill at and below the nuclear island foundation depth must have a shear-wave velocity of at least 1000 ft/sec. See Tr. at M-2341; Staff Seismic Evaluation Presentation at 49-50. The staff concluded that SNC had developed adequate engineered backfill specifications and had established ITAAC that are adequate to ensure that these specifications will be met during actual placement of the backfill. See Tr. at M-2341 to -2342; Staff Seismic Evaluation Presentation at 51.

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4.220 The emplacement of the mud mat is the subject of another ITAAC. SNC witness Mr. Moore testified that the mud mat is constructed by placing six inches of concrete on the engineered backfill material, spraying on a waterproofing membrane, and then placing another six inches of concrete over the membrane. See Tr. at M-2277. Staff witness Mr. Tegeler testified that to meet the requirements specified in the AP1000 DCD, the coefficient of friction between the waterproofing membrane and mud mat concrete must be at least 0.7. See Tr. at M-2349. Mr. Tegeler and Dr. Ma also explained that while preliminary data from a vendor indicates this requirement can be met, the ITAAC requires that realistic onsite testing be performed to ensure the requirement is met in the as-built mud mat. See Tr. at M-2350 to -2351.

4.221 Another important parameter in the LWA seismic evaluation is the foundation input response spectra (FIRS). SNC witness Mr. Moore and the staff witnesses explained that this is similar to the GMRS, except it provides the seismic input at the base of the nuclear island foundation, forty feet below grade. See Tr. at M-2271 to -2272; Staff Seismic Evaluation Presentation at 41. Mr. Moore testified that, as was the case with the GMRS, the FIRS also exceeded the AP1000 CSDRS in certain frequency ranges. See Tr. at M-2280; SNC Seismic Evaluation Presentation at 27. Therefore, SNC performed a site-specific analysis to attempt to show that the site seismic demand does not exceed the AP1000 certified design capability. See Tr. at M-2283. This site-specific analysis, which is documented in SSAR appendix 2.5E, see Tr. at M-2286, was described at the hearing by SNC witness Mr. Moore as a two-dimensional (2-D) soil-structure interaction (SSI) model used to evaluate the seismic stability of the nuclear island in terms of potential sliding or overturning, see Tr. at M-2283 to -2284. He stated that the model was the standard AP1000 2-D seismic model, except that it used Vogtle ground motion input, rather than the certified design ground motion, and the Vogtle site soil shear-wave velocity

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profiles. See Tr. at M-2285; SNC Seismic Evaluation Presentation at 29. The results of this analysis from SSAR appendix 2.5E, as presented by Mr. Moore at the hearing, showed that the site-specific calculations were bounded by the AP1000 certified design results. See Tr. at M-2286 to -2287; SNC Seismic Evaluation Presentation at 30.

4.222 Seismic stability safety factors also were calculated by SNC and compared to established limits in appendix 2.5E of the SSAR, the results of which Mr. Moore summarized at the hearing. The safety factor is defined as the ratio of seismic capacity to seismic demand (C/D). See Tr. at M-2278 to -2279; SNC Seismic Safety Evaluation Presentation at 26. According to Mr. Moore, the SNC analysis predicted a minimum sliding C/D of 1.83, and a minimum overturning C/D of 2.45. Both of these exceed the stated safety margin lower limit of 1.1. The static bearing C/D was calculated to be 11.9, which also exceeds by a considerable degree the American Society of Civil Engineers-acceptable design guide for foundations of about 3.0. The dynamic bearing C/D of 5.6 likewise is greater than a typical safety factor for dynamic bearing of 2.25. See Tr. at M-2292 to -2293; SNC Seismic Safety Evaluation Presentation at 31. As a consequence, Mr. Moore concluded that, from SNC's perspective, "the backfill is fully acceptable, and able to support the nuclear island with a significant margin. And, therefore, supports the LWA." Tr. at M-2293.

4.223 For its part, according to the staff witnesses, the staff based its LWA-related seismic structural engineering review on SRP sections 3.7.1, 3.7.2, and 3.8.5. See Tr. at M-2343; see also SRP §§ 3.7.1 (rev. 3 Mar. 2007), 3.7.2 (rev. 3 Mar. 2007), 3.8.5 (rev. 2 Mar. 2007) (ADAMS Accession Nos. ML070640306, ML070640311, ML070550055). The results of these reviews are summarized in the three counterpart sections in the FSER. With respect to FSER section 3.7.1, which covers seismic design parameters, including vibratory ground motion, critical damping, and supporting media pertaining to SSI modeling, see Staff Seismic

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Evaluation Presentation at 54, staff witness Mr. Tegeler testified that, while an alternative method was used by SNC to develop the FIRS, the method resulted in a conservative estimate for the horizontal seismic demand. He stated that the staff also concluded that the FIRS satisfied the 10 C.F.R. Part 50, Appendix S requirement that the free field motion at the foundation elevation exceeds a minimum peak ground acceleration value of 0.1 g. Mr. Tegeler further testified that, relative to the staff's LWA review, the staff found the critical structural damping values used in the SNC SSI analysis were consistent with regulatory guidance, specifically Regulatory Guide 1.61, see [RES, NRC], Regulatory Guide 1.61, Damping Values for Seismic Design of Nuclear Power Plants (rev. 1 Mar. 2007) (ADAMS Accession No. ML070260029), and that the parameters used to characterize supporting media were consistent with the measured values. See Tr. at M-2347 to -2348.

4.224 FSER section 3.7.2 documents the staff's review of the seismic systems analysis, including the model description and the SSI analysis. See Staff Seismic Evaluation Presentation at 54. Mr. Tegeler testified that the staff found that the use of the 2-D SSI computer model was acceptable for the evaluation of sliding stability and bearing pressure demands. He noted that the staff also compared some of SNC's SSI analysis results with the AP1000 DCD (revisions 16 and 17) soft soil case and found them to be similar. Finally, based on independent staff calculations, the staff determined that the maximum seismic base shear forces were acceptable. See Tr. at M-2348 to -2349; Staff Seismic Evaluation Presentation at 59-60.

4.225 FSER section 3.8.5 concerns the analysis of foundation stability. See Staff Seismic Evaluation Presentation at 54. Mr. Tegeler testified that the staff reviewed the maximum horizontal forces and maximum friction forces below the mud mat and concluded that the nuclear island structure will not slide during the safe shutdown earthquake. He also testified

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that the staff concluded that the minimum safety factor with respect to failure of the dynamic soil bearing capacity during an SSE is 2.34. See Tr. at M-2356 to -2357.

4.226 In summary, Mr. Tegeler declared that, relative to its LWA seismic analysis, SNC had adequately developed the seismic design parameters and met the applicable regulatory requirements. He stated that, with respect to the seismic systems analysis, SNC had adequately performed the site-specific SSI analysis relative to determining the maximum seismic demands and likewise had met the applicable regulatory requirements. He further testified that, in its foundation analysis, SNC had demonstrated that the mud mat and waterproofing membrane are adequate, and that the nuclear island foundation is stable during an SSE event. See Tr. at M-2357 to -2358; Staff Seismic Evaluation Presentation at 64. Lastly, Mr. Araguas indicated that the staff's evaluation of in-structure seismic response associated with LWA activities will be done as part of its ITAAC review during the COL review. See Tr. at M-2358 to -2362.

g. Board Findings Relating to Seismic Evaluation

4.227 The Board finds that the written record and mandatory hearing presentations clearly indicate the staff conducted a thorough review of SNC's evaluation of seismic factors relevant to Vogtle Units 3 and 4, including LWA-associated activities. As is evidenced by the the large number of seismic-related RAIs and DEIS open items pursued by the staff, the staff examined every major aspect of SNC's seismic analysis to ensure that regulatory requirements were met. The staff made site visits, requested additional onsite measurements, checked input parameters, and performed relevant independent calculations. The Board further finds that SNC's approach of removing the Barnwell Group layer and replacing it with engineered backfill provides a sound basis for meeting seismic requirements at the site. As a consequence, we conclude that a preponderance of the evidence in the record before us supports the conclusion

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that the site, as modified with the proposed backfill, has seismic characteristics that meet the agency's regulatory requirements so as to support issuance of an ESP and an LWA.

4.228 Relative to the staff's review of the technical information presented in the Vogtle ESP application pertaining to the LWA activities being requested, the staff evaluated SNC's seismic analysis and design, including the design ground motion, the foundation input response spectra, and the supporting media for seismic design. The staff also reviewed the applicable seismic system analyses, including the foundation stability of the nuclear island against sliding and overturning, the maximum dynamic bearing pressures developed beneath the foundation basemat, and the horizontal seismic shear stresses developed between the basemat and the top of the mudmat, between the two halves of the mudmat through the waterproofing membrane, and between the bottom of the mudmat and the foundation soils. The Board finds that the staff's review was sufficient to conclude that SNC adequately demonstrated that it met the applicable LWA requirements associated with the stability of subsurface materials and foundations for the requested LWA activities at the Vogtle site.

4.229 SNC also has provided ITAAC for LWA activities associated with backfill and the waterproof membrane. The LWA ITAAC charts are on FSER page A-32. The backfill ITAAC for the LWA includes requirements that the backfill material underneath seismic category 1 structures be installed to meet a minimum of ninety-five percent modified proctor compaction, and that the shear wave velocity be greater than or equal to 1000 ft/sec at the depth of the nuclear island foundation and below. The waterproof membrane ITAAC requires that the friction coefficient to resist sliding is 0.7 or higher. The Board finds that the proposed ITAAC for the LWA are adequate to ensure that the installation of the foundation for the nuclear island will be in accordance with NRC regulations and guidance and will provide adequate margins of safety.

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8. Severe Accident Mitigation Design Alternatives

a. Introduction

4.230 Severe accident mitigation alternatives (SAMAs), encompass potential plant modifications, sometimes referred to as severe accident mitigation design alternatives (SAMDAs), as well as plant procedural changes or training program changes that can reduce the risks of severe accidents. See ESRP at 7.3-1. Section 7.2 of SNC's ER considers the impact of severe accidents, see ER at 7.2-1 to 7.2-8, and section 7.3 of the ER addresses SAMAs and SAMDAs, see id. at 7.3-1 to 7.3-6.³⁰ Relative to the staff's review, FEIS section 5.10.2 addresses severe accident impacts, see FEIS 1B, at 5-80 to 5-89, while FEIS section 5.10.3 considers SAMAs, including SAMDAs, see id. at 5-89 to 5-91. Both the applicant's ER and the staff's FEIS conclude that there are no cost-effective SAMDAs for the VEGP site. See ER at 7.3-1; FEIS 1B, at 5-90. Procedural and training SAMAs are to be addressed when the plant design is finalized and procedures are developed. See ER at 7.3-4; FEIS 1B, at 5-91.

