LBP-07-09

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

Alex S. Karlin, Chairman
Dr. Richard F. Cole
Dr. Thomas S. Elleman

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In the Matter of	Docket No. 52-008-ESP
DOMINION NUCLEAR NORTH ANNA, LLC	ASLBP No. 04-822-02-ESP
(Early Site Permit for North Anna ESP Site)	June 29, 2007

INITIAL DECISION

In the Matter of DOMINION NUCLEAR NORTH ANNA, LLC
(Early Site Permit for North Anna ESP Site)
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INITIAL DECISION

This initial decision sets forth this Board's findings, conclusions, and decisions on six issues that law and regulation mandate must be decided on this uncontested application by Dominion Nuclear North Anna, LLC (Dominion) for an early site permit (ESP). As described below, the Board determines that the NRC Staff's review of the application has been adequate, and the record of this proceeding sufficient, to support the Atomic Energy Act (AEA) safety-related findings necessary for issuance of the ESP. Further, a majority of the Board has independently determined that the relevant requirements of the National Environmental Policy Act (NEPA) and NRC's NEPA regulations have been satisfied and decide that the ESP should be issued, subject to the proposed permit conditions included in Staff Exhibit 17, and subject to the permit conditions, combined operating license (COL) action items, site characteristics, and plant parameter envelope values, representations, assumptions and unresolved issues specified in Appendices I and J to the Staff's Final Environmental Impact Statement, and Appendix A of the Final Safety Evaluation Report.

Pursuant to 10 C.F.R. § 2.340(f), this initial decision is not effective until the Commission completes its review and takes final agency action. See Exelon Generation Company, LLC (Early Site Permit for Clinton ESP), CLI-07-12, 65 NRC __, __ (slip op. at 2) (Mar. 8, 2007) (Clinton II).

I. INTRODUCTION

On September 25, 2003, Dominion filed an application with the Nuclear Regulatory Commission (NRC or Commission) for an ESP under 10 C.F.R. Part 52, Subpart A, seeking approval to locate additional nuclear power reactors, generating up to a total of 9,000 megawatts thermal (MWt), at a site near the shore of Lake Anna in Louisa County, Virginia (the proposed ESP Site).[1] The defining characteristic of the proposed ESP Site is that it is located wholly within the "North Anna Power Station" site (NAPS Site) where two nuclear power reactors already exist and have operated since 1980.[2]

The NAPS Site and the ESP Site are jointly owned by Virginia Electric and Power Company (VEPCO) and the Old Dominion Electric Cooperative (ODEC).[3] Dominion itself has no right, title, or ownership interest in the proposed ESP Site. Id. The two nuclear power plants currently located on the NAPS Site, denominated "Unit 1" and "Unit 2," are also owned by VEPCO and ODEC. Id.; FEIS at 2-1. VEPCO and Dominion are both wholly owned

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[1] NUREG-1811, Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna ESP Site Final Report (Dec. 2006) (Staff Exhibit 3) at 10-1 [FEIS].

[2] Rev. 9 to North Anna ESP Application at 1-1-1 (Sept. 2006) [Appl.].

[3] Dominion's Response to the Licensing Board's January 18, 2007 Order (Issuing Safety-Related Questions) (Feb. 8, 2007) at Question 2 [Dominion Answer to Safety Question]; see Dominion Exhibit 1 (same); North Anna ESP Safety Inquiries Staff Responses to Safety Questions (Feb. 8, 2007) at Question 2 [Staff Answer to Safety Question]; see Staff Exhibit 6 (same).

subsidiaries of Dominion Resources Inc. (DRI). Appl. at 1-1-1. ODEC is not owned by Dominion, VEPCO, or DRI.

Depending on Dominion's ultimate selection of reactor type (seven different reactor designs are being considered), the ESP application seeks approval to locate between two to sixteen additional reactors on the site, with Dominion dividing them into two "Units" (Units 3 and 4) of between one to eight reactors each."[4] Each of the proposed new "units" would be authorized to generate up to 4500 MWt. Appl. at 2-1-3.

An ESP is a special type of NRC permit. An ESP is categorized as a "partial construction permit" under 10 C.F.R. § 52.21. However, its issuance does not authorize an applicant to construct nuclear power reactors.[5] Instead, an ESP focuses on the suitability of a

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[4] For instance, if Dominion decides to use the International Reactor Innovative and Secure (IRIS) design, each Unit could have up to 3 reactors, for a total of 6 new reactors. If the Gas Turbine-Modular Helium Reactor (GT-MHR) is selected, each Unit could have up to 4 reactors for a total of 8 new ones. If Dominion selects the Pebble Bed Modular Reactor (PMBR) design, then each Unit could have up to 8 reactors, for a total of 16 new reactors. Likewise, if the Advanced CANDU Reactor (ACR) 700 design is selected, each Unit could have up to 2 reactors, for a total of 4 new reactors. The other reactor designs covered by the ESP application would each involve only one reactor per Unit. None of these figures include the two existing reactors on the NAPS Site. See Exhibit B: North Anna ESP Environmental Questions (Mar. 1, 2007) at Question 6 [Staff Answer to Environmental Question]; see Staff Exhibit 10 (same); Dominion Response to Environmental Questions (Mar. 1, 2007) at Question 6 [Dominion Answer to Environmental Question]; see Dominion Exhibit 3 (same) at 9-10; FEIS at 6-40 and 6-17.

In this regard, we note that Dominion has recently contracted with GE to obtain long-lead components for the ESBWR, see, e.g., Michael Blake, Dominion Contracts GE for Long-Lead Components, Nuclear News (June 2007) at 12, which implies that this is the likely reactor of choice if a commitment is made to a new plant. Dominion continues to emphasize that they have not yet made a decision on whether to build any new reactors at the North Anna site.

[5] An ESP holder may not actually commence construction of any reactors on the ESP site without having applied for and received a separate construction permit (CP) or combined operating license (COL) from the NRC. See, e.g., 10 C.F.R. § 52.3. However, if the applicant includes a satisfactory site redress plan, an ESP holder may conduct certain site preparation activities under a "limited work authorization" granted under 10 C.F.R. § 50.10(e). See 10 C.F.R. § 52.25. Dominion's ESP application includes a site redress plan and a request for a limited work authorization. See Appl. at 4-1-1.

proposed site, and is defined as a "Commission approval . . . for a site or sites for one or more nuclear power facilities." 10 C.F.R. § 52.3(b). Even if the ESP is granted, an additional application must be submitted and approved before construction of any new reactors can commence.

II. PROCEDURAL BACKGROUND

On November 25, 2003, the NRC published a notice of hearing and opportunity for petition for leave to intervene regarding Dominion's ESP application. 68 Fed. Reg. 67,489 (Dec. 2, 2003). It was a "notice of hearing" rather than a "notice of opportunity to request a hearing" because the Atomic Energy Act (AEA) Section 189a, 42 U.S.C. § 2239(a), states that "[t]he Commission shall hold a hearing . . . on each application . . . for a construction permit for a facility," regardless of whether any person requests a hearing. In this case, the adjudicatory proceeding started as a contested proceeding, and later changed into an uncontested one.

A. Contested Proceeding

In response to the notice of hearing, the Blue Ridge Environmental Defense League, the Nuclear Information and Resource Service, and Public Citizen (collectively, Intervenors), jointly filed a timely petition to intervene.[6] The Board, as originally constituted, [7] concluded that the Intervenors had standing and admitted two of their contentions. LBP-04-18, 60 NRC 253, 270-72, 276 (2004).

The two admitted contentions have now been resolved. Contention 3.3.4, "Failure To Provide Adequate Consideration of the No-Action Alternative," was settled and dismissed by

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[6] Hearing Request and Petition to Intervene by [Intervenors] (Jan. 2, 2004).

[7] As originally constituted, the Board consisted of Judges G. Paul Bollwerk, III, Anthony J. Baratta, and Paul B. Abramson, 69 Fed. Reg. 15,910 (Mar. 26, 2004). The Board was later reconstituted with its current members. 69 Fed. Reg. 49,916 (Aug. 12, 2004).

mutual agreement of the parties in early 2005.[8] Contention 3.3.2, "Impacts on Striped Bass in Lake Anna," was resolved by summary disposition and dismissed because, subsequent to the admission of this contention, Dominion amended its application and substantially reduced the release of the heated water that, according to Contention 3.3.2, would have caused the problematic impacts on the striped bass. LBP-06-24, 64 NRC 360 (2006); see infra note 9. A full description of the resolution of the contested portion of this proceeding is found in our earlier decision, and need not be repeated here.

B. Uncontested Proceeding

With the Board's dismissal of Contention 3.3.2, the North Anna ESP adjudication became an uncontested proceeding subject to the mandatory hearing requirements of AEA §189a(1)(A) and 10 C.F.R. § 52.21. However, even an uncontested, mandatory hearing cannot be held until after the NRC Staff completes its environmental and safety reviews of the application. See 10 C.F.R. § 2.332(d). In this case, Dominion caused a significant delay in this proceeding by substantially amending its ESP application after the adjudicatory proceeding had begun.[9] This, in turn, required the NRC Staff to redo a significant amount of its work. As a consequence, the NRC Staff did not issue its final supplemental Safety Evaluation Report on Dominion's ESP application until November 2006,[10] and did not issue its FEIS until December

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[8] Licensing Board Order (Approving Settlement and Dismissal of Contention EC 3.3.4) (Jan. 6, 2005) (unpublished).

[9] Specifically, on January 13, 2006, Dominion submitted a supplement to its application, proposing to change the cooling system in Unit 3 to a closed-cycle cooling system (using a combined wet/dry cooling tower), and to increase the power level of each proposed unit (Units 3 and 4) from 4300 MWt to 4500 MWt. See Supplement 1, Safety Evaluation Report for an Early Site Permit (ESP) at the North Anna ESP Site Final Report (Sept. 2006) at 1-2.

[10] NUREG-1835, Safety Evaluation Report for an Early Site Permit (ESP) at the North Anna ESP Site Final Report (Nov. 2006) (Staff Exhibit 1) [FSER].

2006.[11] At that point, the Board was able to move forward with the uncontested evidentiary hearing.

On December 14, 2006, the Board held a prehearing conference with the parties for the purpose of expediting the hearing and enabling it to address and resolve the six fundamental issues that must be decided in an uncontested ESP proceeding. Tr. at 484-85. A list of the six fundamental questions is attached hereto as Appendix A. On January 4, 2007, the Board issued its second revised scheduling order (SRSO), setting forth a schedule and certain instructions for the uncontested portion of the proceeding.[12]

Pursuant to the SRSO, the following actions took place: On January 18, 2007, after reviewing Dominion's application and the SER, the Board issued over one hundred written questions relating primarily to safety matters.[13] Both parties filed answers to those questions on February 8, 2007.[14] On February 7, 2007, after reviewing the application and the FEIS, the

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[11] Notice of Availability of [FEIS] for an [ESP] at the North Anna ESP Site, 71 Fed. Reg. 76,705 (Dec. 21, 2006).

[12] Licensing Board Order (Second Revised Scheduling Order) (Jan. 4, 2007) (unpublished).

[13] Licensing Board Order (Issuing Safety-Related Questions) (Jan. 18, 2007) (unpublished) [Board Safety Questions].

[14] Dominion Answer to Safety Question; NRC Staff Legal Brief in Response to Licensing Board's Safety-Related Questions (Feb. 8, 2007) [NRC Staff Legal Safety Brief]; Staff Answer to Safety Question; [Multiple Affidavits] Concerning NRC Staff Response to the Licensing Board's Safety-Related Questions (Feb. 8, 2007), ADAMS Accession No. ML070400293. Dominion filed its supporting affidavits at a later date. See Dominion's Declarations Supporting Response to the Licensing Board's January 18, 2007 Order (Issuing Safety-Related Questions) (Feb. 26, 2007).

Board issued over one hundred written questions primarily related to environmental matters.[15] On March 1, 2007, and March 7, 2007, each of the parties filed answers to those questions.[16]

After publishing a notice in the Federal Register, 72 Fed. Reg. 1344-46 (Jan. 11, 2007), the Board held a "limited appearance statement" session, pursuant to 10 C.F.R. § 2.315(a), in Mineral, Virginia. The session was held on February 8, 2007, during which the Board listened to public comments regarding the ESP application.[17] Written limited appearance statements have also been filed in this proceeding and have been read by the Board.

After reviewing the parties' answers to the safety and environmental questions, and considering the limited appearance statements, the Board issued an order on March 20, 2007, that addressed certain preliminary matters concerning the evidentiary hearing scheduled to commence on April 24, 2007.[18] Specifically, the Board instructed the parties to file their (a) written statements of position, (b) written testimony, and (c) supporting exhibits on or before

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[15] Licensing Board Order (Issuing Environment-Related Questions) (Feb. 7, 2007) [Board Environmental Questions].

[16] Dominion's Response to the Licensing Board's February 7, 2007 Order (Issuing Environment-Related Questions) (Mar. 1, 2007) [Dominion Answer to Environmental Question]; see Dominion Exhibit 3 (same); NRC Staff Legal Brief in Response to Licensing Board's Environment-Related Questions (Mar. 1, 2007) [NRC Staff Legal Environmental Brief]; Staff Exhibit B [NRC Staff Answers to Board Environmental-Related Questions] (Mar. 1, 2007) [Staff Answer to Environmental Question]; see Staff Exhibit 10 (same); NRC Staff Legal Memorandum Transmitting the Staff Response to Board Environment-Related Question 2 (Mar. 7, 2007); see Staff Exhibit 12 (same). The Staff asked the Board to revise Environmental Question #2 and withdraw Environmental Question #82. See NRC Staff Motion for Reconsideration (Feb. 20, 2007). The Board granted the motion and extended the deadline for answers to Question #2 until March 7, 2007. See Licensing Board Order (Reconsideration of Two Environmental Questions and Grant of Extension) (Feb. 27, 2007) (unpublished). Dominion later corrected one of its answers. See Dominion's Correction to Its Response to the Licensing Board's Safety-Related Question 48 (Apr. 17, 2007).

[17] See Dominion Nuclear North Anna ESP Limited Appearance Statements Session Tr. at 1-220 (Feb. 8, 2007).

[18] Licensing Board Order (Instructions for Submission of Written Materials and Setting of Topics and Procedures for Evidentiary Hearing) (March 20, 2007) (unpublished) [Hearing Order].

April 10, 2007. Hearing Order at 3. We stated that "[t]his is the time and opportunity for each party to present all of the evidence that it believes is necessary to carry its burden of proof with regard to the six fundamental questions set forth in Attachment A." Id. The order also listed seven topics where the Board sought clarification at the evidentiary hearing, as follows: 1) site characterization (hydrology, soil, vadose zone, groundwater, and aquifers); 2) tritium; 3) zero release commitment (of radionuclides into any potential liquid pathways); 4) radiological releases and doses from normal operations; 5) surface water impacts and possible mitigation measures; (6) seismic safety; and (7) NEPA alternatives.[19] Id. at 5-6.