4.231 The Board sought further information regarding the site-specific SAMDA analysis that formed the basis of the conclusion in the staff's FEIS that there were no cost-beneficial design alternatives required to be implemented at the Vogtle ESP site. The Board also sought information on how uncertainties were accounted for in this analysis and the major differences between the site-specific analysis and the analysis in the AP1000 DCD. See Licensing Board Memorandum and Order (Memorializing Results of Prehearing Conference and Providing Additional Administrative Directives) (Feb. 4, 2009) at 7 (unpublished).

³⁰ Chapter 7 of the ER, which was not among the parts of the ER proffered for admission into evidence, can be found under ADAMS Accession No. ML091540840.

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b. Witnesses and Evidence Presented

4.232 Information relative to the Board's review of the staff's SAMDA assessment came principally from oral testimony, and the associated presentation slides, of staff witness James V. Ramsdell, Jr. See Tr. at M-2365 to -2374; Exh. NRC000066 (NRC Staff Presentation Topic #8: Severe Accident Mitigation Design Alternatives) [hereinafter Staff SAMDA Presentation]. Mark Notich was also available to respond to Board questions on the subject of SAMDAs at the hearing. See Tr. at M-2365. Applicant SNC did not provide testimony on this topic.

4.233 Mr. Ramsdell's qualifications are discussed in connection with radiological impacts. See supra section IV.A.2.b.ii. Mr. Notich's qualifications are discussed above in connection with water impacts. See supra section IV.A.1.b.

4.234 Based on the respective qualifications and experience of the proffered witnesses, the Board finds Mr. Ramsdell and Mr. Notich qualified to testify as expert witnesses regarding the SAMA/SAMDA analysis relative to the Vogtle ESP application.

c. Regulations and Guidelines Relating to SAMDA Analysis

4.235 Severe accidents are defined as accidents "in which substantial damage is done to the reactor core whether or not there are serious offsite consequences." Policy Statement on Severe Reactor Accidents Regarding Future Designs and Existing Plants, 50 Fed. Reg. 32,138, 32,138 (Aug. 8, 1985). NRC safety and environmental regulations require consideration of the consequences of severe accidents. Section 52.17 of title 10 of the Code of Federal Regulations requires an ESP applicant to submit a safety assessment that includes an analysis of a fission product release from an accident, "using the expected demonstrable containment leak rate and any fission product cleanup systems intended to mitigate the consequences of the accidents." 10 C.F.R. § 52.17(a)(1)(ix). The fission product releases in question are associated with accidents that have "generally been assumed to result in substantial meltdown of the core with

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subsequent release into the containment of appreciable quantities of fission products.” Id. § 52.17(a)(1)(ix) n.1. Thus, implicitly, some discussion of SAMAs is required under the safety regulations.

4.236 On the environmental side, NEPA section 102(2)(C) “implicitly requires agencies to consider measures to mitigate [environmental] impacts.” [NEI]; Denial of Petition for Rulemaking, 66 Fed. Reg. 10,834, 10,836 (Feb. 20, 2001); see also Progress Energy Florida, Inc. (Combined License Application for Levy County Nuclear Power Plant, Units 1 and 2), LBP-09-10, 70 NRC __, __ (slip op. at 55) (Jul. 8, 2009). NRC regulations also require an applicant’s ER to include an analysis of “alternatives available for reducing or avoiding adverse environmental effects.” 10 C.F.R. § 51.45(c). NRC’s policy statement on Nuclear Power Plant Accident Considerations Under the National Environmental Policy Act of 1969, 45 Fed. Reg. 40,101 (Jun. 13, 1980), specifically provides for consideration of measures to prevent or to mitigate the consequences of severe accidents in the ER and EIS of certain categories of nuclear plants. See id. at 40,103. The agency’s 1985 severe accident policy statement, 50 Fed. Reg. at 32,138, provides for consideration of severe accidents for new plant designs.

4.237 ESRP Sections 7.2 and 7.3 provide further guidance on the evaluation of severe accidents and SAMAs. See ESRP at 7.2-1 to 7.3-8. The scope of SAMA analysis includes the identification and evaluation of design alternatives, procedural modifications, and training program changes that reduce the radiological risk from a severe accident by preventing substantial core damage or by mitigating the impacts by limiting releases from containment in the event that substantial core damage occurs. See ESRP at 7.3-1. As was noted above, SAMDAs, which are limited to potential design changes, are a subset of SAMAs; however, the terms are sometimes used interchangeably. See id.

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4.238 In evaluating ESP applications, where detailed design information is not available, the Commission may defer resolution of SAMA issues until the 10 C.F.R. Part 50 construction permit (CP) or 10 C.F.R. Part 52 COL stage. See North Anna ESP, CLI-07-27, 66 NRC at 237 & n.126. SNC, however, has selected the AP1000 certified design for proposed Vogtle Units 3 and 4. Because NRC regulations require design certification applicants to address SAMDAs, see, e.g., 10 C.F.R. §§ 51.30(d), 51.55(a), enough information was available, through the AP1000 DCD, to conduct a limited SAMDA analysis for the Vogtle ESP application.

4.239 Under the AP1000 revision 15 design certification rule, “[a]ll environmental issues concerning severe accident mitigation design alternatives associated with the information in the NRC’s [environmental assessment (EA)] for the AP1000 design and Appendix 1B of the generic DCD, for plants referencing this appendix whose site parameters are within those specified in the severe accident mitigation design alternatives evaluation” are considered resolved. 10 C.F.R. Part 52, app. D, § VI.B.7. Thus, because the Vogtle ESP application references the AP1000 certified design, if the VEGP site parameters are within those of the AP1000 DCD, the AP1000 SAMDA analysis resolves the issue of SAMDAs for the Vogtle ESP application.

d. Evidentiary Presentation

4.240 Initially, staff witness Mr. Ramsdell pointed out that the option to include a SAMDA/SAMA analysis at the ESP stage is provided in ESRP section 7.3. Nonetheless, according to Mr. Ramsdell, the Vogtle ESP is the first ESP application to do so because it refers to a specific plant design, in contrast to the earlier ESPs that used a plant parameter envelope approach for which a SAMDA analysis would not be applicable. See Tr. at M-2367. In response to a Board question, Mr. Ramsdell pointed out that SAMDAs are limited to plant design changes, whereas SAMA is a more generic designation that also includes changes to plant procedures and training. See Tr. at M-2367 to -2368.

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4.241 Mr. Ramsdell testified that the Vogtle ESP application references revision 15 of the AP1000 DCD (Appendix D of 10 C.F.R. Part 52). See Tr. at M-2368. In the FSER for this AP1000 DCD, the staff looked at the probabilistic risk assessment provided by Westinghouse for the AP1000. See Tr. at M-2368 to -2369; Staff SAMDA Presentation at 5; [NRR, NRC], [FSER] Related to Certification of the AP1000 Standard Design, NUREG-1793, ch. 19 (Sept. 2004), available at <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1793/>. As Mr. Ramsdell noted, for its part, Westinghouse started with a list of about 100 potential design alternatives and narrowed it down to sixteen (fourteen design alternatives identified by Westinghouse and two added by the staff). See Tr. at M-2369. The staff reviewed the results of the uncertainty analysis conducted previously for the AP600 (an earlier Westinghouse design) and then evaluated the potential benefits of implementing these design alternatives. See id. The staff review was documented in an EA, see [EA] by the [NRC] Relating to the Certification of the AP1000 Standard Plant Design Docket No. 52-006 (ADAMS Accession No. ML053250292) [hereinafter AP1000 EA], that accompanied the design certification rule. See Tr. at M-2369. Presenting the conclusions from the AP1000 EA, Mr. Ramsdell noted that (1) none of the design modifications evaluated is justified on the basis of cost benefit considerations; and (2) it is unlikely that any other design changes would be justified in the future on the basis of reducing person-rem exposure because the core damage frequencies are very low based on an absolute scale. See Tr. at M-2369; Staff SAMDA Presentation at 6. The EA also concluded that

“the evaluation provides reasonable assurance that there are no additional SAMDAs beyond those currently incorporated into the AP1000 design which are cost-beneficial, whether considered at the time of the approval of the AP1000 design certification or in connection with the licensing of a future facility referencing the AP1000 design certification, where the plant referencing this appendix is located on a site whose site parameters are within

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those specified in Appendix 1B of the AP1000 [DCD]. These issues are considered resolved for the AP1000 design.”

Staff SAMDA Presentation at 7 (quoting AP1000 EA at 4).

4.242 As indicated above, 10 C.F.R. Part 52, app. D, § VI.B.7, states that SAMDA issues are resolved for an application referencing the AP1000 DCD if the specific site parameters are covered by the site parameters assumed in the DCD SAMDA analysis. As a result, according to Mr. Ramsdell, the staff’s analysis focused on determining whether the Vogtle ESP site parameters were bounded by the generic site parameters in the AP1000 DCD. See Tr. at M-2371. Mr. Ramsdell testified that, given the extensive amount of meteorological data, economic cost parameters such as land use information, and population numbers and distributions, the staff decided that it was more “appropriate to use values that describe impacts to determine whether the site-specific values are bounded by the site parameters than to base the determination on comparison of individual elements of large data sets.” Staff SAMDA Presentation at 8; see also Tr. at M-2371. Mr. Ramsdell also declared that the staff decided that the person-rem per reactor year and the offsite economic costs (in dollars per reactor year) were the most appropriate values for determining whether the Vogtle site is bounded by the generic site. See Tr. at M-2371. These numbers were then used to determine the risk of severe accidents. Mr. Ramsdell further noted that, for the AP1000, the probability-weighted, mean population dose risks derived from table B1-3 in appendix B1 of the DCD and the base case and sensitivity case maximum attainable benefits listed in table B1-4 were judged to be the appropriate measures to determine whether the Vogtle site values are within the site parameters specified in appendix B1. See Staff SAMDA Presentation at 8.

4.243 As described by Mr. Ramsdell, the staff compared the VEGP site-specific analysis results with the DCD values. In all cases, the Vogtle site-specific numbers were lower than the generic values included in appendix B1. See Tr. at M-2371 to -2372; Staff SAMDA

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Presentation at 9. The presentation slides accompanying Mr. Ramsdell's testimony provided a summary table that showed that the Vogtle site twenty-four-hour and long-term population dose risk (person-rem per reactor year) were, respectively, twenty-four percent and fifty-one percent lower than the DCD generic analysis. The economic costs, referred to as the "Maximum Attainable Benefit," calculated using a seven percent and three percent discount rate, were, respectively eighty-six percent and seventy-nine percent lower for the Vogtle site than the generic site. See Staff SAMDA Presentation at 9; see also Tr. at M-2371 to -2372.. Thus, as Mr. Ramsdell testified, "the staff conclude[d] that the Vogtle site is in fact bounded by the generic site considered previously and that therefore the issues related to SAMDA are resolved for an AP1000 at the Vogtle site," based upon revision 15 of the AP1000 DCD. Tr. at M-2372. Accordingly, no additional site-specific SAMDA review for the Vogtle ESP application was performed. See Staff SAMDA Presentation at 10.

4.244 In response to a Board question regarding the status of plant procedures and their relationship to the analyses discussed above, Mr. Ramsdell noted that the procedures do not exist at the ESP stage, so that the staff is asking applicants at the COL stage to provide the staff with (1) assurance that as an applicant develops procedures, the procedures will be based on risk information that is available within the plant's probabilistic risk assessment (PRA); and (2) a time schedule when those procedures will be developed. See Tr. at M-2372 to -2373. The Board also questioned the low probability-weighted economic costs associated with severe accidents and the implication that even the most simple plant modification would not be justified. Mr. Ramsdell responded that this is a direct consequence of the low core damage and offsite release frequencies for the AP1000 plant design relative to current generation plants and that he was comfortable with these numbers. See Tr. at M-2372 to -2374.

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e. Board Findings Relating to SAMDAs

4.245 A severe accident mitigation alternatives (SAMAs) analysis is performed to determine if there are severe accident mitigation design alternatives (SAMDAs), new or modified procedural implementations, or new or modified training activities that can be justified to reduce the risk of severe accidents.

4.246 Because SAMDA issues are resolved for an application referencing the AP1000 DCD if the specific site parameters are covered by the site parameters assumed in the AP1000 DCD SAMDA analysis, the Board finds that in this instance the staff appropriately focused its analysis on determining whether the Vogtle ESP site parameters were bounded by the generic site parameters in the AP1000 DCD.

4.247 The Board finds that the use of overall site impacts to determine whether the Vogtle site is bounded by the AP1000 DCD site parameters is an adequate approach. The Board concurs that the use of population dose risk (person-rem per reactor year) and the maximum attainable benefit (in dollars per reactor year) were appropriate parameters for determining whether the Vogtle site is bounded by the AP1000 DCD generic site.

4.248 The Board finds that the staff performed an adequate review of the difference between these overall site impacts for the Vogtle site and the AP1000 DCD and that no additional site-specific SAMDA review for the Vogtle ESP application is necessary. Consequently the Board finds that the NRC Staff's conclusions constitute a reasonable evaluation of SAMDAs for the Vogtle ESP site.

4.249 The Board notes that the status of plant procedures and their adequacy under the analyses discussed is not being resolved at the ESP stage. Rather, at the COL stage the staff will be asking SNC to (1) provide assurance that the procedures developed by SNC will be

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based on risk information that is available within the plant's PRA; and (2) provide the staff with a schedule outlining when those procedures will be developed.

9. Future Regulatory/Licensing Activities Associated with the ESP

4.250 As was the case with other ESP mandatory hearings, see, e.g., Grand Gulf ESP, LBP-07-1, 65 NRC at 88-91, the Board requested additional information regarding a number of future regulatory and licensing issues associated with the SNC ESP application for Vogtle Units 3 and 4. The first of these involved items that were being deferred from the ESP licensing process to the COL stage. The Board's interest in this regard was having the staff identify the deferrals and outline the reasons why these subject matter areas (e.g., radioactive waste management system, per FEIS section 3.2.3, see FEIS 1A, at 3-14) were being postponed to the COL stage. See Licensing Board Environmental Questions at 4.

4.251 The second item with potential future import that the Board requested be addressed at the hearing was the proposed conditions associated with the ESP, as included in appendix A to the staff's FSER. See Licensing Board Safety Questions at 4. The staff likewise was asked to identify and to review the reasons for these proposed permit conditions as they impose requirements on SNC. Also under this general subject matter, another area of concern for the Board was the impacts, if any, on the Vogtle ESP application of AP1000 design certification revisions 16 and 17 that currently are under NRC review. In this regard, given that the ESP application currently references only AP1000 DCD revision 15, the Board was particularly interested in the staff's explanation of the effect of these future DCD revisions on the requested LWA and the site redress plan.

4.252 Finally, during the course of the hearing, as an aid to its understanding, the Board asked the staff for a briefing on the subject of the inspections, tests, analyses, and acceptance criteria, or ITAAC, associated with the ESP application. In particular, the Board was

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interested in the relationship between the ESP and COL ITAAC, given the current scheduling overlap between the agency's review of the ESP and COL applications for proposed Units 3 and 4, and the fact that the ESP application for the proposed Vogtle units is the first ESP application to include a complete, integrated emergency plan that incorporates ITAAC.

4.253 The staff, as the lead party for all these issues, presented Christian J. Araguas as a witness for all four of these subjects as they related to the staff's safety review. His background and qualifications were previously outlined in section IV.A.1.b supra. Also called as a witness regarding the environmental aspects of the COL deferral and AP1000 certification revision items was Mark D. Notich, whose background and qualifications were described in section IV.A.1.b supra. In addition, although not originally listed as witnesses for the COL deferral and AP1000 design certification revision discussions, included at the staff's request as part of the panels on those subjects were, respectively, Michael A. Smith and James V. Ramsdell, Jr., whose backgrounds and qualifications are set forth in section IV.A.2.b.ii supra. The Board finds that all four of these witnesses are qualified to testify as expert witnesses regarding the various aspects of the future regulatory and licensing activities that are associated with the ESP for proposed Vogtle Units 3 and 4.

a. Deferrals to Combined License Stage

i. Introduction

4.254 Although the ESP process is designed, among other things, to permit an applicant to resolve various safety, environmental, and emergency planning issues associated with the particular site at issue prior to the submission of a COL application, items for which sufficient information is lacking at the ESP stage of the licensing process may be subject to deferral for consideration at the COL stage of the process. See Grand Gulf ESP, LBP-07-01, 65 NRC at 90. To ensure that it was aware of the nature and justification for such deferrals

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relative to the proposed Vogtle units, the Board requested that a mandatory hearing presentation be provided identifying and explaining the deferrals being contemplated for these facilities. See Licensing Board Environmental Questions at 4; Licensing Board Safety Questions at 4.

ii. Witnesses and Evidence Presented

4.255 As was noted above, see supra section IV.A.9, the staff provided three witnesses to discuss the matter of deferrals to the COL process, in conjunction with staff's prefiled slide presentation that was admitted as an exhibit. See Tr. at M-2188 to -2209; Exh. NRC000067 (NRC Staff Presentation Topic #9, Deferrals to COL) [hereinafter Staff COL Deferrals Presentation].

iii. Regulations and Guidelines Regarding COL Deferrals

4.256 Relative to the staff's environmental review, although not a regulatory directive, as it encompasses all subject matter areas that the staff believes need to be covered in an ESP, the ESRP forms the basis upon which the staff makes a determination regarding the completeness and sufficiency of a given application's environmental report and, thereafter, the staff's own DEIS and FEIS. See ESRP at 1. The SRP, NUREG-0800, provides guidance to the staff in performing application safety reviews. See NUREG-0800, at 1 (rev. 1 Nov. 2007). The NRC's Review Standard (RS)-002, contains detailed guidance for staff personnel reviewing the safety aspects of ESP applications. See Grand Gulf ESP, LBP-07-01, 69 NRC at 88.

iv. Evidentiary Presentation

(1) Environmental Review

4.257 Staff witness Mr. Notich, the staff's environmental project manager for the Plant Vogtle ESP, indicated that "the environmental review performed by the staff [for the Vogtle ESP] encompasses all subject matter areas necessary for the ESP application and no other required

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review has been deferred to the combined license stage.” Tr. at M-2191. In response to a Board inquiry as to the meaning of the word “required” as it is used in denoting what is required to be reviewed at the ESP stage, Mr. Smith responded by referring to NUREG-1555, the ESRP, declaring that it provides the guidance for the ESP review. He indicated that there are a lot of “gray areas” associated with the information that is provided at the ESP stage, but generally the staff uses the guidance in the ESRP for the areas of review. See Tr. at M-2193 to -2194.

4.258 Relative to what appeared to the Board to be a COL deferral provision in the FEIS, see Licensing Board Environmental Questions at 4, Mr. Notich acknowledged that FEIS section 3.2.3 did indicate that the analysis of the radioactive waste management system was being deferred to the COL stage. Mr. Notich explained, however, that the analysis of that system had, in fact, been conducted by the staff and the impacts resulting from liquid and gaseous effluent releases were determined for plant construction and operation as shown in FEIS sections 4.9 and 5.9, respectively. He provided specific references to pages in these sections of the FEIS that documented the results of these analyses as well. See Tr. at M-2191 to -2192; Staff COL Deferrals Presentation at 10. Therefore, according to Mr. Notich, “[i]n Section 3.4.3 the staff only intended to indicate that the final design information may change at the combined license stage and this may constitute new and significant information for the combined license environmental review.” Tr. at M-2193; see also Staff COL Deferrals Presentation at 10.

4.259 Further, in response to a specific Board request for verification that the staff analysis in the FEIS was complete (absent new and significant information identified as the system design progresses in the COL stage, at which time the analysis will be revised as necessary), Mr. Notich stated that was correct. See Tr. at M-2194 to -2195. Although the Board again pursued the apparent contradiction between this statement indicating that nothing

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that was required was deferred to the COL and the FEIS statement that the radioactive waste management system analysis was deferred, Mr. Notich acknowledged that the staff's FEIS wording could have been better in this regard.