In response to the Hearing Order, Dominion submitted its statement of position, pre-filed testimony, witness list, answers to the Board's inquiries, and related affidavits and statements of appearance on April 10, 2007.[20] The NRC Staff also submitted its statement of position, exhibit list, prefiled testimony, and related affidavits.[21] The Board held a prehearing conference with the parties on April 18, 2007,[22] and held the evidentiary hearing for the North Anna ESP application from April 24 to April 26, 2007. In compliance with the Commission policy requiring

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[19] Because of witness availability and time constraints, these topics were covered in a different sequence at the evidentiary hearing. See EH Tr. at 20. For logical reasons, we have grouped these topics in a different sequence in Section IV, infra.

[20] See Dominion's Pre-Hearing Statement (Apr. 10, 2007); Dominion's Pre-filed Testimony of Marvin K. Smith, Stephen D. Routh, Dr. William R. Lettis, Dr. Robin K. McGuire, and Dr. John R. Davie on Safety Matters (Apr. 10, 2007); see also Dominion Exhibit 9 (same); Dominion's Pre-filed Testimony of Marvin K. Smith, Karen K. Patterson, and John D. Cudworth on Environmental Matters; Dominion's Response to Questions in the License Board's March 20, 2007 Order (Apr. 10, 2007); see also Dominion Exhibit 10 (same); Dominion's Witness List on Topics in Section II.D of March 20, 2007 Order (Apr. 10, 2007); Dominion Exhibit List (Apr. 10, 2007).

[21] See NRC Staff's Written Statement of Position (Apr. 10, 2007); NRC Staff Exhibit List (Apr. 10, 2007); Prefiled Direct Testimony of George F. Wunder on Environmental Issues in the North Anna ESP Proceeding (Apr. 10, 2007); see also Staff Exhibit 15 (same); Prefiled Direct Testimony of John S. Cushing on Environmental Issues in the North Anna ESP Proceeding (Apr. 10, 2007); see also Staff Exhibit 16 (same); Staff Affidavits (Staff Exhibit 9).

[22] Tr. at 593-630 (Apr. 18, 2007).

that we hold evidentiary hearings "in the vicinity of the site of the proposed facility," the hearing was held in Louisa, Virginia. 10 C.F.R. Part 2, App. A, § I.a. (2004).[23] On May 11, 2007, the parties filed proposed findings of fact and conclusions of law.[24] In addition, on May 7, 2007, we received "Dominion's Supplement to the Record on Alternative Sites" and on May 11, 2007, the NRC Staff filed its response to Dominion's Supplement.

III. LEGAL STANDARDS

As previously stated, an ESP is a type of construction permit and therefore an ESP application requires a hearing, whether or not anyone challenges the proposed ESP. AEA § 189a. In an uncontested proceeding such as this one, the Board's role is significantly different from our usual role where we adjudicate and decide specific "contentions" that are raised and litigated by adverse parties who are strongly motivated to identify areas of concern, to marshal and present factual and technical evidence supporting their opposing positions, and to define and sharpen the issues that we must decide.

The role of the Board in complying with the mandate of the Atomic Energy Act §189 is to independently evaluate the record and the adequacy of the Staff's review and then to decide six fundamental issues that are specified by the law and regulations.[25] The Commission has stated that, for three of these issues, the Board's role is analogous to that of an appellate court

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[23] Although Appendix A was rescinded, see 69 Fed. Reg. 2182, 2274 (Jan. 14, 2004), we still rely on it as an authoritative expression of the Commission's policy. See Exelon Generation Company et al. (Clinton Early Site Permit), CLI-05-17, 62 NRC 5, 35 n.40. (2005) (Clinton I).

[24] Dominion's Proposed Findings of Fact and Conclusions of Law (May 11, 2007); NRC Staff's Proposed Findings of Fact and Conclusions of Law in the Mandatory Hearing (May 11, 2007).

[25] The Staff's knowledge that its work will be independently and carefully reviewed by a Board may, in itself, encourage the Staff to perform its reviews even more diligently than might otherwise be the case.

applying the "substantial evidence" test. Exelon Generation Company et al. (Clinton Early Site Permit), CLI-05-17, 62 NRC 5, 39 (2005) (Clinton I). For these three issues (two under AEA and one under the NEPA) the Board must review the sufficiency of the record and the sufficiency of the NRC Staff's review, and decide if they are adequate to support the Staff's proposed findings. See 10 C.F.R. § 104(b)(2). The Commission has called this a "simple 'sufficiency' review." Clinton I at 39. Such a review is not to be a "rubber stamp," but instead the Commission has called for boards to "carefully probe" NRC Staff findings "by asking appropriate questions and by requiring supplemental information." Id. at 40.

For the other three fundamental issues, which the Commission has denominated the "NEPA Baseline Issues," the Board has a "special responsibility" and the scope of the Board's review is significantly different. Clinton I at 30. For these issues the Board is not merely reviewing the sufficiency of the record and the adequacy of the Staff's review and findings, but instead "must reach [its] own independent determination of uncontested NEPA baseline questions." Id. at 45.

For all six fundamental issues, however, the Board is to make its decisions without conducting a "de novo" review. This means that "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 I at 39-40 (emphasis added). The "no de novo review" approach, however, does not change the Board's responsibility to independently interpret and apply the law and to decide the six ultimate issues in an uncontested ESP case such as this.

A. Three Issues Subject to the Appellate Review – Substantial Evidence Test

In an uncontested hearing, the Board must make "appellate review" decisions, using the substantial evidence test, on three issues. Two are safety-related and one is NEPA-related.

1. AEA Safety Issue 1

The first "appellate review" decision that the Board must make is whether the application and the record of the proceeding contain sufficient information, and the review of the application by the NRC Staff has been adequate, to support a negative finding on the question of whether the issuance of the ESP will be inimical to the common defense and security or to the health and safety of the public. Clinton I at 33 n.32. The Commission has referred to this as "AEA Safety Issue 1." Id.

AEA Safety Issue 1 is a determination that is mandated by Section 103d of the AEA,[26] which states that "no license may be issued to any person within the United States if, in the opinion of the Commission, the issuance of a license to such person would be inimical to the common defense and security or to the health and safety of the public." AEA § 103d, 42 U.S.C. § 2133(d). The NRC regulations reiterate this requirement, specifying that, before issuing a construction permit for a nuclear power reactor, the Commission must conclude that "[t]he issuance of a license to the applicant will not . . .. be inimical to the common defense and security or to the health and safety of the public." 10 C.F.R. § 50.40(c). NRC's "Notice of Hearing" regulation, 10 C.F.R. § 2.104(b)(2)(i), while not the legal source of the Board's duty to decide this fundamental issue,[27] provides that the notice shall specify that, even if a proceeding

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[26] The requirements for the notice of hearing in a construction permit proceeding are outlined in 10 C.F.R. § 2.104(b) and state, inter alia, that the notice must direct the presiding officer to consider "[w]hether the issuance of a permit for the construction of the facility will be inimical to the common defense and security or to the health and safety of the public." 10 C.F.R. § 2.104(b)(1)(iv).

[27] 10 C.F.R. § 2.104 is titled "Notice of Hearing" and merely specifies the contents of the notice of hearing. As such, this regulation is not the source of the Board's legal responsibilities. Thus, for example, 10 C.F.R. § 2.104(b)(3)(ii) specifies that the notice of hearing will state that the presiding officer will "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." If the notice so specifies, this regulation is satisfied. The source of the Board's legal responsibilities on this issue, however, is 10 C.F.R. § 51.105(a)(2), which states that "the

(continued...)

is uncontested, the Board must decide this question.[28] The notice of hearing in this proceeding complied with this requirement. It stated that the Director of NRR would propose a finding on AEA Safety Issue 1[29] and that, even if the proceeding were uncontested, the Board would "determine whether the application and the record of the proceeding contain sufficient information, and the review of the application by the Commission's staff has been adequate to support a negative finding on Safety Issue 1 . . . as proposed to be made by the Director [of NRR]." 68 Fed. Reg. 67,489 (Dec. 2, 2003).

2. AEA Safety Issue 2

The second "appellate review" decision that the Board must make is whether the application and the record of the proceeding contain sufficient information, and the review of the application by the NRC Staff has been adequate, to support a positive finding that, taking into consideration the site criteria contained in 10 C.F.R. Part 100, a reactor, or reactors, having the characteristics that fall within the parameters for the site, can be constructed without undue risk to the health and safety of the public. Clinton I at 33 n.32. The Commission refers to this as "AEA Safety Issue 2." Id.

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[27](...continued)
presiding officer will . . . independently consider the final balance among the conflicting factors contained in the record of the proceeding with a view to determining the appropriate action to be taken."

[28] 10 C.F.R. § 2.104(b)(2)(i) states that "[I]f the proceeding is not a contested proceeding, the presiding officer will determine: (i) Without conducting a de novo evaluation of the application, whether the application and the record of the proceeding contain sufficient information and the review of the application by the Commission's staff has been adequate to support . . . a negative finding on (b)(1)(iv) . . . proposed to be made by the Director of Nuclear Reactor Regulation." The "finding on (b)(1)(iv)" referred to in the regulation is "Whether the issuance of a permit for the construction of the facility will be inimical to the common defense and security or to the health and safety of the public." 10 C.F.R. § 2.104(b)(1)(iv).

[29] Contrary to the wording of the notice in the Federal Register, in this proceeding the Director of NRR has not proposed a finding, positive or negative, on AEA Safety Issue 1, AEA Safety Issue 2, or the Overriding NEPA Issue. See NRC Staff's Written Statement of Position (Apr. 10, 2007) at 56.

The duty to decide AEA Safety Issue 2 is derived most directly from 10 C.F.R. § 52.21. This ESP regulation states, in pertinent part:

> In the hearing, the presiding officer shall also determine whether, taking into consideration the site 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.

10 C.F.R. § 52.21. The "Notice of Hearing" regulation, while again not the source of this legal duty, requires that all notices for construction permit proceedings list AEA Safety Issue 2 as a decision that must be made. 10 C.F.R. §§ 2.104(b)(2)(i) and (b)(1)(i)(d). The notice of hearing for this proceeding complied with this requirement. 68 Fed. Reg. at 67,489.

3. Overriding NEPA Issue

The third "appellate review" decision that the Board must make in an uncontested ESP proceeding is whether the review conducted by the Commission pursuant to NEPA, 42 U.S.C. §§ 4321-4347, has been adequate. See Clinton I at 33 n.33. The Commission referred to this as the "overriding NEPA issue" as distinguished from the "baseline" NEPA issues (discussed later). Id.

The duty of the Commission, and in this context this Board, to decide the Overriding NEPA Issue, even in an uncontested case, is derived from NEPA itself. The statute declares that it is the federal government's policy "to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans." NEPA § 101(a), 42 U.S.C. § 4331(a). NEPA then directs all federal agencies, "to the fullest extent possible" to comply with this policy and, inter alia, to use a systematic and interdisciplinary approach in considering environmental issues, and, before taking any major Federal action significantly affecting the

quality of the human environment, to generate a detailed environmental impact statement. See NEPA § 102(2)(A), (C) and (E), 42 U.S.C. § 4332(2)(A), (C) and (E).[30]

The Overriding NEPA Issue is also dictated and explained in Calvert Cliffs' Coordinating Comm., Inc. v. AEC, 449 F.2d 1109 (D.C. Cir. 1971) (Calvert Cliffs), where the United States Court of Appeals for the District of Columbia held that NEPA requires the Commission's hearing board to independently review Staff environmental analyses and independently consider the final balance among conflicting factors, regardless of whether NEPA issues are raised by an intervenor. Id. at 1118 (invalidating regulations precluding Licensing Board review of NEPA considerations).

NRC's current NEPA regulations, implementing Calvert Cliffs, are found in 10 C.F.R. Part 51. The NEPA procedures for construction permit proceedings are at 10 C.F.R. § 51.105. Specifically these regulations require the Board to decide the Overriding NEPA Issue by mandating that, even if a proceeding is uncontested, the Board must determine "whether the NEPA review conducted by the NRC staff has been adequate." 10 C.F.R. § 51.105(a)(4). As with the other two issues, the "Notice of Hearing" regulation requires the notice to include the Overriding NEPA Issue, 10 C.F.R. § 2.104(b)(2)(ii), and the notice in this proceeding complied. 68 Fed. Reg. 67,489.

B. Three "Independent Determination" NEPA Baseline Issues

Quite separately from the three appellate review issues discussed above, the law, regulations, and case law require the Board to independently decide three NEPA baseline issues. Consistent with Calvert Cliffs and NEPA, the Commission's regulations specify that:

> [I]n a proceeding for the issuance of a construction permit for a nuclear power reactor . . . the presiding officer will:

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[30] The full text of NEPA § 102(2)(A), (C) and (E) are provided in section V.C infra.

> (1) Determine whether the requirements of section 102(2)(A), (C), and (E) of NEPA and the regulations in this subpart 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; [and]
>
> (3) Determine . . . whether the construction permit . . . should be issued, denied, or appropriately conditioned to protect environmental values.[31]

10 C.F.R. § 51.105(a)(1)-(3). These NEPA Baseline Issues[32] must be included in the notice of hearing, 10 C.F.R. § 2.104(b)(3)(i)-(iii), and were in fact included in the notice for this proceeding. 68 Fed. Reg. at 67,489.

The Commission described the Board's duty relating to the three NEPA Baseline Issues, as follows:

> In sum, under Calvert Cliffs and under NRC regulations, licensing boards must reach their own independent determinations on uncontested NEPA 'baseline' questions – i.e., whether the NEPA process 'has been complied with,' what is the appropriate 'final balance among conflicting factors,' and whether the 'construction permit should be issued, denied, or appropriately conditioned.' But in reaching those independent judgments, boards should not second-guess underlying technical or factual findings by the NRC Staff.

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[31] 10 C.F.R. § 51.105(a)(3) reads, in full, as follows: "Determine, after weighing the environmental, economic, technical and other benefits against environmental and other costs, and considering reasonable alternatives, whether the construction permit . . . should be issued, denied, or appropriately conditioned to protect environmental values." (Emphasis added). The underlined phrase is not applicable to ESPs because the Commission's ESP regulations specify that the NEPA environmental impact statement (EIS) for an ESP "need not include an assessment of the benefits (for example, need for power) of the proposed action." 10 C.F.R. §§ 52.17(a)(2) and 52.18. This is because the benefits vs. cost analysis can be postponed until the reactor licensing stage. See System Energy Resources, Inc. (Early Site Permit for Grand Gulf ESP Site), LBP-07-01, 65 NRC 27, 36 n.14 (2007).

[32] These issues are called "baseline" issues, because these decisions must be made "regardless of whether the proceeding is contested or uncontested." 10 C.F.R. § 2.104(b)(3). This is in contrast to the three "appellate review" questions, which change depending on whether the proceeding is contested or uncontested. Compare 10 C.F.R. § 2.104(b)(1) to 10 C.F.R. § 2.104(b)(2).