4.260 Finally, during additional questioning, Mr. Notich indicated that, given the pending revisions to the AP1000 DCD and possible future revisions, the state of the design of the plant might change. In response to a Board inquiry about when SNC would be formally adopting AP1000 DCD revisions 16 and 17 (as opposed to revision 15 that was formally referenced in the application), SNC counsel Mr. Blanton indicated that SNC anticipated adopting revisions 16 and 17 in the May 2009 time frame.³¹ See Tr. at M-2196.

(2) Safety Review

4.261 Relative to the staff's safety review of the Vogtle ESP application, staff witness Mr. Araguas began by indicating that all the requirements have been met (subject to the permit conditions and ITAAC, which are identified in sections IV.A.9.b and IV.A.9.d infra and are to be met in the future), and "no review required for the ESP or LWA has been deferred to the COL stage." Tr. at M-2197. This being said, Mr. Araguas acknowledged that there were outstanding various COL action items, which he referenced as being defined in the staff's presentation materials as

identify[ing] certain matters that shall be addressed in the FSAR by an applicant for a CP or COL who submits an application referencing the Vogtle ESP. These items constitute information requirements but do not form the only acceptable set of information in the FSAR. An applicant may depart from or omit these items, provided that the departure or omission is identified and justified in the FSAR. In addition, these items do not relieve an applicant from any requirement in 10 CFR Parts 50 and 52 that

³¹ DCD revision 17 (which incorporates the revision 16 changes as well, see Vogtle COL, LBP-09-3, 69 NRC at __ & n.5 (slip op. at 15 & n.5), was incorporated by reference into the Vogtle Units 3 and 4 COL application in revision 1 to that application, dated May 22, 2009. See Letter from Joseph A. (Buzz) Miller, SNC Exec. Vice President, Nuclear Development, to NRC, at 1 (May 22, 2009) (ADAMS Accession No. ML091630226).

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govern the application. After issuance of a CP or COL, these items are not controlled by NRC requirements unless such items are restated in the preliminary safety analysis report or FSAR, respectively.

Staff COL Deferral Presentation at 4; see also Tr. at M-2197 to -2198.

4.262 In response to Board questions regarding the meaning of the last sentence of this definition vis a vis the purported lack of any COL deferrals, staff counsel Mr. Moulding indicated by way of clarification that an applicant may address a COL action item by inserting additional information in its preliminary or final SAR, which may resolve the action item. Moreover, according to Mr. Moulding, if the action item is resolved in this manner, that information would remain part of the FSAR, as an official licensing document, after issuance of the COL. See Tr. at M-2200 to -2201.

4.263 Mr. Araguas then discussed the Vogtle ESP COL action items included in appendix A to the staff's FSER. COL Action item 2.2-1 requires the applicant at the COL stage to address the effects of a release of hydrazine from onsite storage tanks that might have an impact on control room habitability for the new units. According to Mr. Araguas, the reason that this item was not resolved for the ESP is that the analysis requires design information about the control room that is not available at the ESP stage. See Tr. at M-2201; Staff COL Deferral Presentation at 5.

4.264 In response to Board questions about why this particular item was not an ITAAC, and about the general differences between a COL action item and an ITAAC, Mr. Araguas responded that the purpose of an ITAAC is to demonstrate that the plant is constructed correctly, which is not the appropriate categorization for this item given that the analysis of post-chemical release control room habitability can be performed without constructing the control room, at least as long as the final design information can be made available. See Tr. at M-2202 to -2203.

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4.265 As for COL Action item 2.2-2, which, according to Mr. Araguas, requires the applicant to identify the quantities of the chemicals that will be used for the proposed plants and their potential impact on control room habitability, it is a corollary to the first action item. Lacking both information about the quantity of hazardous chemicals involved and design information about the control room, this item likewise must await design information at the COL stage to perform the necessary analysis of control room habitability. See Tr. at M-2203 to -2204; Staff COL Deferral Presentation at 5.

4.266 Mr. Araguas next discussed COL Action item 2.3-1, which requires that

[i]f, at the COL or CP stage, the applicant chooses an alternative plant design that requires the use of a ultimate heat sink (UHS) cooling tower, the applicant will need to identify the appropriate meteorological site characteristics (i.e., maximum evaporation and drift loss and minimum water cooling conditions) used to evaluate the design of the chosen UHS cooling tower.

Staff COL Deferral Presentation at 6; see also Tr. at M-2204 to -2205. Mr. Araguas explained that, even though the applicant has based its application on the AP1000 DCD, at the ESP stage the staff is not approving the AP1000 reactor, but instead the narrowly focused plant parameter envelope that the chosen design reflects. This, Mr. Araguas noted, can be contrasted to previous ESPs, which were based on a plant parameter envelope for which one of the important, specific site characteristics was a UHS cooling tower. According to Mr. Araguas, because SNC has requested approval for a plant that does not rely on a UHS cooling tower, this characteristic was not evaluated. With COL Action item 2.3-1, however, in the event there is a different plant design at the COL stage, SNC would be required to evaluate the UHS cooling tower site characteristic. See Tr. at M-2204 to -2205. Moreover, when questioned why this particular item was singled out as needed if a different plant design is later chosen at the COL stage given there could be a large number of items, in addition to the UHS cooling tower issue, that would change, Mr. Araguas indicated that the staff singled out this particular item because

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it reflected an omission of key site characteristic information that was unique to the AP1000 passive design and had not been evaluated at all for this site. In contrast, the other information that would change for a different plant design would require an update of information that has already been evaluated. See Tr. at M-2205 to -2208.

4.267 Mr. Araguas then described COL Action item 2.4-1, which he characterized as rather straightforward. According to Mr. Araguas, this item involves confirmation that no chelating agents will be comingled in the radioactive waste liquids or used to mitigate an accidental release. If such agents were to be comingled and/or so used, then they would have to be specifically accounted for in the dose analyses provided for under 10 C.F.R. Part 20, app. B, tbl. 2. See Tr. at M-2208; Staff COL Deferral Presentation at 7.

4.268 Finally, with regard to COL Action item 13.6-1, Mr. Araguas indicated this provision requires that, because it was not specifically addressed in the Vogtle ESP application, in the context of the Vogtle COL application SNC must provide specific access control measures to address the existing rail spur that enters the VEGP site controlled area. According to Mr. Araguas, specific security plan access control measures are not required for review at the ESP stage, so that the railroad spur can be addressed at the COL stage. See Tr. at M-2208.

v. Board Findings Regarding COL Deferrals

4.269 The Board finds that the deferral of the analysis of the radioactive waste management system noted in the ESP FEIS is acceptable given that (1) it was only intended to indicate that the final design information might change at the COL stage, which could in turn constitute new and significant information for the COL environmental review; and (2) the analysis of that system had, in fact, been conducted by the staff and the impacts resulting from liquid and gaseous effluent releases were determined as required in the FEIS. The Board notes that such design changes may be associated with DCD revisions currently under staff review

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and only recently formally adopted by SNC in its COL application, see supra n.31, while the SNC ESP application remains based on DCD revision 15.

4.270 The Board concurs that the analysis of the effects of a hydrazine spill on control room habitability cannot be completed until the COL stage when the required design information needed to perform this analysis becomes available. Likewise, the Board concurs that the analysis of impacts on control room habitability from chemicals used for the proposed plants cannot be completed until the COL stage.

4.271 The Board concurs that the UHS cooling tower site characteristic was not evaluated at the ESP stage because of the reference to the AP1000 reactor design, and that this would have to be evaluated in the event that another reactor design were chosen at the COL stage.

4.272 The Board concurs that if chelating agents were to be comingled in the radioactive waste liquids or used to mitigate an accidental release, then they have to be specifically accounted for in the dose analyses under 10 C.F.R. Part 20, app. B, tbl. 2.

4.273 The Board concurs that the access control measures to address the existing rail spur that enters the VEGP site controlled area are an item properly addressed at the COL stage.

4.274 The Board finds that no safety or environmental review required for the ESP or LWA was deferred to the COL stage and that all requirements applicable to the ESP and LWA have been met, subject to permit conditions and ITAAC.

b. Permit Conditions

i. Introduction

4.275 Appendix A of the FSER for the Vogtle ESP application includes a list of nine permit conditions proposed by the staff. See FSER at A-2 to A-3. Permit Condition 1

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addresses excavation and replacement of soil under Seismic Category 1 structures at the site. See id. at A-2. Permit conditions 2 through 8 relate to the site emergency plan, with permit conditions 2 through 7 addressing EALs and permit condition 8 addressing the location of the TSC. See id. at A-2 to A-3. Permit Condition 9 requires the COL applicant to demonstrate either that the site-specific Chi/Q values from the ESP fall within those approved in a referenced certified design or, if no certified design is referenced, that the values in the final design are bounded by the ESP values. See id. at A-3.

ii. Witnesses and Evidence Presented

4.276 As was noted above, see supra section IV.A.9, the staff provided one witness to discuss the matter of ESP permit conditions, in conjunction with a prefiled slide presentation that was admitted as an exhibit. See Tr. at M-2209 to -2217; Exh. NRC000068 (NRC Staff Presentation Topic #10, Proposed Permit Conditions) [hereinafter Staff Permit Conditions Presentation].

iii. Regulations and Guidelines Relating to Permit Conditions

4.277 The concept of attached permit conditions to an ESP arises from 10 C.F.R. § 52.24(b), which states

The [ESP] must specify the . . . terms and conditions of the [ESP] the Commission deems appropriate. Before issuance of either a construction permit or combined license referencing an [ESP], the Commission shall find that any relevant terms and conditions of the [ESP] have been met. Any terms or conditions of the [ESP] that could not be met by the time of issuance of the construction permit or combined license, must be set forth as terms or conditions of the construction permit or combined license.

10 C.F.R. § 52.24(b). Thus, any permit conditions imposed that are not met before a COL referencing the ESP is issued will attach to the COL.

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iv. Evidentiary Presentation

4.278 Staff witness Mr. Araguas began by defining a permit condition according to the terms of 10 C.F.R. § 52.24(b) and explained that “[a] permit condition is not needed when an existing NRC regulation requires a future regulatory review of a matter to ensure adequate safety during [] design[,] construction[,] or inspection activities for a new plant.” Tr. at M-2210; see also Staff Permit Conditions Presentation at 3. Mr. Araguas then provided examples of three instances in which a permit condition should be used: (1) when there is an unsupported assumption that can only be supported after ESP issuance; (2) when there is an important site attribute that is unacceptable and must be corrected during plant construction; and (3) when there is a future act upon which the staff evaluation depends. See Tr. at M-2210 to -2211; Staff Permit Conditions Presentation at 4.