Clinton I at 45 (citations omitted). In short, while generally accepting the technical and factual findings of the Staff,[33] the Board must independently decide (a) whether NEPA Sections 102(2)(A), (C) and (E) have been complied with, (b) the final balance among conflicting factors, and (c) whether the ESP should be issued, denied, or appropriately conditioned.

C. Legal Standards Particularly Relevant to ESPs

Before turning to the specific issues raised by the Dominion ESP application, several legal aspects of an ESP must be noted.

1. Banking, Barring, and Grandfathering of "Resolved" Environmental Siting Issues for 20 to 40 Years

The fact that an ESP holder cannot commence construction of the proposed nuclear reactors without obtaining an additional license from the NRC does not mean that an ESP is not an important permit. Once the ESP is issued, the proposed site for the nuclear reactors is "banked" or approved; the regulations applicable to the site are frozen as of the date that the ESP is issued; and "the Commission may not impose new requirements . . . on . . . the site." 10 C.F.R. § 52.39(a)(1). The only exceptions are (1) modifications "necessary to bring the permit or site into compliance with the Commission's regulations and orders applicable and in effect at the time the permit was issued" and (2) modifications "necessary . . . to assure adequate protection of the public health and safety or the common defense and security." Id. (emphasis added). Since an ESP is valid for up to twenty years, 10 C.F.R. § 52.27, and can be extended for another twenty years, 10 C.F.R. § 52.29(a), the first exception listed above generally serves to immunize or "grandfather" the ESP holder against more stringent regulations that might be

[33] We do not conduct a de novo review. However, the Board need not accept the Staff's "technical or factual findings. . . if the board found the Staff review to be incomplete or the Staff findings to be insufficiently explained in the record." Clinton I at 45.

issued any time during the next twenty to forty years.[34] The second exception allows NRC to override the grandfathering and impose more protective permit conditions only if they meet a "necessity" threshold.[35]

As the Commission has stated, an ESP makes it "possible to resolve important [site] licensing issues before the construction permit proceeding" and "in effect make[s] possible the banking . . . of sites." 54 Fed. Reg. 15,372, 15,378 (Apr. 18, 1989) (emphasis added). Stated another way, once an ESP is issued, the public, and in most cases, the NRC, are barred (absent a finding of necessity) from applying more stringent or contemporary regulatory siting requirements on matters that were "resolved" in the ESP proceeding. 10 C.F.R. § 52.39(a)(2).

Given this twenty to forty year grandfathering, it would be helpful to understand what issues are "resolved" in a uncontested ESP proceeding, and what issues are not "resolved." The regulations are somewhat vague on this point. They state that if, after the ESP is issued, an ESP holder submits an application to construct a nuclear reactor or reactors on the site, "the Commission shall treat as resolved those matters resolved in the proceeding on the application for . . . the [ESP]." 10 C.F.R. § 52.39(a)(2) (emphasis added). This tautology (matters that are resolved, shall be treated as resolved) is not very instructive. It is uncertain as to what "resolved

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[34] That an ESP applicant intends to apply for a combined operating license within the next year does not alter the legal and regulatory impact and importance of an ESP. Corporate plans may change. But, once granted, the ESP grandfathers and banks the site against most regulatory changes and improvements for twenty to forty years.

[35] The ESP regulations state that, once an ESP has been issued, more protective conditions may be imposed on an ESP holder if "the modification is necessary . . . to assure adequate protection of the public health and safety or the common defense and security." 10 C.F.R. § 52.39(a). (emphasis added). This is similar to NRC's backfitting standard, which states that the "Commission shall always require the backfitting of a facility if it determines that such regulatory action is necessary to ensure that the facility provides adequate protection to the health and safety of the public and is in accord with the common defense and security." 10 C.F.R. § 50.109(a)(5) (emphasis added).

in the proceeding" means. The "resolution" of this issue may need to await the adjudicatory proceedings on the COL or actual construction permit (CP) applications.

2. "Early Partial Decisions on Site Suitability Issues" and No Partial ESPs

Prior to the Commission's creation of the early site permit mechanism in 1989, NRC regulations established a similar procedure, which remains in effect today, whereby an applicant could obtain "Early Partial Decisions on Site Suitability Issues" for prospective construction permit sites. See 10 C.F.R. Part 2 Subpart F ("Additional Procedures Applicable to Early Partial Decisions on Site Suitability Issues in Connection with an Application for a Permit to Construct Certain Utilization Facilities"). The substantive regulations governing such "Early Partial Decisions" are found at 10 C.F.R. Part 50, Appendix Q "Pre-Application Early Review of Site Suitability Issues." The ESP regulations do not replace these earlier regulations, 10 C.F.R. § 52.13, but understanding the difference between "Early Partial Decisions" and "Early Site Permits" may help define the limits applicable to each.

The main differences between an Early Partial Decision and an ESP are that the Early Partial Decision lasts only five years and is, by definition, only "partial" (resolving only those site suitability issues that the applicant specifically asks to resolve), see 10 C.F.R. § 2.606(b)(2), whereas the ESP lasts for twenty years and once it is issued it covers the site ("the Commission may not impose new requirements . . . on the early site permit or the site"). See 10 C.F.R. § 52.39(a)(1). This was a major point of controversy when the ESP regulations were promulgated. During the comment period on the proposed ESP regulations, the Attorney General of the State of New York noted the availability of the Early Partial Decisions and questioned the need for ESPs and "whether there could be grounds adequate to support approval of a site for twenty years." 54 Fed. Reg. at 15,378. Another commenter, the Connecticut Siting Council, agreed, saying that it would be difficult for a public entity to "meaningfully participate in a decision on an application" for an ESP unless it "proposed a

specific nuclear power plant" and "contain[ed] projected emissions, discharges, site impacts, safety factors, and exact operational parameters." Id. at 15,378. The Commission rejected the suggestion that ESP applications be limited to "a specific nuclear power plant." But the Commission agreed that an ESP application must contain "exact operational parameters," saying "[I]t is just such information which both the proposed rule and the final rule would require of applicants for early site permits."[36] Id. (emphasis added). The Commission also said that "partial early site permits [would not] be issued [because] it is not likely that resolutions of isolated site issues could have the degree of finality which a permit lasting up to twenty years must have." Id. The Commission stated that ESPs serve to resolve "most site issues" and that "[w]here adequate information is not available, early site permits will not be issued." Id. In such situations, where a twenty-year ESP would not be available, the company could request an Early Partial Decision pursuant to 10 C.F.R. Part 2, Subpart F.[37]

IV. SUMMARY OF KEY EVIDENCE

As noted above, in an uncontested hearing on an ESP application, the law requires this Board to make six fundamental and ultimate decisions. For three of them, the Commission has stated that our review is akin to "appellate review" and our duty is to determine whether the record and the Staff review have been sufficient to support the findings required for the issuance of an ESP. For the other three, the NEPA Baseline Issues, the Board must

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[36] This Board construes this statement by the Commission as referring to the "plant parameter envelope," or PPE, used by the Staff and Applicant in an ESP application as a surrogate for the actual parameter for a single specific reactor design.

[37] Dominion's ESP application lacks a number of Plant Parameter Envelope (PPE) values, see infra § VI.C. and includes numerous unresolved issues, see, e.g., Staff Answer to Environmental Question 5 (listing 35 unresolved environmental questions). Given this situation, the Commission may want to consider providing instruction as to how this approach can be reconciled with the Commission's 1989 statements regarding no partial ESPs and no ESPs without adequate information. See infra § VI.C.

independently make the initial decisions. In neither case is the Board to conduct a de novo review of the Staff's factual and technical findings, unless, after a review of the record, the Board finds NRC Staff review inadequate or its findings insufficient. Supra p. 9-16.

With these standards in mind, the Board approached this assignment as follows. First, we studied and discussed the FSER and FEIS amongst ourselves. We also reviewed pertinent sections of Dominion's application and environmental report. Then we issued one wave of safety questions and one wave of environmental questions, probing the basis and/or logic of key matters that seemed unclear or that otherwise concerned us.[38] The NRC Staff and Dominion each answered these questions (in a significant number of cases, Dominion deferred to or adopted the Staff's answer) and we studied these answers.[39] Next, the parties submitted written statements of position, written testimony, and exhibits intended to provide a record sufficient to meet their burden of proof on the six fundamental questions.[40] We reviewed and studied this material. Finally, we held an evidentiary hearing, during which we heard oral testimony on seven topics where the Board hoped that clarification and resolution of issues could be achieved through our questioning of witnesses.[41] At the end of the evidentiary hearing, we also heard from the parties' lawyers on three legal issues.[42] Subsequent to the hearing, the

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[38] See supra notes 13, 15.

[39] See supra notes 14, 16.

[40] See supra notes 20, 21.

[41] The fact that we did not take live testimony on a topic does not necessarily mean that we were satisfied with the written answers. We may simply have concluded that, given the non-adversarial nature of the proceeding, live testimony would not have clarified the matter.

[42] The three legal questions dealt with (1) whether the FEIS satisfies the Commission's environmental justice policy, (2) the status of NRC's Part 52 rulemaking and whether it informs the issue regarding the prohibition of partial ESPs or the issuance of ESPs in the absence of adequate information, and (3) with regard to the proposed Permit Condition 4, the impact of two recent Commission rulings System Energy Resources, Inc. (Early Site Permit for Grand Gulf

(continued...)

parties submitted supplementary material related to the NEPA alternatives issue[43] and proposed findings of fact and conclusions of law.[44]

We also note what we did not do. This Board did not undertake a de novo review of any issue. With a limited number of exceptions on matters which required further inquiry, we did not attempt to verify, duplicate, or litigate the factual or technical findings of the NRC Staff. For example, if the Staff testified that the wet and dry cooling towers for Unit 3 would cause direct evaporative losses of 8,707 gallons per minute (gpm) of water, or gave a technical opinion that Unit 3 would result in increasing the amount of time there would be 20 cubic feet per second (cfs) or less discharged into the North Anna River from 6% per year to 11% per year, or stated that raising the water level in Lake Anna by 10 inches would eliminate the impact of Unit 3, we did not recalculate or require litigation or proof of the Staff's factual or technical opinions and findings. Although, as required, we have taken an "independent 'hard look' at the NRC Staff safety and environmental findings," Clinton I at 34, we relied heavily on the Staff's work and made no effort to duplicate it.

On this basis, this initial decision does not attempt to reiterate every factual item in the FEIS or FSER and instead focuses only on those factual, technical, or legal concerns that we deemed difficult or most important to our decisionmaking on the six fundamental questions. This initial decision does not and need not even cover all of the areas of concern reflected in our

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[42](...continued)
ESP Site), CLI-07-14, 65 NRC __ (Mar. 27, 2007) and Exelon Generation Co., LLC (Early Site Permit for Clinton ESP Site), CLI-07-12, 65 NRC __ (Mar. 8, 2007) [Clinton II]. EH Tr. at 624-25.

[43] Dominion Supplement to the Record on Alternative Sites (May 7, 2007); NRC Staff Response to "Dominion's Supplement to the Record on Alternative Sites" and Staff Supplement to the Record (May 11, 2007).

[44] Dominion Proposed Findings of Fact and Conclusions of Law (May 11, 2007); NRC Staff's Proposed Findings of Fact and Conclusions of Law in the Mandatory Hearing (May 11, 2007).

200+ questions and answers, or all of the direct testimony and exhibits.[45] We have not attempted to rebut, pursue clarification, or quibble about every problematic answer or statement (legal, factual, or technical) by the parties. This initial decision merely covers the key points in our thinking and analysis.

A. Surface Water Impacts and Possible Mitigation Measures

Prior to the evidentiary hearing, the Board instructed the parties to produce subject matter experts to testify at the evidentiary hearing and respond to questions concerning "the potential impacts (e.g., lake levels, altered downstream flows, etc.) of the proposed ESP on the water in Lake Anna and downstream, studies performed or imminent (e.g., the IFIM), and possible measures to mitigate these impacts." Hearing Order at 6. This topic is primarily environmental, focusing on the proposed project's environmental impacts and the consideration of reasonable alternatives and mitigation measures as required by NEPA.[46] This subject was covered in various places in the FEIS, including Section 5.3, "Operational Impacts at the Proposed Site – Water Related Impacts," and Section 5.4.2, "Operational Impacts at the Proposed Site – Ecological Impacts – Aquatic Impacts."

During the evidentiary hearing the NRC Staff produced a panel of witnesses who gave a presentation on surface water impacts and mitigation, and responded to the Board's questions.[47] The Staff witnesses provided a slide presentation that was admitted as Staff Exhibit 18. EH Tr. at 50, 53. Likewise, the Board heard testimony on this subject from a panel

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[45] For example, after receiving answers to our two sets of written questions, a large number of important topics were not singled out by the Board for oral testimony and questioning. These included population growth rates, storms, hurricanes, floods and other Acts of God, design basis accidents, severe accidents, effects of dam rupture and quality assurance.

[46] Surface water impacts had been the subject of numerous public comments in response to the draft EIS, the subject of various limited appearance statements, and were the basis for dismissed Contention EC 3.3.2. Supra p. 4-5.

[47] The NRC Staff's witnesses on this subject were Lance W. Vail, Jeffrey A. Ward and Dr. Michael J. Scott, all of Pacific Northwest Nuclear Laboratory, and Dr. Michael T. Masnick of NRC. See EH Tr. at 65-66.

of Dominion witnesses[48] and Dominion also submitted a slide presentation that was admitted as Dominion Exhibit 15. EH Tr. at 63.

As a matter of basic orientation on surface water impacts, we note that the FEIS states that the two existing nuclear power plants at the NAPS Site, Units 1 and 2, use a once-through cooling water design that withdraws up to 1,934,300 gallons per minute (gpm) from Lake Anna, passes this water through the power plants, and then discharges the heated water to the Waste Heat Treatment Facility (WHTF). FEIS at 5-19. The WHTF is a 3,400 acre surface water impoundment area that discharges into Lake Anna at dike 3. Id. at 2-6. The main body of Lake Anna is approximately 9,600 acres. Id.

With regard to the cooling water for proposed Units 3 and 4, the Staff summarized the situation as follows:

> The two proposed units employ considerably different cooling systems, with different water needs (Dominion 2006). The proposed Unit 3 would use a closed-cycle, combination wet and dry cooling tower system.
>
> The plant would primarily use wet towers to cool Unit 3 during periods of relative water surplus, which are defined as periods when the water surface elevation of Lake Anna is at or above elevation 76.2 m (250 ft) above mean sea level (MSL). In the ER, this cooling mode for Unit 3 is termed the Energy Conservation (EC) mode.
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> During periods when the elevation of Lake Anna is below 76.2 m (250 ft) MSL for a period of seven or more consecutive days, Unit 3 would be cooled with a closed-cycle, combination wet and dry cooling tower system to limit the consumptive water use. Dominion terms this cooling mode for Unit 3 as the Maximum Water Conservation (MWC) mode . . . . The dry cooling towers would be designed to remove at least one-third of the excess heat from Unit 3 under worst case atmospheric conditions.
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> . . .
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> Unit 4 would use a dry cooling system that transfers heat directly from the condenser to an air cooled heat exchanger without the use of Lake Anna cooling water.