4.279 Relative to the Vogtle ESP, Mr. Araguas indicated that a total of nine permit conditions have been identified. See Tr. at M-2211. Seven of those conditions are associated with emergency planning and have been discussed above relative to that topic. See supra section IV.A.6. The remaining two permit conditions are discussed below.

4.280 The first of these, PC-1, requires that “[t]he ESP holder shall either remove and replace, or shall improve, the soils directly above the Blue Bluff Marl for soils under or adjacent to Seismic Category 1 structures, to eliminate any liquefaction potential.” Staff Permit Conditions Presentation at 5; FSER at A-2; see also Tr. at M-2211. Mr. Araguas explained that the ESP application indicated that portions of the soil above the Blue Bluff marl are susceptible to liquefaction during a seismic event and that the applicant stated that it would need to remove the soil directly above the Blue Bluff marl to meet a proposed site characteristic of no liquefaction potential at the VEGP site. The staff, therefore, proposed PC-1 “to ensure this future act occurs.” Tr. at M-2211 to -2212; Staff Permit Conditions Presentation at 5. For its

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part, the Board asked a series of questions regarding the difference between accomplishing this result using a permit condition as opposed to an ITAAC given this permit condition is associated in a limited way with plant construction. Mr. Araguas pointed out that this was excavation-related work involving removal of the soil followed by replacing that soil with a material that eliminates the potential for liquefaction. As such, it does not relate to any specific safety criteria, which are what are covered under the ITAAC for backfill placement. See Tr. at M-2212 to -2214.

4.281 The other non-emergency planning-related permit condition referenced by Mr. Araguas, PC-9, reads as follows:

If a COL or CP application referencing this ESP also references a certified design, the COL or CP applicant may demonstrate compliance with the radiological consequence evaluation factors in 10 CFR 52.79(a)(1) or 10 CFR 50.34(a)(1), respectively, by demonstrating that the site-specific [Chi]/Q values determined in the ESP fall within those evaluated in the approval of the referenced certified design. However, if a COL or CP referencing this ESP does not reference a certified design, the applicant would still need to demonstrate that its source term is bounded by the source term values included in the ESP.

FSER at A-3; see also Tr. at M-2214; Staff Permit Conditions Presentation at 10. The Board questioned the need for this permit condition given that it appeared to be already satisfied by the Vogtle COL application, which references the AP1000 certified design, and the fact that the ESP analysis has already demonstrated that the site Chi/Q is bounded by that certified design. See Tr. at M-2215. Mr. Araguas stated that the ESP is a stand-alone permit that does not depend on the existence of a COL application that specifies a certified design for the proposed facilities. See Tr. at M-2216. As a consequence, if applicant SNC chooses at a later time to reference another certified design, or to proceed with a custom design, then this permit condition would be applicable and would have to be satisfied. See Tr. at M-2215. In addition, Mr. Araguas testified that the intent of this permit condition was to incorporate the accident

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source term as part of the ESP and to clarify that the COL applicant would have to show that it is bounding unless the COL application references a certified design. See Tr. at M-2215 to -2216. Mr. Araguas agreed, however, that, given the current Vogtle situation with an ESP application and a COL application that both refer to the AP1000 certified design and are being reviewed simultaneously, this permit condition has been met. See Tr. at M-2216.

v. Board Findings Regarding Permit Conditions

4.282 The Board finds that the non-emergency plan-related ESP permit conditions are appropriate and notes that PC-9 is already being met, at least so long as the Vogtle COL application continues to reference the AP1000 certified reactor design.

c. AP1000 Design Certification Revisions

i. Introduction

4.283 Because the Vogtle ESP application references revision 15 of the AP1000 DCD, the FSER and FEIS also primarily reference revision 15. See, e.g., FSER at 2-344; FEIS 1A, at 3-1. Since SNC filed the initial Vogtle ESP application, however, Westinghouse Electric Company has submitted two proposed amendments, revisions 16 and 17, to the AP1000 DCD. See Westinghouse Electric Co. LLC, AP1000 Design Control Document (rev. 16 May 2007) (ADAMS Accession No. ML071580939); Westinghouse Electric Co. LLC, AP1000 Design Control Document (rev. 17 Sept. 2008) (ADAMS Accession No. ML083230868). As a consequence, the Board requested a presentation at the mandatory hearing on the effects, if any, of revisions 16 and 17 on SNC's ESP application. See Dec. 31, 2008 Order at 1-2.

ii. Witnesses and Evidence Presented

4.284 As was noted above, see supra section IV.A.9, the staff provided three witnesses to discuss the matter of AP1000 design certification revisions, in conjunction with a prefiled slide presentation that was admitted as an exhibit. See Tr. at M-2273 to -2397; Exh. NRC000069

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(NRC Staff Presentation Topic #11, AP1000 Design Certification Revisions) [hereinafter Staff AP1000 Revisions Presentation].

iii. Regulations and Guidelines Relating to Revisions to Referenced Certified Design

4.285 An ESP is an approval for a nuclear plant site, see 10 C.F.R. § 52.1, and specifies design parameters for the site, see 10 C.F.R. § 52.24(b). The ER for an ESP application may evaluate the environmental impacts of a reactor or reactors falling “within the site characteristics and design parameters for the [ESP] application.” 10 C.F.R. § 51.50(b)(2). At the COL stage, an applicant may reference both an ESP and a standard design certification in its application. See 10 C.F.R. § 52.73(a). If the application references an ESP, the applicant must demonstrate that the chosen design (e.g., the certified design) falls within the parameters specified in the ESP or, on the safety side, request a variance. See 10 C.F.R. §§ 51.50(c)(1)(i), 52.79(b)(1)-(2).

4.286 Additionally, an LWA applicant must submit, as part of the safety analysis report for the LWA, design information related to activities within the scope of the requested LWA. See 10 C.F.R. § 50.10(d)(3)(i).

iv. Evidentiary Presentation

(1) Safety Review

4.287 Staff witness Mr. Araguas began by noting that the Vogtle ESP SSAR (and all of its revisions), the SAR associated with the LWA request, and the staff’s FSER for the ESP and the LWA all were based upon revision 15 of the AP1000 DCD. See Tr. at M-2376 to -2377. He then noted that the staff safety evaluation at the ESP stage “rel[ies] on a very limited set of design information,” id. at M-2377, and clarified that, when the NRC issues an ESP that references a certified design, it does not mean that there is NRC approval of the site for that

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specific design. See id. Rather, according to Mr. Araguas, such approval is associated with the review that is done at the COL stage. See id.

4.288 With respect to the LWA, Mr. Araguas indicated that an applicant must submit the design and construction information relating to the LWA activities:

Since design information is required in an LWA to support the requested activities, an applicant must either incorporate by reference a certified design or furnish design details for review under an LWA. Granting of the LWA by the NRC approves the requested activities under the LWA as well as that specific design information that were within the scope of those LWA activities.

Tr. at M-2377 to -2378. In this instance, SNC has incorporated by reference the applicable portions of the AP1000 DCD revision 15 relative to the Vogtle LWA request. See Staff AP1000 Revisions Presentation at 5; see also Tr. at M-2376 to -2377.

4.289 With this background, Mr. Araguas then addressed the differences between revisions 15 and 16 of the AP1000 DCD relative to the evaluation of the ESP application. Of note in this regard, according to Mr. Araguas, was that the accident source term proposed in revision 16 of the AP1000 DCD has changed from revision 15. See Tr. at M-2378; Staff AP1000 Revisions Presentation at 6. Nonetheless, because SNC referenced DCD revision 15, design changes associated with any subsequent revisions were not considered in the staff's safety review. See Tr. at M-2378; Staff AP1000 Revisions Presentation at 6. The staff thus proposes to include the revision 15 accident source term as a set of bounding parameters in the ESP such that any differences between the COL and ESP source terms would need to be reviewed and resolved at the COL stage. See Tr. at M-2378 to -2379; Staff AP1000 Revisions Presentation at 6.

4.290 Relative to the LWA, Mr. Araguas testified that only a major change in the footprint of the nuclear island base mat would affect the basis for the LWA approval, while moderate changes in the structural design would not invalidate the basis for the LWA approval.

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He also noted that, if there are incompatibilities between the design information approved in the LWA and design information submitted in the COL application, they likewise would need to be reviewed at the COL stage. Any activities performed under an LWA are thus at the risk of the applicant because the COL or CP may not be approved by the agency or the design adopted may be incompatible with the LWA construction. See Tr. at M-2379; Staff AP1000 Revisions Presentation at 7.

4.291 The Board inquired about revision 17 and any subsequent revisions to the AP1000 design that might arise. See Tr. at M-2379 to -2381. Initially, the Board asked whether, if SNC adopts revision 17, the staff would then begin an active review of that revision relative to the COL application. Mr. Araguas indicated that it was his understanding that adoption of revision 17 by SNC would result in such a review by the staff. See Tr. at M-2379. He also affirmed the Board's understanding that no COL would be issued for proposed Vogtle Units 3 and 4 until SNC either adopted all of the current DCD revisions in its COL application or, if it chose not to incorporate the latest revisions, underwent an agency review process in which any design differences between the COL design and the DCD revisions were treated as custom design elements. See Tr. at M-2380 to -2381.

4.292 Finally, in response to a Board inquiry as to why there was no COL action item associated with the transition between the dose analyses in the ESP and the COL, Mr. Araguas indicated that one of the ESP permit conditions (i.e., PC-9) covers that issue. See Tr. at M-2390 to -2391. He also indicated that at the COL stage, the staff will issue an entirely new FSER, not just a supplement.³² See Tr. at M-2393.

³² Indeed, as staff counsel Patrick Moulding pointed out at the hearing, see Tr. at M-2393 to -2394, for a COL application referencing an ESP, 10 C.F.R. § 52.79(b) requires that the application include a safety analysis report that "either include[s] or incorporate[s] by reference the [ESP] site safety analysis report" and that contains additional information and analyses "sufficient to demonstrate that the design of the facility falls within the site characteristics and
(continued...)"