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[48] The witnesses were Dr. Jud White, Mr. Bill Bolin, Mr. John Waddill, Dr. Stewart Taylor, Dr. Patrick Ryan, and Dr. Charles Coutant. See EH Tr. at 135.

FEIS at 3-9. As a basic matter, wet cooling towers transfer heat to the atmosphere through water evaporation and conduction, whereas dry cooling systems do so by moving a large amount of air through a heat exchanger. Id. at 8-4.

The consumptive loss of water caused by Units 1 and 2, and by proposed Unit 3, affects or will affect the level of water in Lake Anna and in the downstream rivers. Under the current operating scheme for the lake and the North Anna Dam, the normal water level for Lake Anna is kept at 250 feet mean sea level (MSL), FEIS at 2-20, and the annual average release rate from the dam is 270 cfs. EH Tr. at 145 (Dr. Stewart Taylor, testifying for Dominion). Meanwhile, the Commonwealth of Virginia requires that as long as Lake Anna can sustain a water level of at least 250 feet MSL, the North Anna Dam must release at least 40 cubic feet per second (cfs) into the North Anna River. FEIS at 2-21. However, if drier weather conditions occur and the lake surface falls below the elevation of 248 feet MSL, the State allows the release from the North Anna Dam to be decreased to an absolute minimum of 20 cfs. Id. at 2-12. In short, although the annual average flow in the North Anna River is 270 cfs (with significant annual fluctuations), the State attempts to maintain a flow of at least 40 cfs in the North Anna River, while occasionally tolerating a minimum flow of 20 cfs during drier conditions.

The Staff noted that the proposed “closed-cycle, dry cooling system” for Unit 4 would use “almost no cooling water.”[49] FEIS at 5-19. Thus, the Staff states that Unit 4 would have “no impact on the lake level or downstream flows.” Staff Exhibit 18 at Slide 3-4.

In contrast, Unit 3's combination wet/dry cooling system would cause an annual average “forced evaporative loss of 8,707 gallons per minute from the lake,” as estimated by Mr. Lance Vail on behalf of the Staff. Staff Exhibit 18 at 3-4; EH Tr. at 72. Mr. Vail acknowledged that the Staff did not estimate the amount of direct or indirect water loss caused by the 1.9 million gpm

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[49] The estimated consumptive loss of water from operating the Unit 4 dry cooling system is less than one gpm. FEIS at 3-10.

used by Units 1 and 2. EH Tr. at 120. He also acknowledged that the Staff did not attempt to determine whether conservation measures on Units 1 and 2 (e.g., sending some of their heated water to (enlarged) cooling towers for Units 3 and 4) could offset the 8,707 gpm evaporative loss caused by Unit 3. EH Tr. at 120-26, 130-31.[50]

Mr. Jeffrey Ward of the Staff testified that, during non-drought years, the addition of Unit 3 would essentially (a) double the amount of time that the water level in Lake Anna would drop to 248 feet MSL or below, and (b) double the amount of time discharges from the North Anna Dam would be at the low, 20 cfs level. EH Tr. at 78. With Units 1 and 2 as a baseline, the Staff estimates that the lake level for non-drought years would be at 248 feet MSL or lower for 6% of the year. Id. But the addition of Unit 3 would essentially double this figure to 11% of the year. Staff Exhibit 18 at 13; EH Tr. at 78. During drought years, the impacts on the lake level and downstream flow would be greater. Staff Exhibit 18 at Slide 5.

Mr. Vail, testifying for the Staff, stated that the increase of the low water levels in Lake Anna and low discharges from the North Anna Dam would be eliminated entirely if the NRC were to require dry cooling for Unit 3, as it proposes to do for Unit 4. EH Tr. at 114. Dr. Masnik of the Staff also acknowledged that, by increasing the water level in Lake Anna by 10 inches, this would counterbalance the increased time at low discharges caused by Unit 3. EH Tr. at 87-88.

In contrast with the NRC Staff model, which predicted an increase from 6 to 11% in how long Lake Anna would be at or below 248 feet MSL and the discharge at 20 cfs, see FEIS App. K at K-10, Dr. Stewart Taylor, testifying for Dominion, stated that Dominion's model predicts that the frequency of the Lake level dropping below 248 feet MSL and 20 cfs flow would increase only from about 5% of the time to 7% of the time. ER at 3-5-16; EH Tr. at 139, 143.

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[50] Likewise, Dominion did not consider the possibility of water conservation measures on Units 1 and 2. EH Tr. at 189-91.

The Board explored why Dominion's and NRC Staff's predictions were so different. Both Mr. Vail, for the NRC Staff, and Dr. Taylor, for Dominion, agreed that the NRC Staff's model used a fixed, average evaporation rate of 8,707 gpm applied over the entire period of analysis. EH Tr. at 119, 141. The average evaporation rate used by the NRC Staff overestimates the evaporation rate that would prevail when the operating lake level is below 248 feet MSL and when the proposed Unit 3 would be using the combination wet/dry cooling tower system. Id. at 70, 141. Dominion's model predicts weekly lake level and outflows using the entire 24-year period of record, including the two lowest years of precipitation in the extended period of record. EH Tr. at 138 (Taylor), 99 (Vail).

Dr. Taylor testified that Dominion's model is more realistic, because it modeled the anticipated mode of operation of the proposed cooling system and thus it more accurately predicts the increase in reduced water level and downstream flows resulting from the operation of the proposed third unit. EH Tr. at 139-43.

The Staff's position is that, although Unit 3's water consumption will increase from 6% to 11% of the year the amount of time when the lake level is below 248 feet MSL and the flow of the North Anna River is at 20 cfs, these changes will have little or no impact on the fisheries or biota in the lake or downstream rivers. Dr. Michael Masnik, testifying for the Staff, opined that there will be no impact to fisheries in Lake Anna. EH Tr. at 75-76. Similarly, Mr. Jeffrey Ward testified that the impacts to fish in the rivers downstream of the lake will be small. Id. at 78; Staff Exhibit 18 at 8. Mr. Ward testified there are two reasons for this: one, periods of low flow (generally late summer and fall) are not expected to coincide with the spawning season (spring and early summer), and two, spawning occurs many miles downstream in the Pamunkey River, which has two other significant tributaries contributing to its flow levels. EH Tr. at 78-80; Staff Exhibit 18 at 11. Mr. Vail testified that the "Staff evaluated the potential impacts to benthic communities, aquatic plants and riparian vegetation common to downstream locations" and

"concluded that the impact of reduced flow [due] to the addition of Unit 3 is expected to be undetectable." EH Tr. at 81; Staff Exhibit 18 at 16. Dominion's witnesses made similar representations.[51]

The Board asked the parties whether they had studied and assessed the potential socioeconomic impacts of the increase of the low flow periods in the river. Dr Michael Scott of PNNL, testifying for the Staff, presented a slide concerning the socioeconomic impacts on the lake. Staff Exhibit 18 at 19. He said that the impact of Lake Anna water levels would be "small" in normal water years, with a "moderate temporary" impact on private lakefront property when water levels were below 248 feet MSL and a "moderate temporary" impact on boating and private dock usage when lake levels were below 248 or above 250 feet 6 inches. EH Tr. at 92-93; Staff Exhibit 18 at 19. But Dr. Scott acknowledged that his presentation did not address possible socioeconomic impacts in the river. EH Tr. at 93. When asked about kayaking and recreational fishing downstream, Dr. Scott stated that "we did not find anything in the very brief search . . . that would allow us to make a judgment" about downstream socioeconomic impacts. Id. at 94. He had "very little information" about downstream socioeconomic impacts. Id. at 109.

Next, the Board raised questions about the instream flow incremental methodology (IFIM) study that Dominion is about to undertake with the Commonwealth of Virginia. See EH Tr. at 107. The Board noted the apparent contradiction between the Staff asserting that the lowering of lake and downstream levels caused by Unit 3 is not a problem, and yet requiring Dominion to perform the IFIM study concerning such impacts.[52] Id. Dr. Masnik, testifying for the Staff, said that the Staff had discussed the IFIM study with the State, and that the Staff's

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[51] For example, Dr. Charles Coutant stated "our conclusion is that the biological effects on the overall communities - river communities would be small," EH Tr. at 153, and Mr. William Bolin testified that "20 cfs is not detrimental to the river system." Id. at 163.

[52] The Staff is proposing to impose the IFIM on Dominion. See FEIS at J-9 and Staff Exhibit 17 (Draft Permit) at 5 (proposed permit condition 3.I.2).

position is that the changes in downstream flow that would be caused by Unit 3 "are within the normal variation that you would expect in a small river system like North Anna [that] is in the southeastern part of the United States." Id. at 110. Dr. Jud White, testifying for Dominion, stated that the IFIM study is "really a study to optimize state permit decisionmaking related to how we manage the lake and how releases from the dams are handled." Id. at 164. See also Dominion Exhibit 15 at 18; EH Tr. at 177. But Dr. White agreed that the IFIM study is being done because of concerns about the lowered lake levels and downstream flows that will be produced by Units 3 and 4. EH Tr. at 178-80.

Finally, before closing on the surface water impacts issue, the Board notes that the Staff's proposed permit does not impose any requirements or conditions as to when Dominion must operate the dry cooling tower for Unit 3, and when it can rely solely on the wet cooling tower that causes the forced evaporation of 8,707 gpm from the lake on average. See FEIS at J-9. Apparently, the Staff will leave this entirely up to Dominion and perhaps the Commonwealth of Virginia.[53] However, the Staff attorney Brooke Poole did confirm that condition 3.E.2 of the Staff's proposed ESP would specify that Unit 4 must use a dry cooling tower. EH Tr. at 122. See also Staff Exhibit 17 (Draft Permit) at 3.

B. Site Characterization – Hydrology, Groundwater, Isotope Transport

Prior to the evidentiary hearing, the Board instructed the parties to produce subject matter experts to testify at the evidentiary hearing and respond to questions concerning "the measurement, monitoring, data, and characterization of the hydrology of, and any radiological or chemical contamination in, the soil, vadose zone, groundwater, and aquifers at or near the proposed site." Hearing Order at 5. This subject is safety-related because "in determining the

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[53] Dominion has defined the lake level conditions when they will switch between the maximum water conservation mode (maximum use of the dry cooling tower for Unit 3) and the more normal energy conservation mode (wet cooling tower only for Unit 3). FEIS at 3-7 through 3-10.

acceptability of a site . . . [f]actors important to hydrological radionuclide transport . . . must be obtained from on-site measurements." 10 C.F.R. § 100.20(c)(3). It is also related to NEPA because, in order to analyze the environmental impacts of a project on a site, it is necessary to know the characteristics of the site.

During the evidentiary hearing the NRC Staff produced a panel of witnesses who gave a presentation on site characterization, hydrology, groundwater, and isotope transport, and responded to the Board's questions.[54] The Staff witnesses provided a slide presentation that was admitted as Staff Exhibit 19. EH Tr. at 51, 53. Likewise, the Board heard testimony on this subject from a panel of Dominion witnesses[55] and Dominion submitted a slide presentation that was admitted as Dominion Exhibit 12. EH Tr. at 61, 63.

This subject is closely related to the topic that we denominated as the "Zero Release Commitment," which concerns the meaning and effect of the Staff's proposed Permit Condition 4 (requiring the use of "features to preclude" certain accidental releases). This subject will be addressed in Section IV.C, infra. It is sufficient to note at this point that proposed Permit Condition 4 does not actually preclude releases, does not apply to systems such as the spent fuel pool, and does not appear to apply to slow leaks. See § IV.C, infra. In addition, these two topics were the subject of considerable concern by the Boards in the two prior ESP mandatory

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[54] The NRC Staff's witnesses for this panel were Mr. Goutam Bagchi and Mr. Lance W. Vail. See Staff Exhibit 19 (stamp); EH Tr. at 201-04.

[55] Dominion's witnesses for the hydrology panel were Dr. Stewart Taylor, Mr. Carl Tarantino, Mr. Carter Cooke, Mr. Loran Matthews, and Mr. Donald Hintz. See EH Tr. at 249; Dominion Exhibit 12.

hearings and have been addressed by the Commission.[56] The Commission rulings are dispositive on the issues they address, and we will apply those rulings here.

The regulatory context for the "Site Characterization - Hydrology" topic starts with 10 C.F.R. § 52.21, which states "in the [ESP] hearing, the presiding office shall determine whether, taking into consideration the site 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." Part 100 specifies numerous "factors to be considered when evaluating sites" such as "population density and use characteristics," the "nature and proximity of man-related hazards," and "physical characteristics of the site, including seismology, meteorology, geology, and hydrology." 10 C.F.R. § 100.20(a)-(c). On the subject of hydrology, the regulation specifies:

> Factors important to hydrological radionuclide transport (such as soil, sediment, and rock characteristics, adsorption and retention coefficients, ground water velocity, and distances to the nearest surface body of water, <u>must be obtained from on-site measurements</u>."

10 C.F.R. § 100.20(c)(3).

The relevant Staff guidance document for ESPs, "RS-002, Processing Applications for Early Site Permits" (RS-002) (2004), emphasizes the importance of obtaining and evaluating the hydrological measurements:

> The geological and hydrological characteristics of the site may have a bearing on the potential consequences of radioactive materials escaping from a nuclear power plant or plants of specified type (or falling within a plant parameter envelope [PPE]) that might be constructed on the proposed site. <u>Special precautions</u> should be planned if a reactor or reactors would be located at a site where a significant quantity of radioactive effluent <u>could accidentally flow into nearby streams or rivers</u> or find ready access to underground water tables.

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[56] <u>See</u> <u>Exelon Generating Company, LLC</u> (Early Site Permit for Clinton ESP Site), LBP-06-28, 64 NRC 460, 495 (2006); <u>Clinton II</u>, CLI-07-12, 65 NRC __, ___ (slip op. at 3-4) (Mar. 8, 2007); <u>Grand Gulf ESP</u>, LBP-07-01, 65 NRC at 54-61; <u>Grand Gulf ESP</u>, CLI-07-14, 65 NRC __, __ (slip op. at 2-3) (Mar. 27, 2007).

. . .

> To meet the requirements of 10 CFR Parts 52 and 100 with respect to accidental releases of liquid effluents, the following specific criteria are used:
>
> 1. Radionuclide transport characteristics of the groundwater environment with respect to existing and future users should be described. Estimates and bases for coefficients of dispersion, adsorption, groundwater velocities, travel times, gradients, permeabilities, porosities, and groundwater piezometric levels between the site and existing or known future surface water and groundwater users should be described and be consistent with site characteristics.

RS-002 at 2.4.13-1 to 2. (emphasis added).

Turning to Dominion's application, the Staff noted at the outset that "completeness and clarity are of paramount importance" in meeting the hydrology requirements of 10 C.F.R. § 100.20(c)(3). FSER at 2-61. Later, the Staff noted that Dominion did not provide the onsite measured values of adsorption and retention coefficients for radioactive materials, calling this "Open Item 2.4-11." FSER at 2-134. The Staff then noted that, in response to Open Item 2-4-11, Dominion assembled a radionuclide inventory from information provided in the AP1000 Design Control Document and the Advanced Boiling Water Reactor Standard Safety Analysis Report. Id. Dominion then screened the inventory to identify those radionuclides that may migrate through the subsurface to Lake Anna with a residual activity in excess of the values listed in Column 2 of Table 2 in Appendix B of 10 C.F.R. Part 20. Id. The applicant assumed an instantaneous release of the radwaste to the saturated zone ignoring any adsorption or retardation from the point of release to Lake Anna and accounted for the radioactive decay in the inventory during migration. Id. Dominion used a travel time of 16 years based on a maximum measured hydraulic conductivity of 3.4 feet per day, a horizontal hydraulic gradient of 0.03 feet per feet, an effective porosity of 0.33, and an estimated travel distance of 1800 feet from release point to Lake Anna. Id. Dominion used distribution coefficients for each of the selected radionuclides based on published values and the measured physical and chemical soil properties at the ESP site. Id.

After reviewing Dominion's response to Open Item 2-4-11, the Staff identified three major issues regarding subsurface migration of radionuclides released accidentally to the accessible environment (Lake Anna and the WHTF):

> The first issue is the composition of the radionuclide inventory and selection of specific radionuclides from the inventory that may be critical to public health and safety. . . . The second issue is the definition or delineation of potential subsurface pathways from the point of release to the accessible environment. The third issue is related to the uncertainty of subsurface hydrological properties that may affect the migration of the radionuclides.

FSER at 2-135 (emphasis added).

With regard to the first issue, the Staff "determined that the applicant's screening procedure for selecting the radionuclides of importance to subsurface hydrological transport may be inappropriate" because "the dose calculations should include all radionuclides that may reach Lake Anna or the WHTF via a subsurface pathway in order to estimate the total dose to an individual using these waters," not just those radionuclides that exceed the acceptable limits as prescribed by Column 2 of Table 2 in Appendix B to 10 C.F.R. Part 20. FSER at 2-135.

With regard to the second issue, the Staff stated that "since the nuclear power plant design has not been selected at the ESP stage and no details regarding the location of an accidental radioactive material release are available, the staff concludes that it is not possible at the ESP stage to delineate all possible subsurface pathways at the ESP site and to evaluate the potential pathways to determine the most critical event." FSER at 2-135. Given that an ESP is, by definition, based on a plant parameter envelope instead of a specific reactor design or details, and does not require a "delineat[ion] of all possible surface pathways" we are uncertain why Dominion could not at least provide a PPE for its application. See § VI.C, infra.

With regard to the third issue, the Staff stated: "[B]ecause of incomplete knowledge of subsurface hydrological and chemical properties and the likely composition of the radwaste effluent itself, significant uncertainty exists in the characterization of radionuclide migration in

the subsurface at the ESP site at the time of ESP review." FSER at 2-136. This uncertainty seems inconsistent with the requirements of 10 C.F.R. §100.20(c)(3) and RS-002. However, the Staff responds to this uncertainty in two ways. First, it postpones "the appropriate subsurface hydrological characterization" until the time of "a COL or CP application" when the reactor design and additional "details related to the radwaste design and location" will be known.[57] FSER at 2-136. Second, the Staff dispenses with the required subsurface hydrological characterization, stating "this issue could be resolved if there were no releases of radionuclides to the ground water" and thus proposing Permit Condition 4, which requires radwaste systems to have "features to preclude" accidental releases. Id. As we will see, despite some confusion by technical members of the Staff, it ultimately acknowledged that proposed Permit Condition 4 does not prohibit releases or establish that there will be "no releases." See § IV.C, infra.

Turning to the evidence presented at the hearing, Mr. Goutam Bagchi, testifying for the Staff, agreed that the in situ measurements required by 10 C.F.R. § 100.20(c)(3) and RS-002 had not been done. EH Tr. at 216-18. Mr. Bagchi stated that instead of such measurements, "it is best to preclude any releases" and postpone this to the COL stage. Id. at 218.

> Mr. Bagchi: They did not use the on-site characteristics, that's why we felt that we, they did not need the regulation, that aspect of the regulation. Therefore we should preclude it.
> Judge Karlin: Preclude it, what do you mean preclude it?
> Mr. Bagchi: Preclude any kind of release. Use the design features, engineered features.
> Judge Karlin: Just say that there will be none?
> Mr. Bagchi: There will be none.

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[57] Dominion has committed that "appropriate source term values would be developed and the consequences of accidental releases of liquid effluents to ground and surface waters would be evaluated in the COL application." Appl. at 2-2-147. The NRC Staff characterizes this as a promise to do a "detailed numerical model . . . as part of any COL application." Staff Answer to Safety Question 48.

Id. at 219-20. When asked how he could reconcile this approach with the Staff's RS-002 (dated 2004), Mr. Bagchi characterized it as an "outdated document." Id. at 225.

The Staff testimony on this point was consistent with its answers to our prior written questions. We had asked "what prevents the Applicant and Staff from developing more sufficient knowledge [data] on the subsurface hydrological and chemical properties at this time?" Board Safety Question 50A. The Staff answered that it was impossible to draw liquid pathways without knowing the "exact location and elevation" of a likely point of accidental release. Staff Answer to Safety Question 50A.

We also asked "what prevents the Applicant and Staff from developing a [PPE] for the 'likely composition of the radwaste effluent'?" Board Safety Question 50B. The Staff responded that "at the ESP stage, the information on the quantity, quality and timing of liquid effluents to be stored in the radwaste tanks is unknown." Staff Answer to Safety Question 50B. We find this answer unresponsive, because, by definition, a PPE is a surrogate that is used when such reactor specific details are not available. Hence the need for the Applicant to provide, at least, the PPE, and hence our question – what prevents the Applicant and Staff from developing PPE parameters on the issue of hydrology?

In our written questions we asked, "how does [the absence of a PPE on hydrology and satisfaction of 10 C.F.R. § 100.20(c)(3)] comport with the Commission's statement that 'where adequate information is not available, early site permits will not be issued?'" Board Safety Question 50D. The Staff responded that "characterization of factors important to [subsurface radionuclide migration], such as soil, sediment, and rock characteristics, is unnecessary if the design precludes inadvertent releases of liquid radioactive effluents during normal operation. Permit Condition 4 would impose such a requirement on the design." NRC Staff Legal Safety Brief at 4 (emphasis added). The Staff adds, in a strange non-sequitur, that "[t]he Commission's statement that ESP's should not be issued if 'adequate information is not available' appears

directed to the information necessary to support analysis of an ESP term up to twenty years, and should not be taken as an instruction to deny an application rather than use permit conditions to address particular issues." Id. at 5 (emphasis added).[58] See § VI.C, infra.

It should be added that Dominion's witness, Dr. Stewart Taylor, correctly pointed out that at least some of the radionuclide transport analysis requirements of RS-002, such as hydraulic conductivity and hydraulic gradient, were met. EH Tr. at 285-86. He acknowledged that others, such as distribution coefficients, were not determined. Id. at 286.

Another hydrology related item that concerned the Board is whether Dominion and the Staff have an adequate baseline as to the hydrology and existing contamination (if any) at the NAPS Site, so as to be able to distinguish any Unit 3 and 4 contamination from any pre-existing contamination and be able to respond to and control the situation if Units 3 and 4 were to experience releases or additional chemical or radiological contamination at the ESP Site. Here, Mr. Bagchi presented a slide stating "Radiological Contaminants: None at ESP site." Staff Exhibit 19 at 5. Upon questioning, however, Mr. Bagchi acknowledged that there are no radiological monitoring wells on the ESP site. EH Tr. at 206. We question how he could assert "no radiological contamination" if no one had even bothered to look for it. Id. Further, Mr. Bagchi acknowledged that "more recent information" indicates that there is some radiological contamination (tritium) at the ESP Site. Id. Mr. Bagchi also testified that there is no known radiological contamination on the NAPS Site. Id. at 207. But again, upon questioning we learned, from Mr. Stoetzel of the Staff, that there is only one radiological monitoring well on the NAPS Site, and he did not know if it is upgradient or downgradient of the existing Units 1 and 2.

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[58] The Statement of Consideration makes no reference to the "use of permit conditions" as a mechanism for issuing an ESP when adequate information is not available. Instead, it suggests that a Partial Decision of Site Suitability Issues (addressing non-hydrology site issues) is the proper solution. 54 Fed. Reg. at 15,378.

Id. at 222. And again, some more recent information now reveals some radiological contamination on the NAPS Site. EH Tr. at 206.

Dominion's witnesses clarified some points. Mr. Matthews testified that there are 19 piezometric wells that measure only groundwater elevation level on the NAPS Site and they are all upgradient of Units 1 and 2. EH Tr. at 254-55. Mr. Matthews indicated, that, as a logical matter, groundwater from the NAPS Site goes into Lake Anna and into the discharge canal in the WHTF. Id. at. 256. This seems logical, but does not dispense with the value of knowing the nature and amount of contamination that may be leaching from the site into the lake. Mr. Tarantino, testifying for Dominion, stated that there are seven observation wells on the NAPS Site (as distinguished from the ESP Site) where Dominion has sampled and analyzed for tritium. Id. at 261-62. Only one of them, he says, seems to show tritium in measurable quantities. Id. at 263. Looking at the seven wells on the maps provided by Dominion, it appears that all seven are upgradient of Units 1 and 2. Compare Dominion Exhibit 12 at 4, 10. Thus, they cannot not tell us whether there are chemical or radiological leaks from the existing Units 1 and 2, and would not help us distinguish any new contamination that might be attributable to Units 3 and 4. Given the absence of downgradient monitoring, the Board is thus not surprised that Mr. Tarantino concluded it "strongly appears that we do not have any active and known found leaks from Unit 1 and 2 operations into groundwater." EH Tr. at 275 (emphasis added).

C. Zero Release Commitment

Prior to the evidentiary hearing, the Board instructed the Staff to produce a subject matter expert or experts to respond to questions concerning "the Staff's proposed permit condition 4 'requiring that an applicant referencing any such ESP design any new unit's radwaste systems to preclude any and all accidental releases of radionuclides into any potential liquid pathways' and the Staff's associated determination to exclude any such releases in assessing the potential environmental impact of the proposed ESP." Hearing Order at 5. The

Board perceived the proposed Permit Condition 4 as committing Dominion to preclude all releases and thus called it the "zero release commitment." We classified this issue as primarily a NEPA issue, because the FEIS simply did not address the possibility that Units 3 and 4 could cause groundwater (and thence lake) contamination and environmental impacts, see FEIS 5-59 to 61; EH Tr. at 635, and because the Commission decision in Clinton II and Grand Gulf resolved and deferred the AEA safety issue. Clinton II, CLI-07-12, 65 NRC at __ (slip op. at 3-4); Grand Gulf ESP, CLI-07-14, 65 NRC at __ (slip op. at 2-3). At a later time, the Board indicated that Dominion was also welcome to provide witnesses on this subject, but it declined.[59]

On April 10, 2007, the Staff informed us of a change in the wording of its proposed Permit Condition 4. The Staff decided to "conform the wording of this proposed permit condition to that addressed by the Commission in its recent decisions regarding identical permit conditions in the Grand Gulf and Clinton ESP proceedings." NRC Staff's Written Statement of Position at 12, n.21 (Apr. 10, 2007). Thus, proposed Permit Condition 4 now requires, as a condition of the grant of the ESP, that:

> radioactive waste management systems, structures and components, as defined in Regulatory Guide 1.143, for a future reactor include features to preclude accidental releases of radionuclides into potential liquid pathways.[60]

See Clinton II, CLI-07-12, 65 NRC at __ (slip op. at 3-4); Grand Gulf ESP, CLI-07-14, 65 NRC at __ (slip op. at 2-3).

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[59] Tr. at 613 (Apr. 18, 2007); Email from David Lewis to North Anna ESP Licensing Board (Apr. 20, 2007) (stating that "Dominion does not intend to present witnesses on Topics 3 (Zero Release) and 7 (NEPA Alternatives)").

[60] This permit condition is numbered 3.E.3 in the draft ESP permit submitted by the NRC Staff. Staff Exhibit 17 at 3. However, it was proposed Permit Condition 4 in the FSER, see FSER at A-3, see also FEIS at J-9, and has consistently been referred to as such by the parties. Accordingly, we will continue to refer to it as proposed Permit Condition 4.

It initially appeared to the Board that even the revised Permit Condition 4 might be construed to require Dominion to assure that there would be zero releases. The likelihood of achieving "zero release" concerned us, because the NRC Staff had previously stated:

> Systems or structures can experience undetected radioactive leaks over a prolonged period of time. Systems or structures that are buried or that are in contact with soil, such as spent fuel pools, tanks in contact with the ground, and buried pipes are particularly susceptible to undetected leakage.

Staff Answer to Environmental Question 62A.

During the evidentiary hearing we explored the Staff's interpretation and intent concerning proposed Permit Condition 4. Most importantly, we grappled with an issue that had likewise bothered both of the prior ESP boards, to wit: whether the proposed permit condition totally prohibits accidental releases.[61] At first, Mr. Gotham Bagchi, who identified himself as the primary originator of the concept of Permit Condition 4, EH Tr. at 621, testified that it was his interpretation and intent that proposed permit condition indeed prohibited all accidental releases from radwaste systems, see id. at 220 ("there will be none"), and that any such releases would violate proposed Permit Condition 4. Id. at 628. Later, however, Mr. Robert Weisman, counsel for the NRC Staff, rejected and reversed this interpretation. Mr. Weisman pointed out that the proper interpretation of proposed permit condition is a legal question. Id. at 630. Mr. Weisman stated the Staff's legal position is that proposed Permit Condition 4 does not prohibit releases, instead requiring that Dominion must provide "adequate protection" against such releases. Id. at 778. Mr. Weisman indicated that it is the Staff's position that actual accidental releases of radioactive contamination to the groundwater would not violate Permit Condition 4. Id. at 780.

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[61] See Grand Gulf ESP, LBP-07-01, 65 NRC at 58 (finding that "the anticipated performance expressed by the Staff in the hearing and the language of the regulations, are far less rigorous than the absolute nature of PC-2 - which precludes 'any and all' radionuclide release," and thus that "the design requirements stated in PC-2 are meant to be a goal of the design feature rather than a specific performance criteria"). See also Clinton ESP, LBP-06-28, 64 NRC at 495 ("We are concerned that the absolute obligation created by Permit Condition 4 is unachievable as a practical matter and, therefore, may be unenforceable as a legal matter").

The second major point gleaned from the testimony was that proposed Permit Condition 4, as amended, does not protect against leaks or releases from spent fuel pools or many other components of a nuclear power plant. This is inherent in the phrase "radioactive waste management systems, structures and components, as defined in Regulatory Guide 1.143" which was added to proposed Permit Condition 4. Mr. Bagchi pointed out proposed Permit Condition 4 "does not cover undetected leakages through pipes and other locations," EH Tr. at 614, and "does not include certain structures, for example spent fuel pool and spent fuel systems." Id. at 615.