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(2) Environmental Review

4.293 Staff witness Mr. Notich indicated in connection with the environmental review process that the original ER submitted with the Vogtle ESP application (i.e., revision 0) referenced revision 15 of the AP1000 DCD, as did ER revisions 1 and 2. Consequently, the staff FEIS likewise is based on revision 15 of the DCD. See Tr. at M-2381; Staff AP1000 Revisions Presentation at 9. Moreover, certain revision 15 design characteristics were used for the staff's environmental impacts analysis. These included characteristics associated with the plant and its facilities, the reactor fuel, normal and accidental radioactivity releases, plant water use, and cooling system characteristics. See Staff AP1000 Revisions Presentation at 10; FEIS 1C, at I-1 to I-9 (app. I).

4.294 Thereafter, according to Mr. Notich, in a letter dated December 26, 2007, SNC submitted comments on the DEIS that contained new information based on DCD revision 16, which was then under staff consideration as part of the separate DCD review process. This new information related to the circulating water system, final effluent discharge, auxiliary emissions, additional diesel generators, fuel irradiation levels, and service water system usage. See Tr. at M-2382 to -2383; Staff AP1000 Revisions Presentation at 11-12. Mr. Notich testified that, based on this new information, the staff revised certain sections of the FEIS, including section 3.2, Plant Description; section 5.2, Meteorological and Air-Quality Impacts; section 5.3, Water-Related Impacts; section 5.4, Ecological Impacts; section 6.2, Transportation Impacts; section 7.3, Water Use and Quality; and section 7.5, Aquatic Ecosystem. See Tr. at M-2382. Mr. Notich also testified that, from the analysis of the new information provided by SNC, the staff concluded that the changes between AP1000 DCD revisions 15 and 16 would not affect the impact conclusions stated in the FEIS. The design parameter values used in the COL

³²(...continued)
design parameters specified in the [ESP]." See 10 C.F.R. § 52.79(b)(1).

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application would, however, be considered new and potentially significant information and would be reviewed by the staff at the COL stage. See Tr. at M-2383; Staff AP1000 Revisions Presentation at 13. In this regard, Mr. Notich noted, changes associated with AP1000 DCD revision 17 would also be considered as part of the staff's review of the COL application. See Tr. at M-2383 to -2384.

4.295 With this explanation in mind, the Board questioned the staff witnesses regarding the process that would be used to transition between the ESP, referencing AP1000 DCD revision 15, and the COL, if it references a subsequent revision. In response, staff witness Mr. Ramsdell indicated that, at the COL stage, the staff would issue a new EIS addressing any new information, determining whether the new information is significant, and if it is significant, performing a detailed analysis based on the new information. See Tr. at M-2385 to -2386. By way of clarification, staff counsel Patrick Moulding indicated that the applicant would be responsible for identifying new and significant information and that the COL-stage EIS would not be a new EIS, but a supplement to the ESP FEIS discussing only new and significant information. See Tr. at M-2386 to -2387. According to Mr. Notich, the supplemental EIS would be issued first in draft form for public comment and then in final form after incorporating changes from the comment period. See Tr. at M-2388. Moreover, the draft and final supplemental EIS would be issued even if the staff concluded that there was no new and significant information, and the public would have an opportunity to comment on this conclusion. See Tr. at M-2389.

v. Board Findings Regarding AP1000 Design Certification Revisions

4.296 With respect to safety considerations, the Board finds that the inclusion of the AP1000 DCD revision 15 accident source term as a set of bounding parameters in the ESP is appropriate because any differences between the COL and ESP source terms would need to be

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reviewed and resolved at the COL stage. The Board notes that the COL cannot be issued based upon revision 15 of the DCD and must be either updated to reference the final DCD as revised, or incorporate the deviations from the DCD revisions as custom design features.

4.297 The Board finds that, to the degree there are incompatibilities between the design information approved in the LWA and design information submitted in the COL application, those deviations would need to be reviewed at the COL stage, leaving any construction activities performed under an LWA a source of risk for applicant SNC if the design is later found to be incompatible with the LWA construction.

4.298 The Board notes that a new FSER will be issued at the COL stage that will either incorporate or reference the ESP FSER and contain all of the additional safety considerations evaluated for the COL.

4.299 From the environmental perspective, the Board finds that issuance of the ESP based upon AP1000 DCD revision 15 is acceptable because applicant SNC would be responsible for identifying new and significant information at the COL stage, including changes between AP1000 DCD revision 15 and the DCD revision SNC ultimately adopts in the COL application at the COL stage. Further, the Board notes that the COL EIS would not be a new EIS, but a supplement to the ESP FEIS discussing only the new and significant information.

d. Inspections, Tests, Analyses, and Acceptance Criteria

i. Introduction

4.300 During the course of the hearing, the Board requested a briefing on the subject of the ITAAC associated with the Vogtle ESP application. The Board was interested in better understanding the ESP ITAAC, their relationship to the COL ITAAC, and the overall manner in which the ESP ITAAC would be handled by the staff in this licensing proceeding. See Tr. at M-1910 to -1911. This was especially so given the current schedule overlap between the

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ESP and COL applications, and the fact that the Vogtle ESP is the first ESP application to include a complete and integrated emergency plan that, as discussed in section IV.A.6.d supra, includes ITAAC. Appendix section A.5 of the FSER contains the ITAAC, in table format, for the ESP and LWA. See FSER at A-32 to -56.

ii. Witness and Evidence Presented

4.301 As was noted above, see supra section IV.A.9, the staff provided one witness to discuss the matter of ITAAC. See Tr. at M-2120 to M-2127.

iii. Regulations and Guidance Related to ITAAC

4.302 To grant an ESP, the Commission must find that “[t]he proposed [ITAAC], including any on emergency planning, are necessary and sufficient, within the scope of the [ESP], to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the license, the provisions of the Act, and the Commission’s regulations.” 10 C.F.R. § 52.24(a)(5). As discussed above, an applicant has the option of submitting a complete and integrated emergency plan under section 52.17(b)(2)(ii), but if the applicant chooses to do so, it must include in the ESP application the proposed inspections, tests, and analyses that will be performed, and the acceptance criteria that are “necessary and sufficient” for the Commission’s required findings for issuance of the ESP. See id. § 52.17(b)(3). In addition, the Commission will review any proposed ITAAC relative to a request for an LWA submitted with an ESP application. See FSER at A-32; see also 10 C.F.R. § 50.10(d)(3).

4.303 At the COL stage, a COL application likewise must include, among other things, the “proposed inspections, tests and analyses, including those applicable to emergency planning,” to be performed and “the acceptance criteria that are necessary and sufficient” to support the Commission’s finding that a COL can be granted. See 10 C.F.R. § 52.80(a). If a

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COL application "references an early site permit with ITAAC or a standard design certification or both, the application may include a notification that a required inspection, test, or analysis in the ITAAC has been successfully completed and that the corresponding acceptance criterion has been met." Id. § 52.80(a)(3). If the applicant makes this notification, which is essentially a request for a Commission finding on the completion of ITAAC needed for issuance of a COL, the Commission is required to identify these ITAAC in the notice of hearing published in the Federal Register for the COL proceeding. See id. §§ 52.80(a)(3), 52.85.

4.304 If the Commission finds that these ESP or design certification ITAAC have been met, "[t]his finding will finally resolve that those acceptance criteria have been met, those acceptance criteria will be deemed to be excluded from the combined license, and findings under § 52.103(g) [(i.e., findings required before operation of the facility)] with respect to those acceptance criteria are unnecessary." Id. § 52.97(a)(2). Upon issuance of a COL, the Commission also must identify any ITAAC that have not yet been met. See id. § 52.97(b). Thereafter, but no later than "1 year after issuance of the [COL] or at the start of construction as defined in 10 CFR 50.10(a), whichever is later" the COL licensee must submit "its schedule for completing the inspections, tests, or analyses in the ITAAC." Id. § 52.99(a). The licensee must provide schedule updates as outlined in section 52.99(a), with appropriate notifications of completed ITAAC as required by section 52.99(c) and with the NRC reviewing the licensee's ITAAC submissions to "ensure that the prescribed inspections, tests, and analyses in the ITAAC are performed." Id. § 52.99(e). Prior to operation under a COL, a notice of intended operation will be published in the Federal Register "[n]ot less than 180 days before the date scheduled for initial loading of fuel." Id. § 52.103(a). An opportunity for hearing will be provided in this notice regarding certain matters, one of which is ITAAC that have not been found to have been met under section 52.97(a)(2) prior to issuance of the COL. See id. § 52.103(a), (b). To this end,

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"[a]t appropriate intervals" during the time between issuance of a COL and "the last date for submission of requests for hearing under 52.103(a), the NRC shall publish notices in the Federal Register of the NRC staff's determination of the successful completion of inspections, tests, and analyses." Id. § 52.99(e)(1). Additionally, the NRC is required to make publicly available any notifications from the COL licensee indicating that the licensee believes certain ITAAC have been met as well as any notifications that any uncompleted ITAAC will be met prior to operation. See id. § 52.99(e)(2).

4.305 Guidance relevant to the development and review of proposed ITAAC is provided in NUREG-0800. Section 14.3 of NUREG-0800 explains that, for an ESP, the staff review of proposed ITAAC is focused on any that are provided with the site emergency plan. See NUREG-0800, at 14.3-3 n.1, 14.3-4 (Mar. 2007). NUREG-0800 explains that the staff reviewer should use section 14.3.10 to perform the review of the ESP site emergency plan ITAAC, which contains a table of generic ITAAC that can be used. See id. at 14.3-7, 14.3.10-2, 14.3.10-11 to -12 (tbl. 14.3.10-1). Section 14.3.10 also references the generic ITAAC table in Regulatory Guide 1.206 that, notwithstanding its title relating to COL applications, provides additional guidance. See id. at 14.3.10-4 to -5; [NRR, NRC], Regulatory Guide 1.206, Combined License Applications for Nuclear Power Plants (LWR ed.), at C.II.1-B-2 to -13, tbl. C.II.1-B1 (June 2007), available at <http://www.nrc.gov/reading-rm/doc-collections/reg-guides/power-reactors/active/01-206/>.

iv. Evidentiary Presentation

4.306 Staff witness Mr. Araguas began his explanation regarding ITAAC by indicating that the ITAAC, including those associated with the ESP site emergency plan, are used to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the COL and the provisions of the Commission's rules and regulations. In other

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words, they will verify that an as-built facility conforms to the approved plant design and applicable regulations. If SNC demonstrates that the ESP and COL ITAAC are met, and the NRC agrees that they are successfully met, then Plant Vogtle would be permitted to load fuel. See Tr. at M-2120 to -2121.

4.307 Mr. Araguas also explained that ITAAC are usually documented in a table with a three-column format (although the ITAAC for the site emergency plan have four columns). The first column contains the specific design commitments. The second column contains the inspections, tests, analyses, or combination of the three methods to be used by the licensee to demonstrate that the design commitments have been met. The third column contains the acceptance criteria for the methods described in column two that, if met, demonstrate that the commitments in the first column have been met. See Tr. at M-2121 to -2122. The ESP application for Vogtle includes ITAAC associated with emergency planning and LWA activities. The Board questioned how the ESP ITAAC would be integrated with the COL ITAAC. Mr. Araguas replied that the regulations allow the ESP ITAAC to be completed prior to the issuance of the COL, but if not completed, they will be carried forward and included with the COL ITAAC. See Tr. at M-2122 to -2123.

4.308 Consistent with the regulations described above, Mr. Araguas indicated that, for ESP ITAAC completed prior to the issuance of the COL, a notice of hearing would be issued delineating the ITAAC that were closed out. See Tr. at M-2123. In this regard, Mr. Araguas agreed with the observations by Mr. Blanton, SNC counsel, that, as set forth in 10 C.F.R. § 52.103(a) relative to the time period after the issuance of the COL:

[T]he way it would work is whatever ITAAC are imposed in the ESP will be incorporated by reference in the COL. Those ITAAC will be satisfied at whatever point in the construction process they are satisfied. The COL would state what the ITAAC are, both from the ESP and the COL and the DCD. Then before fuel load which will be after the issuance of the COL, that we would provide notice

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that the ITAAC had been satisfied or about to be satisfied and at that point you'd have a potential notice of opportunity for hearing on whether or not the ITAAC had been satisfied.

Tr. at M-2125. In addition, staff witness Mr. Araguas cited section 52.80(a)(3) as affording the potential for another notice of hearing that would be put forth prior to issuance of the COL regarding any ITAAC that have been closed out at that point. See Tr. at M-2125 to -2126. And in this regard, Mr. Moulding, as counsel for the staff, clarified that section 52.80(a)(3) indicates that "if the application references an [ESP] with ITAAC or a standard design certification or both, the application may include a notification that a required inspection test or analysis in the ITAAC has been successfully completed and that the corresponding acceptance criterion has been met." Tr. at M-2126. In that event, according to Mr. Moulding, "the Federal Register notification required by 52.85 must indicate that the application includes this notification. So that's just indicating if there are ITAAC and the Applicant believes that that's been met, that would be indicated in the COL application." Tr. at M-2126 to -2127.

4.309 The Board noted in its discussion with the staff that because for Vogtle Units 3 and 4 there is an existing COL application in conjunction with an ESP application for which ITAAC have not been completed, the COL application does not include such a notification. The Board assumed, however, that there are ITAAC, in particular those associated with LWA activities such as backfill and waterproof membrane installation, that seemingly would have to be closed out while the COL review is in process. Mr. Araguas did not disagree, but did not know when SNC would submit a notice indicating that a particular ITAAC, including LWA-related ITAAC, has been completed. It nonetheless was clear from the discussion that, at some point, SNC would have to notify the staff in some manner that ITAAC, including the LWA ITAAC, are

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complete. Whether that would be prior to issuance of a COL is not clear.³³ See Tr. at M-2127 to -2128.

v. Board Findings Related to ITAAC

4.310 The Board findings relative to the LWA ITAAC are discussed in section IV.A.6.e supra. The Board findings relative to the site emergency plan ITAAC are discussed in section IV.A.5.e supra. The Board findings required by 10 C.F.R. § 52.24(a)(5) relative to the proposed ITAAC are provided in section V.C infra. In this regard, the Board concurs with the staff that the proposed ESP and LWA ITAAC for Vogtle Units 3 and 4, when properly completed, will "provide reasonable assurance that the facility has been constructed and will be operated in conformity with the license, the provisions of the [AEA], and the Commission's regulations." 10 C.F.R. § 52.24(a)(5).

B. Additional Items

1. Environmental and Safety Topics Not Addressed at Hearing

4.311 Following the issuance of the staff's FEIS and ASER, in its orders providing presentation topics for the evidentiary hearing, the Board posed questions to the staff and applicant in a number of environmental and safety areas. See Licensing Board Environmental Questions, app. A; Licensing Board Safety Questions, app. A. These questions related to the

³³ A related matter concerns the lack of any delineated schedule in the licensing scheme for the staff's review of completed ITAAC, other than the logical requirement that review of all ITAAC must be complete upon NRC approval for operation beyond five percent power, see section IV.9.d.iii supra. In addition, it is unclear whether LWA ITAAC must be found to be met prior to issuance of any LWA under 10 C.F.R. § 50.10(e). Because of this, the Board is concerned that in a proceeding where, as here, there are LWA ITAAC, combined with the possibility that the staff seemingly could issue a COL without these ITAAC being found to be met, see 10 C.F.R. § 52.97(b), a COL licensee might begin construction prior to a staff determination on the LWA ITAAC. In the event that the staff determines that certain LWA ITAAC have not been met, this could mean that a COL licensee would have to undo any construction to correct deficiencies in those LWA activities, likely at considerable time and expense. Notwithstanding the warning in section 50.10(f) that "[a]ny activities undertaken under a limited work authorization are entirely at the risk of the applicant," the Commission might wish to provide clarification on this issue.

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presentation topics, as well as to other portions of the FEIS and ASER not encompassed by the presentation topics. Among the question areas not covered by the presentation topics were socioeconomic impacts, air quality impacts, construction costs, see Licensing Board Environmental Questions, app. A, at 2-3, 6, physical security, meteorology, and certain aspects of hydrology such as flood and freeze hazards, see Licensing Board Safety Questions, app. A, at 1-2. The Board finds that the staff's and applicant's written responses to the questions, see SNC Response to Environmental Questions at 3-24; Staff Response to Environmental Questions, attach. A, at 1-56; id., attach. C; SNC Response to Safety Questions at 2-4; Staff Response to Safety Questions, attach. A, at 1-62, adequately addressed the Board's concerns in those areas. Accordingly, we consider these issues resolved for this ESP proceeding.

4.312 Additionally, there are portions of the FEIS, such as those dealing with historical and cultural resources and environmental justice, and of the FSER, such as that dealing with SNC's quality assurance program, that the Board did not specifically inquire into in this proceeding. We found those portions to be sufficient on their face and therefore did not pursue them further. See Clinton ESP, CLI-06-20, 64 NRC at 21-22. We consider the issues addressed in those portions of the FEIS and FSER to be resolved in favor of issuance of the ESP and LWA.

2. Applicability of the Aircraft Impact Rule

4.313 In a March 6, 2009 memorandum and order, the Board requested that the parties discuss at the mandatory hearing the impacts of a then-proposed aircraft impacts rule on this ESP proceeding. See Licensing Board Memorandum and Order (Additional Matters Relating to Contested and Mandatory Hearings) (Mar. 6, 2009) at 5 (unpublished). At the hearing, staff counsel indicated that the aircraft rule in question had not yet been published but that it would not affect the issuance of an ESP or LWA for the Vogtle site. See Tr. at M-2396 to -2397.

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4.314 Subsequently, a final rule requiring consideration of aircraft impacts for new nuclear power reactor licenses was published on June 12, 2009. See Consideration of Aircraft Impacts for New Nuclear Power Reactors, 74 Fed. Reg. 28,112 (June 12, 2009). By its terms, the rule requires an aircraft impact assessment as part of certain construction permit, operating license, standard design certification and approval, combined license, and manufacturing license applications. See id. at 28,146. It does not, however, mention ESP or LWA applicants among those who must perform the aircraft impact assessment. Thus, the adequacy of any aircraft impact assessment concerning proposed Vogtle Units 3 and 4 is appropriately a topic of the COL proceeding and not this proceeding.

4.315 Accordingly, we find that the applicant and staff have satisfied their ESP and LWA-stage obligations with regard to the aircraft impact rule.

3. Additional Information in Satisfaction of 10 C.F.R. § 52.24

4.316 Finally, because this proceeding involves a notice of hearing issued before a subsequent change in the Commission's rules concerning issuance of ESPs, in a March 12, 2009 memorandum and order the Board requested that the parties address in their opening statements the relationship between the findings the Board had been directed to make in the Notice of Hearing and those required under 10 C.F.R. § 52.24. See Licensing Board Memorandum and Order (Additional Mandatory Hearing Matters) (Mar. 12, 2009) at 1-2 (unpublished). Both SNC and the staff addressed this topic at the hearing. See Tr. at M-1682 to -1685, M-1687 to -1689. Additionally, after the hearing, SNC filed a set of stipulations agreed to by the staff, as well as an affidavit of SNC's Licensing Manager, Charles Pierce, and accompanying documents, addressing SNC's compliance with certain portions of 10 C.F.R. § 52.24. See [SNC] Submittal of Affidavit Addressing Requirements Under 10 C.F.R. § 52.24 (Apr. 8, 2009) (identified as Exh. SNC000100, see Apr. 17, 2009 Order at 2). SNC and the staff

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stipulated that (1) SNC's ESP application meets the applicable standards and requirements of the AEA and the Commission's regulations; (2) required notifications to other agencies or bodies regarding the ESP application have been duly made; and (3) the applicant is technically qualified to engage in any activities authorized by the ESP and LWA. See id. at 1. In his affidavit, Mr. Pierce stated that (1) SNC, a subsidiary of Southern Company, holds operating licenses for three currently existing nuclear power plants; (2) SNC has a contract with Stone & Webster, Inc., a subsidiary of Shaw Construction and Westinghouse Electric Corporation, for construction activities, including those related to the LWA; (3) the ESP application for the Vogtle site was submitted to the NRC on August 15, 2006, and was determined to be complete and accepted for docketing on September 26, 2006; and (4) SNC has served copies of the application and/or notified all public officials required under NRC regulations to be served or notified. See Pierce Affidavit at 1. The affidavit was accompanied by Mr. Pierce's curriculum vitae, Part 1 (Administrative Information) of the Vogtle ESP application, Chapter 1 of the Vogtle ESP SSAR, the Federal Register notice announcing acceptance for docketing of the Vogtle ESP application, and an affidavit listing public officials served with copies of, or notified of, the availability of the Vogtle ESP application. See id. attachs. 1-5.