> Judge Karlin: What else does it not include in terms of things that might leak?
>
> Mr. Bagchi: There are so many things in a huge nuclear power plant that could leak. I can't begin to list all of them. It is only those associated with radioactive waste management system that's covered.

Id. at 616. Mr. Dehmel of the Staff had previously testified that "some of the highest concentrations of [the radionuclide tritium] are found in [the] spent fuel pool." Id. at 337.

Mr. Bagchi's testimony is confirmed by NRC Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures and Components Installed in Light-Water-Cooled Nuclear Power Plants" (Rev. 2, Nov. 2001), which states:

> Except as noted, this guide does not apply to the reactor water cleanup system, the condensate cleanup system, the chemical and volume control system, the reactor coolant and auxiliary building equipment drain tanks, the sumps and floor drains provided for collecting liquid wastes, the boron recovery system, equipment used to prepare solid waste solidification agents, the building ventilation systems (heating, ventilating, and air conditioning), instrumentation and sampling systems beyond the first root valve, or chemical fume hood exhaust systems. In addition, this guide does not apply to the main condenser circulating or component cooling water systems, the spent fuel handling and storage systems, or the fuel pool water cleanup system.

Reg. Guide 1.143 at 1.143-3 to 4. Additionally, the regulatory guide only applies to "light-water-cooled" nuclear power plants, as its name states, and thus does not apply at all to two of the seven reactor types included in Dominion's ESP application.[62]

The testimony elicited a third significant limitation to the coverage of proposed Permit Condition 4. Specifically, Mr. Bagchi pointed out that when the permit condition uses the term "accidental releases," it does not cover slow undetected leaks into the ground, soil and groundwater. EH Tr. at 619. Mr. Bagchi stated that the term "accidental" refers to "sudden accidental releases," id. at 231, excludes slow long term releases such as tritium, id., and instead concerns "failure of a tank. Failure of a pipe. Some accident causes a puncture or a hole somewhere." Id. at 619. Mr. Bagchi "completely agree[d]" with the Staff statement that "systems or structures can experience undetected radioactive leaks over a prolonged period of time" and that those "that are buried or that are in contact with the soil . . . are particularly susceptible to undetected leakage." Id. at 639.

Mr. Matthews, testifying for Dominion, agreed that the term "accidental" excludes slow leaks, and would not cover issues such as tritium leaks. EH Tr. at 252-53. But Mr. Matthews stated that an analysis of a "rupture instantaneously [releasing] the entire inventory [of a tank] and putting it in the groundwater" is more conservative than analyzing the consequences of a long slow leak. Id. at 287. He also acknowledged, however, that if the slow release went undetected for several years, it might result in a worse situation than a sudden large release that was detected within several weeks. Id.

Focusing on a similar issue, Mr. Bagchi pointed out that although a spent fuel pool is designed to withstand a "design basis accident," and thus designed with features to preclude

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[62] Two of the reactor designs covered by the ESP application are not light-water-cooled reactors. These are the two gas-cooled reactor designs – the Gas Turbine-Modular Helium Reactor (GT-MHR), and the Pebble Bed Modular Reactor (PMBR). See Appl. at 2-1-10.

leakage in the event of a DBA, these design features would not necessarily prevent slow leakage from the spent fuel pool tanks or pipes. EH Tr. at 643.

In sum, the testimony on the meaning and impact of proposed Permit Condition 4 revealed that it is not a "zero release commitment." Proposed condition 4 would require that certain important parts (i.e., "radioactive waste management systems, structures and components, as defined in Regulatory Guide 1.143") of certain types of nuclear reactors (i.e., light-water-cooled reactors) must include "features to preclude" certain releases (i.e., sudden/accidental) of radionuclides into potential liquid pathways. As its name would imply, Regulatory Guide 1.143 would not apply to non-light-water-reactors. It would not apply to spent fuel pools or to many other components that might leak. It would not apply to slow releases. And even where it did apply, it would not prohibit releases, but merely require that the design include "features" intended to preclude releases.

D. Tritium

Prior to the evidentiary hearing, the Board instructed each party to produce a subject matter expert or experts to provide a brief presentation and respond to questions concerning the "sources, release mechanisms, approximate contributions, pathways, and concentrations of tritium associated with nuclear power reactors in general and associated with the NAPS and ESP sites in particular." Hearing Order at 5. The Board was concerned about this issue for a number of reasons. The FEIS indicated that, because of Units 1 and 2, "tritium has concentrated in Lake Anna" and implied that, but for the fact that Dominion amended its application to reduce the annual tritium releases from Units 3 and 4 (from 3,100 curies per year (Ci/yr) per unit to 850 Ci/yr[63]), the tritium concentrations in Lake Anna could or might exceed the

[63] A "curie" is a unit of measurement for radioactivity. "Curie means that amount of radioactive material which disintegrates at the rate of 37 billion atoms per second." 10 C.F.R § 30.4. A "pico-curie" is a trillionth of a curie. EH Tr. at 387-88.

EPA drinking water standard.[64] FEIS at 5-59. (Note, however, that water from Lake Anna is not used directly as drinking water. FEIS at 2-5.) The tritium issue is primarily a NEPA issue because it involves the environmental impacts of the proposed ESP and possible mitigation measures, but the topic also has a safety element because safety regulations require that exposure to radiation be "as low as reasonably achievable" (ALARA). 10 C.F.R. § 50.36a(a).

During the evidentiary hearing, the NRC Staff produced a panel of witnesses who gave a presentation on tritium and responded to the Board's questions.[65] The Staff witnesses provided a slide presentation that was admitted as Staff Exhibit 20. EH Tr. at 52, 53. Likewise, the Board heard testimony on this subject from a panel of Dominion witnesses[66] and Dominion submitted a slide presentation that was admitted as Dominion Exhibit 13. EH Tr. at 62, 63.

Mr. Stoetzel, testifying for the Staff, explained that tritium is a radioactive form of hydrogen with a half life of 12.5 years. EH Tr. at 297-98. Tritium can bond with oxygen to form "tritiated water," which is chemically (but not radioactively) identical to normal water and cannot be filtered from water. Id. at 298. In this decision, the terms "tritium" and "tritiated water" are generally used interchangeably. Tritium presents an internal hazard to humans, primarily from drinking tritiated water or eating fish or other aquatic food that contains tritium. Id. The EPA has set a 20,000 pCi/L "maximum contaminant level" for drinking water.[67]

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[64] "In Dominion ER Revision 9 (Dominion 2006a) the tritium release was revised from 115 TBq/yr (3,100 Ci/yr) per unit to 31.5 TBq/yr (850 Ci/yr) per unit. This value was reduced to ensure concentrations in Lake Anna would not exceed the EPA drinking water standard of 741 Bq/L (20,000 pCi/L) found in 40 CFR Part 141." FEIS at 5-59.

[65] See EH Tr. at 296. The Staff's panel consisted of Greg Stoetzel, the principal Safety and Health Engineer with the Pacific Northwest National Laboratory and Jean-Claude Dehmel. Id. See also Staff Exhibit 20 (Slide Presentation on Tritium).

[66] See EH Tr. at 386. Dominion's panel consisted of Mr. Carl Tarantino, Donald Hintz, Ken Jha, and Dr. Stewart Taylor. Id.

[67] EPA sets the "maximum contaminant level goal" (MCLG) for tritium and other beta

(continued...)

Nuclear reactors are sources of tritium in the environment. Mr. Stoetzel advised the Board that a 1,000 megawatt electric pressurized water reactor is expected typically to release approximately 800 Ci/yr of tritium in liquid effluent and 35 Ci/yr to the air, whereas a heavy water reactor, such as the CANDU ACR-700, is expected typically to release 3,100 Ci/yr in liquid effluent and 3,500 Ci/yr to the air. EH Tr. at 299-300; Staff Exhibit 20 at 5-6.

The mechanisms whereby nuclear power plants discharge tritium or tritiated water, and how Dominion discharges its tritium, were explained by the parties essentially as follows. Different types of water and wastewater from Units 1 and 2 are accumulated in a tank or tanks. EH Tr. at 304 (Dehmel), 434 (Tarantino). Then the operator samples and analyses the radioactivity of the contents of the tank.[68] Id. at 305 (Dehmel), 435 (Tarantino). For Units 1 and 2, the monthly average tritium radioactivity in the collection tank is between 100,000 pCi/L and 10 million pCi/L. Id. at 442 (James Breedon). Then the operator pumps the tank out and discharges the radioactive water via a pipe into the WHTF. Id. at 304 (Dehmel). The discharges do not occur continually, but instead are released in controlled batches. Id. at 305. The amount of radioactivity of the discharge is not monitored at the point it is discharged from the pipe. Id. at 318-21. Instead, the tritium level is measured in the wastewater in the accumulation tank, id. at 320, and at a monitoring point in the second lagoon of the WHTF. Id.

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[67](...continued)
emitters at zero. 40 C.F.R. § 141.55. MCLGs are nonenforceable health goals set at the level "at which no known or anticipated adverse effects on the health of persons would occur, and which allow an adequate margin of safety." 40 C.F.R. § 141.2. EPA sets the enforceable "maximum contaminant level" (MCL) for tritium and other beta emitters at 20,000 pCi/L, a level that avoids producing "an annual dose equivalent to the total body or any internal organ greater than 4 millirem/yr." 40 C.F.R. § 141.66(d). The MCL is commonly referred to as the EPA drinking water standard. Mr. Dehmel testified that the NRC includes the EPA drinking water standard (i.e., MCL) in the technical specifications that a licensee must meet under 10 C.F.R. § 50.36a. EH Tr. at 462.

[68] Actually, the wastewater is analyzed for a radionuclide that is surrogate for tritium and then the amount of tritium is calculated based on established ratios. EH Tr. at 324-25.

at 314. This is approximately 3.4 miles from the discharge point. Id. at 403-04. Dominion does not treat or remove the tritiated wastewater (e.g., solidify and land dispose it) before it is discharged into the WHTF and Lake Anna, deeming it scientifically difficult and/or not cost effective. Id. at 443-44 (Breedon). Instead, compliance is achieved by dilution of the radioactive tritium with the water in the WHTF and Lake Anna. Id. at 319.

Units 1 and 2 routinely release tritium into Lake Anna. FEIS at 5.59. Combined, their total release of liquid tritium into the WHTF and the Lake averages 810 Ci/yr. Dominion Exhibit 13 at 4. But the amounts vary widely from year to year, from 340 Ci/yr to 1,110 Ci/yr during the period of 2000-2005. Id.; EH Tr. at 399-400. Mr. Tarantino testified that the annual liquid discharge from each of the existing units would be approximately 405 Ci/yr. EH Tr. at 400.

Mr. Dehmel testified that, absent Units 1 and 2, the background concentration of tritium in Lake Anna would be less than 170 pCi/L. EH Tr. at 316-17. With Units 1 and 2 operating however, the average tritium concentration in the WHTF is 3,050 pCi/L and in the downstream North Anna River is 2,960 pCi/L. Id. at 315. These values are well below 20,000 pCi/L "maximum contaminant level" set by EPA for drinking water. 40 C.F.R. § 141.66(d).

Dominion developed a bounding estimate of tritium releases from the proposed new Units 3 and 4. EH Tr. at 311; Dominion Exhibit 13 at 8. Dominion's ESP application originally used the range of tritium levels provided by the vendors of the various reactors included in Dominion's ESP application. EH Tr. at 311. For example, the AP1000 vendor estimated that Units 3 and 4 would produce 1,010 Ci/yr total per year of tritium, the ESBWR and ABWR vendors estimated 60 Ci/yr total per year, and the CANDU ACR-700 vendor estimated 3,100 Ci/yr total per year. Dominion Exhibit 13 at 8.

The highest figure for tritium, 3,100 Ci/yr per year, came from Atomic Energy Canada, Limited (AECL), the company hoping to sell its CANDU ACR-700 reactors. EH Tr. at 393. However, Dominion decided that this figure was too high, and that it could achieve "dramatically

lower" tritium effluent releases from the CANDU ACR-700. Id. at 421. This was important because the NRC believed that the additional discharge of 3,100 Ci/yr into Lake Anna, combined with the discharges from the existing units, might cause the lake to exceed the EPA drinking water standard. Mr. Dehmel stated:

> For the ACR-700, [Dominion] initially assigned a value of 3,100 curies per year and after the staff's evaluation, we flagged it to the Applicant and said "Be aware that if you go with 3,100, there is going to be a potential – its going to potentially result in Lake Anna and the waste treatment facility exceeding the EPA drinking water standard of 20,000 picocuries per liter."

Id. at 334. Mr. Dehmel testified that, as a result of this discussion, Dominion reduced its PPE to 850 Ci/yr per unit. Id.; FEIS at 5-59. The NRC Staff made no effort to determine whether 850 Ci/yr is a reasonable value to use for a PPE that includes the CANDU ACR-700.[69] EH Tr. at 334.

Mr. Stoetzel testified for the Staff, and Dominion did not disagree, that if Units 3 and 4 each released 850 Ci/yr of tritium into the WHTF and Lake Anna, then the average concentration of tritium in the lake would rise by approximately 6,400 pCi/L, going from approximately 3,050 pCi/L to approximately 9,400 pCi/L. EH Tr. at 312, 327-28 (Mr. Stoetzel); Staff Exhibit 20 at 10; FEIS at 5-59. The concentration of 9,400 pCi/L represents 47% of the EPA drinking water standard.[70] However, the Staff indicated that each unit would result in a maximum total body dose of 0.81 mrem to the maximally exposed adults, FEIS at 5-59 to 61, and that these levels were within NRC standards.

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[69] Indeed, at a different point Mr. Smith, testifying for Dominion, stated that the CANDU ACR-700 is "not a design we are considering." EH Tr. at 396. If this is so, perhaps Dominion should delete this design from its ESP application, rather than require NRC and this Board to continue to evaluate an entirely hypothetical and already discarded design option.

[70] It was recently reported that "EPA is weighing whether to double the effectiveness factor [i.e. risk] it assigns for tritium," referencing current work by EPA's Science Advisory Panel. EPA Tritium Risk Plan May Force Tighter Nuclear Plamt Controls, Inside EPA (June 15, 2007). This could cut the MCL for tritium down to 10,000 pCi/L. If the ESP is issued before the MCL is changed, Dominion may be grandfathered against any such more stringent tritium standard.

> The design objectives of 10 CFR Part 50, Appendix I are applicable to each reactor unit. Doses to whole body and maximum organ at Lake Anna from liquid effluents [not just tritium] were well within the 0.03mSv/yr (3 mrem/yr) and 0.1 mSv/yr (10 mrem/yr) Appendix I design objectives, respectively.

FEIS at 5-62 (emphasis added); EH Tr. at 464; Staff Exhibit 21 at 13.

The final point to be made concerning tritium is that the figures provided by Dominion and the Staff only include the amounts that Dominion intentionally discharges from its wastewater pipes into the WHTF and Lake Anna. These figures (e.g., 850 Ci/yr per unit, 9,400 pCi/L in the lake, 0.81 mrem per unit) do not include tritium, or any other liquid radionuclides, that might unintentionally leak from Units 1 and 2, or 3 and 4, via groundwater into Lake Anna.

> The staff did not consider leakage to the groundwater as a pathway in the Environmental Impact Statement because of proposed Safety Permit Condition Number 4 which would require the Applicant to submit a rad waste system design with features to preclude accidental releases into potential liquid pathways.

EH Tr. at 306. Figure 5-3 in the FEIS makes clear that NRC did not consider leaks to groundwater (and thence to Lake Anna) as an "exposure pathway to humans" potentially resulting from the operational impact of the proposed ESP. FEIS at 5-60. Mr. Dehmel explained that, unless they are captured by part of the wastewater treatment system, such unplanned and controlled releases are not included in the amounts of tritium covered by the FEIS. See EH Tr. at 342-43. Such "abnormal" releases are simply not accounted for. Id. at 349. The main explanation for excluding such leaks seems to be that proposed Permit Condition 4 precludes them. Also, as will be discussed elsewhere, the parties later testified that, using the normal groundwater flow at the site, it would take 16 years for a leak from the ESP Site to reach Lake Anna. EH Tr. at 786. See also FSER at 2-127. Third, Mr. Smith, testifying for Dominion, stated that by taking "no credit" for any absorption coefficients (i.e., by assuming that any liquid radionuclide would travel with the groundwater without being slowed down or absorbed by the intervening soil), Dominion's groundwater transport model was

conservative and bounding. EH Tr. at 429-31. Mr. Tarantino acknowledged, however, that Dominion currently has no groundwater monitoring wells that are downgradient of existing Units 1 and 2. Id. at 415-16.

The Board's concern over the tritium leak issue was also triggered by the NRC's own Tritium Task Force. In response to unplanned and unmonitored releases of radioactive materials into the environment, the NRC Executive Director for Operations formed the Liquid Radioactive Releases Lessons Learned Task Force on March 10, 2006 and the Task Force issued a Final Report on September 1, 2006.[71] Board Exhibit 1. The Task Force stated that "under the existing regulatory requirements the potential exists for unplanned and unmonitored releases of radioactive liquids to migrate offsite into the public domain undetected." Board Exhibit 1 at ii. The Task Force recommended that "NRC should require adequate assurance that leaks and spills will be detected before radionuclides migrate offsite via an unmonitored pathway." Id. at 22. We agree with this finding and recommendation, which supports our inquiry into this matter in this ESP proceeding.

E. Radiological Releases and Doses from Normal Operations

Prior to the evidentiary hearing, the Board instructed each party to produce a subject matter expert or experts to provide a brief presentation and respond to questions concerning the "radiological releases, pathways, and doses associated with the existing site and the proposed ESP, including the nature, adequacy, and confidence levels associated with the data, estimates, and calculations, the monitoring and measurements performed or to be imposed to assure compliance, and the relevant regulatory standards." Hearing Order at 5-6. Among other things, the Board was concerned as to how the radiological releases and doses were calculated, the process by which operating experience was incorporated into the source term for normal

[71] Liquid Radioactive Release Lessons Learned Task Force Final Report (Sept. 1, 2006), ADAMS Accession Number ML062650312.

releases, how NRC would regulate and segregate the radioactive effluents from the existing Units 1 and 2 versus the radioactive effluents that would be released from proposed Units 3 and 4, and whether the new increment of radiation from these units would be problematic, either as a safety or environmental matter.

During the evidentiary hearing the NRC Staff produced a panel of witnesses who gave a presentation on the radiological releases and doses from normal operations and responded to the Board's questions.[72] The Staff witnesses provided a slide presentation that was admitted as Staff Exhibit 21. EH Tr. at 52, 53. Likewise, the Board heard testimony on this subject from a panel of Dominion witnesses[73] and Dominion also submitted a slide presentation that was admitted as Dominion Exhibit 14. EH Tr. at 62, 63.

At the outset, Mr. Dehmel, testifying for the Staff, explained that the existing and proposed units are subject to a multiplicity of regulations. EH Tr. at 459. First, he referenced 10 C.F.R. §§ 20.1301 and 20.1302, stating that they require "nuclear power reactors" to comply with the annual dose limit of 100 mrem to members of the public and an effluent concentration limit specified in 10 C.F.R. Part 20 Appendix B, Table 2. EH Tr. at 459. (Actually, the regulatory language of 10 C.F.R. § 20.1301(a) applies to "each licensee" and each "licensed operation" rather than to each reactor. This distinction becomes significant if multiple reactors are covered by a single license.) Second, Mr. Demhel noted that 10 C.F.R. § 20.1301(e) requires "reactors" to comply with EPA's radiation protection standard in 40 C.F.R. Part 190. EH Tr. at 459-60. Mr. Dehmel stated that EPA's standard limits the annual dose to members of the public to 25 mrem to the total body. (Actually, this provision is neither reactor nor site specific, and applies to

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[72] The Staff's witnesses for the topic were Mr. Greg Stoetzel and Mr. Jean-Claude Dehmel. See EH Tr. at 457; Staff Exhibit 21.

[73] Dominion's witnesses for the topic were Mr. Ken Jha and Mr. Carl Tarantino. See EH Tr. at 534; Dominion Exhibit 14.

doses "as the result of exposures to planned discharges of radioactive materials, radon and its daughters excepted, to the general environment from uranium fuel cycle operations." 40 C.F.R. § 190.10(a).) Third, Mr. Dehmel pointed us to 10 C.F.R. §§ 50.34a and 50.36a and Part 50 Appendix I "design objectives." EH Tr. at 460; Staff Exhibit 21 at 6. For example, 10 C.F.R. § 50.36a(a) requires licensees to keep releases of radioactive materials "as low as reasonably achievable" (ALARA). As to the design objectives specified in Part 50 Appendix I, we note that they are generally expressed on a "per-reactor" basis that would appear to allow a licensee with, for example, six reactors, to expose the public to six times the specified level of radiation.[74] For example:

> The calculated annual total quantity of all radioactive material above background to be released from <u>each</u> light-water-cooled nuclear power <u>reactor</u> to unrestricted areas will not result in an estimated annual dose or dose commitment from liquid effluents for any individual in an unrestricted area from all pathways of exposure in excess of 3 millerems to the total body or 10 millirems to any organ.

10 C.F.R. Part 50, App. I, § II.A (emphasis added). Dominion indeed takes this more lenient interpretation, asserting that since it is applying for two units, it should be permitted to double its release of radiation under Appendix I. EH Tr. at 543; Dominion Exhibit 14 at 7.

As to the actual doses of radiation to the public from the NAPS Site and proposed ESP Site, the Staff testified that they are well within the above specified regulatory limits. Mr. Stoetzel testified that historical data shows that "doses to the maximally exposed individual around the [NAPS] were a small fraction of the limits specified in the Federal Regulations." EH Tr. at 458. With regard to the proposed new Units 3 and 4, Mr. Stoetzel testified, that according to the Staff's calculations "estimated doses to the maximally exposed individual per unit were

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[74] Appendix I also specifies that "[a]ccount shall be taken of the cumulative effect of all sources and pathways within the plant contributing to the particular type of effluent being considered." 10 C.F.R. Part 50, App. I § 3.

within the 10 CFR Part 50 Appendix I design objectives [and] . . . well within the regulatory standards of 40 CFR Part 190." Id. at 469.

One question that concerned the Board was why the estimated radioactive effluent doses from the proposed Units 3 and 4 are twenty times higher than the doses from existing Units 1 and 2. Specifically, we referred to Table 5.4-11 in the Supplemental Safety Evaluation Report, Staff Exhibit 1, which states that the total exposure to radioactive effluents from the two new units will be 6.4 mrem per year (total body) and that the total exposure from Units 1 and 2 would be 0.32 mrem per year (total body), for a total combined dose of approximately 6.8 mrem per year (total body). See Board Safety Question 85; EH Tr. at 470. Both the Staff and Dominion acknowledged that the exposure from the proposed units was shown as 20 times higher than the exposure from the existing units and explained that this was an "artifact" of the conservative plant parameter envelope. Staff Answer to Safety Question 85; Dominion Answer to Safety Question 85; EH Tr. at 472-74. Asked if the Staff believed that a twenty-fold increase in radioactive effluent complied with the "as low as reasonably achievable" concept, Mr. Dehmel stated that the Staff had not made an ALARA determination, and that this would need to await the time when Dominion actually selected the "kind of rad waste system they're going to have." EH Tr. at 475-76. Mr. Dehmel stated that the ALARA determination is made at the COL stage. Id. at 529.

Mr. Stoetzel testified for the Staff that Dominion's "current operational monitoring program [for Units 1 and 2] is adequate to establish the radiological impacts to the environment related to construction and operation of the proposed units." EH Tr. at 478; Staff Exhibit 21 at 19. But he quickly backed away from this proposition when questioned about NRC's Liquid Radioactive Release Lessons Learned Task Force Final Report (Sept. 2006) which had recommended that reactors should monitor for unplanned releases to groundwater. EH Tr. at 478-79. For example, Mr. Stoetzel was asked, given his endorsement of the current monitoring

program at NAPS, whether Dominion should abandon its proposal to implement a new "groundwater protection initiative." Id. Mr. Dehmel clarified the Staff's position, which was merely that the Staff believes that Dominion's current radiological monitoring program complies with the current regulations and regulatory guidance. Id. at 480-81. He declined to opine as to whether more monitoring, as per the Task Force recommendations, is advisable. Id. at 480.

Various other subjects were covered. The Staff witnesses attempted to explain the origin and derivation of the source terms[75] that the Staff used when calculating the χ/Q values.[76] EH Tr. at 482-93. With regard to the source terms for reactors other than the AP1000, ABWR and ESBWR, Mr. Dehmel stated that, using the PPE concept, they recognized that "four of the designs [covered by Dominion's application] are essentially conceptual designs. There is no operating history or no real information available." Id. at 484. Large variations in the gaseous (25X) and liquid (2X) exposure pathways over the last four-year period for Units 1 and 2 were explained as due to operating outages. Id. at 496. NRC confidence levels associated with the χ/Q values were discussed. Id. at 517-22.

Subsequent testimony from Dominion's witnesses confirmed some of the Staff's testimony. But we also learned, from testimony by Mr. Tarantino, that while the water in Lake

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[75] "'Source term' refers to the magnitude and mix of the radionuclides released from the fuel [in any given event or accident], expressed as a fraction of the fission product inventory in the fuel, as well as their physical and chemical form, and the timing of their release." 10 C.F.R. § 50.2.

[76] In order to calculate the radiation dose that an individual might receive as a result of an event or accident that releases radiation, you must know (or assume) the "source term" (the magnitude and mix of the radionuclides released at the source), the distance between the source of the release and the individual in question, and the amount of dispersion that might occur between these two points. The dispersion is a function of environmental and site conditions such as local meteorology, wind direction and velocity, building and natural structures and barriers, and site size. These parameters are incorporated into a single quantity χ(chi)/Q, which is the airborne concentration of radioactivity (typically in units of Ci/L) divided by the plant release rate of the radioactive material (typically in units of Ci/sec). Multiplying the calculated value of χ(chi)/Q by the plant release rate thereby gives the radioisotopic concentration at the boundary reference point which can then be used to calculate a dose rate.

Anna is not actually used for drinking water, this is used as a conservative assumption by Dominion. EH Tr. at 542. He added that "the tritium contribution to the liquid total body and critical organ doses in 2005 is the majority of its dose. [ ] actually 97½ and 92 percent of the total dose was due to tritium for that particular year." Id. at 543.

F. NEPA Alternatives

Prior to the evidentiary hearing, the Board instructed the Staff to designate and produce a subject matter expert or experts to respond to questions concerning "the Staff's identification [and] consideration of all reasonable alternatives including system design alternatives, alternative sites, and other alternatives and possible mitigation measures." Hearing Order at 6. This is an issue under NEPA and relevant to several of the six fundamental issues that the Board must decide in an uncontested ESP proceeding. For example, NEPA Baseline Issue 1 requires that we determine whether NRC has complied with NEPA Section 102(2)(C)(iii), which states that the NRC must provide a "detailed statement" on "alternatives to the proposed action." 42 U.S.C. § 4332(C). At a later time, the Board indicated that Dominion was also welcome to provide witnesses on this subject, but it declined.[77]

1. Written Evidence on Alternatives

As a baseline for the testimony on this topic, it is important to review the written evidence concerning NEPA alternatives that is found in the FEIS and in Dominion's Environmental Report (ER), Dominion Exhibit 11. At the outset in the FEIS, the NRC Staff indicated that it was following the NEPA alternatives process specified in NUREG-1555, the NRC "Environmental Standard Review Plan for Environmental Reviews for Nuclear Power Plants," (ESRP) specifically, Section 9.3 "Alternative Sites." FEIS at 8-1. The FEIS then devoted two sections to

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[77] See Tr. at 613 (Apr. 18, 2007); Email from David Lewis to North Anna ESP Licensing Board (Apr. 20, 2007) (stating that "Dominion does not intend to present witnesses on Topics 3 (Zero Release) and 7 (NEPA Alternatives)").

alternatives: one on the "Impacts of Alternatives" (FEIS § 8.0) and the other on the "Comparison of the Impacts of the Proposed Action and Alternative Sites" (FEIS § 9.0).

Section 8 covers both "system design alternatives" and "alternative sites." With regard to system design alternatives, § 8 discusses three options for Unit 3 – once-through cooling, wet cooling, and dry cooling. FEIS §§ 8.2.1, 8.2.2, and 8.2.3. No system design alternatives are discussed for Unit 4. Section 8 then addresses "alternative sites," discussing "Dominion's Region of Interest" (ROI) (Section 8.3.1); "Dominion's Alternative Site Selection Process" (Section 8.3.2); "NRC's Evaluation of Alternative Sites" (Section 8.3.3), and "Greenfield and Brownfield Alternative Sites" (Section 8.3.4). The NRC Staff then compares the proposed site (i.e., North Anna) to the three alternative sites selected by Dominion (Surry, Savannah River, and Portsmouth). See FEIS §§ 8.4 to 8.9.

Section 9 of the FEIS then provides a more detailed comparison of the impacts of the proposed action and site relative to the three alternative sites selected by Dominion. In it, the Staff concludes that none of the three alternative sites is environmentally preferable or obviously superior to Dominion's proposed action at the proposed site. FEIS §§ 9.2 and 9.3.

Chapter 9 of Dominion's Environmental Report (ER) covered the topic of "Alternatives to the Proposed Action." ER at 3-9-1. It analyzes two types of alternatives, the no-action alternative, ER Section 9.1, and alternative sites, ER Section 9.3.[78] The alternative sites section of the ER

> presents the alternative site evaluation to determine whether there is any obviously superior site when compared to the ESP site. The ROI for the proposed action is defined, the concept of candidate sites within the ROI is presented, the sites selected as reasonable alternatives are identified, and the preferred site (i.e., the ESP site) is selected.