4.317 Based on the information contained in this submission, in addition to the Board's review of the evidence presented in the course of this proceeding, we find that SNC satisfies the requirements of 10 C.F.R. § 52.24(a)(1), (2), and (4) for issuance of an ESP and an accompanying LWA.

V. SUMMARY FINDINGS OF FACT AND CONCLUSIONS OF LAW

5.1 In accordance with the Commission's directives, see Clinton ESP, CLI-05-17, 62 NRC at 34, 39; Clinton ESP, CLI-06-20, 64 NRC at 21-22, the Board conducted an

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independent sufficiency review of the staff findings, and probed those staff findings by focusing in detail on the safety and environmental issues addressed by the staff and SNC in the mandatory hearing presentations. In this regard, as was noted in section IV.B.1 supra, to the extent the Board did not request a presentation or further information from either the staff or SNC on items that were the subject of a series of Board questions prior to the hearing, see Licensing Board Environmental Questions, app. A; Licensing Board Safety Questions, app. A, the Board was satisfied with the answers provided. Similarly, the Board was satisfied with the staff review of topics in the FSER and FEIS that were not the subject of either Board questions or presentations. With respect to each of the topics that were the subject of presentations (and which were described in detail in section IV.A above), the Board concludes that the staff review was sufficient and reasonably supported in logic and fact.

5.2 In accordance with the Commission's notices of hearing for this proceeding, see ESP Hearing Notice, 71 Fed. Reg. at 60,195; LWA Hearing Notice, 72 id. at 64,686; and 10 C.F.R. §§ 50.10(e), 52.24, the Board makes the following additional findings:

A. Safety Findings

5.3 Having reviewed the basis for the staff's central safety-related conclusions, the Board finds that the staff review is adequate to support a finding that the issuance of the Vogtle ESP will provide reasonable assurance of adequate protection to public health and safety and will not be inimical to the common defense and security or to the health and safety of the public (Safety Issues 1 and 5).

5.4 Further, the Board finds that the staff review is adequate to support the finding that, taking into consideration the site criteria contained in 10 C.F.R. Part 100, a reactor, or reactors, having characteristics that fall within the parameters for the site, can be constructed

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and operated without undue risk to the health and safety of the public, in accordance with the notices of hearing (Safety Issue 2).

5.5 Finally, the Board finds that, in accordance with 10 C.F.R. § 50.10(e)(iv), there are no unresolved safety issues relating to the activities to be conducted under the LWA that would constitute good cause for withholding the LWA. As such, the Board finds the LWA should be issued.

B. Environmental Findings

1. NEPA Baseline Issue 1

5.6 NEPA Baseline Issue 1 requires that the Board independently consider and decide whether the requirements of NEPA sections 102(2)(A), (C), and (E) and the Commission's NEPA regulations at 10 C.F.R. Part 51, Subpart A, have been met.

5.7 The information provided by SNC in its ER is adequate and acceptable under 10 C.F.R. Part 51, Subpart A, and NEPA. Moreover, as detailed in the FEIS, in accord with NEPA section 102(2)(A), 42 U.S.C. § 4332(2)(A), the staff's independent technical analysis of that information, as supplemented by the staff, utilizes a "systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment," and therefore comports with the NRC's requirements in Appendix A of 10 C.F.R. Part 51. Furthermore, the staff environmental findings in the FEIS constitute the "hard look" required by NEPA and have reasonable support in logic and fact.

5.8 The FEIS adequately addresses (1) the environmental impact of the proposed action; (2) any unavoidable adverse environmental effects; (3) alternatives to the proposed action; (4) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and (5) any irreversible and

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irretrievable commitments of resources which would be involved in the proposed action should it be implemented in accordance with NEPA section 102(2)(C)(i)-(v), 42 U.S.C.

§ 4332(2)(C)(i)-(v). The Board further concludes that the staff has satisfied the requirements of NEPA section 102(2)(C) by consulting with and obtaining comments from other federal agencies with jurisdiction by law or special expertise. See 42 U.S.C. § 4332(2)(C).

5.9 Consistent with NEPA section 102(2)(E), 42 U.S.C. § 4332(2)(E), the staff's FEIS shows that the staff adequately considered alternatives to recommended courses of action to the proposed action to the extent that it involves unresolved conflicts concerning alternative uses of available resources. Accordingly, the staff consideration of alternatives to the proposed action in the FEIS satisfies NEPA section 102(2)(E), 42 U.S.C. § 4332(2)(E).

5.10 Having reviewed the basis for the staff central environmental-related conclusions, the Board finds that the staff review is adequate under 10 C.F.R. Part 51, Subpart A. See 10 C.F.R. 51.105(a)(4). Thus, all findings and analyses required by NEPA section 102(2)(A), (C), and (E), 42 U.S.C. § 4332(2)(A), (C), and (E), have been satisfied with respect to issuance of the ESP and LWA. See North Anna ESP, LBP-07-9, 65 NRC at 614.

2. NEPA Baseline Issue 2

5.11 NEPA Baseline Issue 2 requires the Board to consider independently the final balance among the conflicting factors contained in the record of the proceeding and to determine the appropriate action to be taken. In accordance with the notice of hearing, the Board has independently considered the final balance among the conflicting factors contained in the record of this proceeding, and concludes that, overall, the balance supports issuance of the ESP and LWA.

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3. NEPA Baseline Issue 3

5.12 Finally, NEPA Baseline Issue 3 requires the Board to determine, after considering reasonable alternatives, whether the ESP should be issued, denied, or appropriately conditioned to protect environmental values. In accordance with the notice of hearing, after reviewing the evidence presented by the parties to this proceeding and considering the reasonable alternatives, the Board concludes that the ESP and the LWA should be issued, and no conditions on such (beyond those already imposed by the staff) are necessary or appropriate to protect environmental values.

C. Section 50.10(e) and Section 52.24(a) Findings

5.13 The Board finds that the requirements of 10 C.F.R. §§ 50.10(e)(1)(iii) and 52.24(a)(1), (2), and (4) have been met, specifically that (1) the SNC ESP application, with which SNC also requests an LWA, meets the applicable standards and requirements of the AEA and the Commission's regulations (Safety Issue 3); (2) required notifications to other agencies or bodies regarding the application for the ESP have been duly made; and (3) applicant SNC is technically qualified to engage in any activities authorized by the ESP and LWA that are the subject of this proceeding (Safety Issue 4).

5.14 The staff review was sufficient to establish that there is reasonable assurance that the site is in conformity with the provisions of the AEA, and the Commission's regulations, as required by 10 C.F.R. § 52.24(a)(3).

5.15 The Board finds that, in accordance with 10 C.F.R. § 52.24(a)(5), the proposed ITAAC, including those on emergency planning, are necessary and sufficient and within the scope of the ESP, so as to provide reasonable assurance that Vogtle Units 3 and 4 will be constructed and operated in conformity with the ESP and the LWA, the AEA, and the Commission's regulations.

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5.16 The Board concludes based on the record of the proceeding that issuance of the ESP and LWA will not be inimical to the common defense and security or to the health and safety of the public, as required by 10 C.F.R. §§ 50.10(e)(1)(iii), 52.24(a)(6).

5.17 Per 10 C.F.R. § 52.24(a)(7) (and 10 C.F.R. § 51.105(c)(1)(iii)), the Board further concludes that any significant adverse environmental impact resulting from LWA activities can be redressed.

5.18 As required by 10 C.F.R. § 52.24(a)(8), and the notices of hearing, all findings required by Subpart A of 10 C.F.R. Part 51 have been made.

5.19 Finally, in accord with 10 C.F.R. § 52.24(b), the ESP should specify the site characteristics, design parameters, and terms and conditions that the Commission deems appropriate. See FSER, app. A. In addition, as required by 10 C.F.R. § 52.24(c), the ESP should specify the activities SNC is authorized to perform under 10 C.F.R. § 50.10.³⁴ See FEIS 1A, at 4-73 (citing SReP at 1-3).

6.1 Pursuant to 10 C.F.R. § 2.1210, it is this seventeenth day of August 2009, ORDERED, that:

A. The Director, NRR, or the Director, NRO, as appropriate, is authorized to issue to SNC an ESP for the VEGP Units 3 and 4 site for a duration of not less than ten (10) nor more than twenty (20) years, consistent with the AEA, the Commission's regulations, and this final partial initial decision.

³⁴ Understanding that the Director, NRR, or the Director, NRO, as appropriate, would issue the ESP and the LWA, the Board expects that this information would be included consistent with 10 C.F.R. § 52.24(b), (c).

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B. The Director, NRR, or the Director, NRO, as appropriate, is authorized to issue to SNC an LWA for the VEGP Units 3 and 4 site consistent with the AEA, Commission regulations, and this final partial initial decision.

C. Pursuant to 10 C.F.R. §§ 2.341(a), 2.1210(a), this partial initial decision will constitute a final decision of the Commission forty (40) days from the date of issuance (or the first agency business day following that date if it is a Saturday, Sunday, or federal holiday, see 10 C.F.R. § 2.306(a)), i.e., on Monday, September 28, 2009, unless a petition for review is filed in accordance with 10 C.F.R. §§ 2.341(b) and 2.1212, or the Commission directs otherwise. Any party wishing to file a petition for review on the grounds specified in 10 C.F.R. § 2.341(b)(4) must do so within fifteen (15) days after service of this partial initial decision. The filing of a petition for review is mandatory for a party to have exhausted its administrative remedies before seeking judicial review. Within ten (10) days after service of a petition for review, parties to the proceeding may file an answer supporting or opposing Commission review. Any petition for review and any answer shall conform to the requirements of 10 C.F.R. § 2.341(b)(2)-(3).

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing SECOND AND FINAL PARTIAL INITIAL DECISION (MANDATORY/UNCONTESTED PROCEEDING) (LBP-09-19) have been served upon the following persons by Electronic Information Exchange.

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Docket No. 52-011-ESP
SECOND AND FINAL PARTIAL INITIAL DECISION (MANDATORY/UNCONTESTED
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Docket No. 52-011-ESP
SECOND AND FINAL PARTIAL INITIAL DECISION (MANDATORY/UNCONTESTED
PROCEEDING) (LBP-09-19)

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[Original signed by Christine M. Pierpoint]
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Dated at Rockville, Maryland
this 17th day of August 2009