[78] The ER states that the subject of energy alternatives is not addressed. ER at 3-9-1.

ER at 3-9-1 to 2. The ER describes its technical approach as using the "candidate site criteria described in NUREG-1555, Section 9.3 . . . to screen for candidate sites . . . in the ROI." ER at 3-9-2. Then Dominion did an alternative site evaluation using 45 site suitability criteria. Id.

First, Dominion defined its ROI as the area marked in Figure 9.3-1 in the ER, included here as Appendix B to this decision and marked with diagonal lines. See ER at 3-9-2. It is a large ROI, appearing to cover most of the Eastern United States, and most of Oklahoma, Kansas, and Iowa, and significant portions of Texas, Louisiana, and other central or western states.

Dominion, using the candidate site criteria in Section 9.3 of NUREG-1555, the Environmental Standard Review Plan (ESRP), to screen for candidate sites in the ROI, ER at 3-9-2, selected two federal (Department of Energy) sites – Portsmouth, Ohio, and Savannah River, South Carolina – and three DRI owned nuclear power plant sites – the North Anna Plant, the Surry Power Station in Surry County, Virginia, and the Millstone Power Station in Waterford, Connecticut. Id. at 3-9-6. An additional justification for selecting North Anna and Surry was that each of these sites was originally issued construction permits for two additional nuclear power units. ER at 3-9-6. Millstone was subsequently rejected.[79]

In short, Dominion identified four "candidate sites" within the ROI – North Anna, Surry, DOE Savannah River, and DOE Portsmouth – for further evaluation." ER at 3-9-6. These were the sites that Dominion considered in its "Alternative Site Evaluation" at Section 9.3.4 of the ER. Id.

2. Testimony Regarding Candidate Sites and Alternative Sites

[79] Id. Millstone was rejected from further evaluation because of its location, particularly its large population and its proximity to a special recreation facility. ER at 3-9-6 and EH Tr. at 579 (Kugler).

During the evidentiary hearing on NEPA alternatives, we focused first on the subject of the NRC's duty to consider candidate and alternative sites. Mr. Kugler, testifying for the Staff, stated that they used NUREG-1555 for the NEPA alternatives analysis. EH Tr. at 559. He agreed that NUREG-1555 calls for the identification of an ROI, then the identification of "candidate sites" within the ROI, and then the selection of "alternative sites" from among the candidate sites. Id. at 561-64. Mr. Kugler said that the "candidate sites" were supposed to be "those sites, at least four, that are within the [ROI] that are considered in the comparative evaluation of sites to be among the best that can reasonably be found for the siting of a nuclear powerplant." Id. at 562-63 (emphasis added). He defined "alternative sites" as "those candidate sites that are specifically compared to the proposed site to see if there is an obviously superior site." Id. at 563.

When asked "what candidate sites did you consider . . . what are the best sites that can reasonably be found within that very large area [of Dominion's ROI]?" Mr. Kugler indicated that he couldn't remember whether the FEIS ever used the term "candidate site." Id. at 564. He was not able to identify any portion of the FEIS where the Staff considered or discussed whether Dominion's chosen "alternative sites" (Surry, Savannah River, and Portsmouth) sites were the best "candidate sites" that could reasonably be found in Dominion's ROI. He stated "I've got to admit, the way we state it in the EIS, we don't clearly state that we have done an evaluation of the candidate sites." Id. at 573.

Mr. Kugler summarized the Staff's approach as follows:

> The approach that was used in the ESRP is to review the process used by the applicant, and determine whether they have used a reasonable process to identify candidate sites, to identify the proposed site and the alternatives, and then to compare those sites. And that's the approach we took. We used the slate of sites that the applicant had identified. We determined that the process they used to identify those sites was reasonable, that the slate of sites was reasonable. And then we evaluated the environmental – we evaluated the environmental impacts at the proposed alternative sites and we formed an

> independent comparison of those sites to determine whether any was environmentally preferable to the proposed site.

EH Tr. at 572. Neither Dominion nor the NRC Staff compared sites within the ROI that were owned by other companies. ER at 3-9-6; FEIS at 8-8 to 8-10. Dominion justified the exclusion of competitor sites as reasonable because of the unlikelihood that a competitor would allow Dominion to build a large generator on its site. See Dominion Answer to Environmental Question 121. See also Affidavit of Andrew J. Kugler in Response to 'Dominion's Supplement to the Record on Alternative Sites' and Staff Supplement to the Record in this Proceeding with Respect to Alternative Sites (May 11, 2007).

Focusing on possible candidate sites with nuclear power plants on them, Mr. Kugler agreed that the Staff did not comply with the requirement that "All nuclear power plants within the identified region of interest having an operating nuclear power plant or construction permit issued by the NRC should be compared with the applicant's proposed site." See NUREG-1555 at 9.3-7; EH Tr. at 566. He stated that this was because the Commission had ruled, in 1977, that "it was not considered reasonable to consider sites that are owned by another utility as alternative sites," EH Tr. at 567, citing the Seabrook decision.[80] Public Service Co. of New Hampshire (Seabrook Station, Units 1 and 2), CLI 77-8, 5 NRC 503, 536 (1977). When asked

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[80] The Staff also cited this Seabrook decision in its response to the Board's written questions, stating "applicants do not consider sites that are owned by a different power generation company" and that "this comports with" the Seabrook decision. Staff Answer to Environmental Question 119. It may be true that applicants do not consider such sites. But this does not necessarily absolve the NRC (which is the entity charged with complying with NEPA) to do so under the rule of reason. In any event, the Seabrook decision did not hold, or even state, that NRC cannot or should not consider sites owned by entities other than the applicant when identifying candidate sites or evaluating alternative sites. Indeed, the Seabrook case, where the NRC evaluated eighteen alternative site within a relatively small ROI consisting of New Hampshire and Maine, Seabrook, CLI 77-8, 5 NRC at 536, contrasts sharply with this case, where the NRC considered only 3 alternative sites, within a ROI of almost half of the continental United States. All Seabrook held was that, under the NEPA rule of reason, eighteen alternatives in a small ROI was enough. Id.

why NUREG-1555, written more than twenty years after the 1977 Seabrook case, did not reflect his interpretation of Seabrook, Mr. Kugler said that the NUREG was being updated. Id.

When asked whether North Anna, Surry, Savannah River, and Portsmouth were the "best that could reasonably be found" within the ROI, Mr. Kugler cited page 9.3-6 of NUREG-1555 which states that there will be "special cases" where the proposed site is already the site of a nuclear power plant. EH Tr. at 570. But he later agreed that the "special case" provision only applies to the "proposed site," and does not relieve NRC from going through the candidate site and alternate site analysis for the alternatives. Id. at 575.

Turning to possible non-nuclear power plant sites within the ROI, Mr. Kugler said he did not know how many such sites were within the ROI, EH Tr. at 579, but that it would probably be a large number. Id. at 580. He stated that the NRC did not look at non-nuclear power plants sites owned by other companies, id. at 581, or even those owned by Dominion and its associated companies. Id. at 580.[81]

The Board also questioned the Staff regarding non-power plant sites not owned by Dominion. We asked whether the Staff considered any federally owned sites other than the two DOE sites. EH Tr. at 582. Mr. Kugler testified that NRC did not look at any other federally-owned sites, whether owned by DOE or by any other federal agencies or entities.[82]

The ER and FEIS also generically excluded, after a brief discussion, any greenfield or brownfield sites. E.R. 9.3.3; FEIS at 8-10. See also Kugler Affidavit at 1 through 3; Declaration

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[81] Mr. Kugler later agreed that the presence of nuclear related activities on a site (as opposed to a non-nuclear power plant) "doesn't bear at all" on the environmental preference of a site. EH Tr. at 603-4.

[82] EH Tr. at 582. One of the reasons given for excluding other sites as possible candidate or alternative sites was a concern that they might not have sufficient transmission lines for electrical power. EH Tr. at 598. We note however that there is no assurance that the North Anna site has sufficient transmission line capacity. The Staff has acknowledged that "the applicant might determine that one or more additional lines are needed" for North Anna. Staff Answer to Environmental Question 14A.

of Marvin L. Smith (May 7, 2007). Dominion determined, and the NRC Staff agreed, that they would be unlikely alternative site candidates. ER at 3-9-4. See also Kugler Affidavit at 1-3; Declaration of Marvin L. Smith (May 7, 2007).

Mr. Kugler stated that NRC evaluated the "process" that Dominion used to develop its candidate sites, and used only the Dominion slate in the NRC alternatives analysis. EH Tr. at 582-83. Mr. Kugler said that NRC relied on the Dominion and Bechtel 2000 report, which addressed candidate sites submitted by the applicant, id. at 601, and that this report was "probably similar" to one NRC would have performed. Id. at 602-3.

In addition, we note that NEPA is only procedural in nature and, after requiring that an agency consider all reasonable alternatives, does not require that the most environmentally benign site be chosen. See Seabrook, CLI-77-8, 5 NRC at 528. The Commission has ruled that, once an adequate alternatives analysis is done, the applicant's proposed site will be rejected "only . . . where an alternative site is obviously superior." Id. See also Florida Power & Light Co. (St Lucie Nuclear Power Plant Unit 2), ALAB-435, 6 NRC 541 (1977).

In Section 9.0 of the FEIS, the NRC Staff evaluated the environmental impacts of constructing and operating two new units at the proposed ESP Site and the three alternative sites to determine (1) whether any of the alternative sites is environmentally preferable, and (2) if so, whether any of them is "obviously superior" to the proposed ESP Site. FEIS at 9-1 to 9-9. The Staff concluded:

> None of the alternative sites was determined to be environmentally preferable to the proposed North Anna ESP site. Therefore, the Staff concluded that none of the alternative sites is obviously superior to the proposed North Anna ESP site.

FEIS at 9-9.

3. Testimony Regarding System Design Alternatives

The evidentiary hearing on NEPA alternatives also inquired into the subject of "System Design Alternatives," as covered in Section 8.2 of the FEIS. We noted that NRC considered three system design alternatives for Unit 3 (dry, wet, and once-through cooling water), but considered no system design alternatives for Unit 4. EH Tr. at 585. Mr. Vail, testifying for the Staff stated that they accepted dry cooling for Unit 4 because it would not add to the "cumulative effect" of Unit 3. Id. at 585. He stated: "We're looking at it incrementally. If you add anything incrementally [for Unit 4] that results in a significant water use, which would be anything other than a dry system, you would push it over that threshold." Id. at 587. And again "We don't look at it as not [sic] two units in isolation. It's the cumulative – the cumulative system." Id. at 588.

When asked whether his concern for the cumulative/incremental impacts of the multiple units on the site led him to consider the NEPA alternative of requiring additional water conservation measures on Units 1 and 2 as a trade-off or offset against the incremental and cumulative water impacts of Units 3 and 4, Mr. Vail said no, this was not considered. EH Tr. at 588. This was consistent with his earlier testimony, as follows:

> Judge Karlin: So you didn't look at whether or not the 8700 gallons per minute [evaporative losses] from Unit 3 could be offset by doing something with regard to Units 1 and 2; you did not look at that?
> Mr. Vail: Correct. We did not look at Unit 1 and 2 as mitigation for Unit 3.

Id. at 120.

Prior to the evidentiary hearing, the Staff had acknowledged that "the fact that a possible alternative is beyond the Commission's power to implement does not absolve the Commission of any duty to consider it" but had added that "that duty is subject to a 'rule of reason.' [citations omitted]." NRC Staff Legal Brief in Response to Licensing Board's Environmental- Related Questions [Question 45] at 22. The Staff "did not find it reasonable to consider measures that would interfere with existing operations of reactors other than those that are subject to the

proposed action" reasoning that "imposing such water-saving measures on existing Units 1 and 2 would likely result in derating the plants, thereby reducing generating capacity." Id. In short, the Staff did not discuss or consider this option in its NEPA alternatives analysis because the Staff deemed it unreasonable.

4. Post Hearing Filings Relating to Alternative Sites

At the end of the evidentiary hearing, Mr. Lewis, counsel for Dominion, requested permission to make a post-hearing submission relating to the NEPA alternatives issue, specifically "explaining exactly why Dominion's fossil facilities are not reasonable alternatives that should even be considered." EH Tr. at 787. The Board granted that request. Id. at 790. The NRC Staff then requested an opportunity to respond to Dominion's submission and the Board agreed. Id. at 796, 799.

On May 7, 2007, the Board received Dominion's Supplement to the Record on Alternative Sites (Dominion Supplement) which attached a Declaration of Marvin L. Smith (Smith Declaration) "explaining why the non-nuclear power plants owned by Dominion's affiliates are not reasonable alternatives that should have been identified or considered as candidate sites." Dominion Supplement at 1. Mr. Smith provided several reasons to exclude non-nuclear power plants. First, Mr. Smith stated that the non-nuclear power plants owned by Dominion "typically" lack the land needed to meet the exclusion area requirements for a nuclear power plant. Smith Declaration at 2. Second, Dominion's non-nuclear power plants "typically do not have excess transmission capacity." Smith Declaration at 3. Third, Mr. Smith asserted that non-nuclear power plants are "often sited in locations that are more urban than is appropriate for a nuclear unit." Smith Declaration at 3. Mr. Smith then sought to "demonstrate the reasonableness" of Dominion's judgment, by saying that Dominion has "examined the characteristics of the non-nuclear power plant sites owned by its affiliates" and that "this examination revealed only one such site that would be big enough to provide an appropriate

exclusion area." Id. Mr. Smith then informed us that this undisclosed site is unsuitable because it would not have sufficient water resources to support a wet/dry cooling system (assuming, it appears, that wet/dry cooling is a siting prerequisite). Id. As a legal matter, Dominion cited Commission case law to the effect that the Board can and should use Dominion's supplemental information to "amend the FEIS pro tanto" and base its NEPA decision on the amended record. Dominion Supplement at 1-2.

On May 11, 2007, the Board received the "NRC Staff Response to 'Dominion's Supplement to the Record on Alternative Sites' and Staff Supplement to the Record" (NRC Staff Response). At the outset we note that the NRC Staff Response goes far beyond what it requested, i.e., the opportunity to respond to Dominion's submission about its non-nuclear sites. EH Tr. at 796-97. The Staff argued that the Dominion Supplement was not necessary because the Staff evaluation of alternative sites was adequate. NRC Staff Response at 1. The Staff proceeded to submit an affidavit from Mr. Kugler.[83] Mr. Kugler reiterated his oral testimony, asserting that the Staff followed the guidance of NUREG-1555 Section 9.3 in evaluating candidate sites because "the Staff determined that Dominion employed a reasonable process" for identifying and evaluating candidate sites. Kugler Affidavit at 2. Mr. Kugler then recites a list of activities from Dominion's ER. Id. Dominion described a large ROI. Id. Dominion eliminated "large numbers of potential sites in the ROI, both greenfield and brownfield" on a "generic basis." Id. at 2-3. Dominion decided generically that greenfield sites were not reasonable. Dominion decided generically that brownfield sites were not reasonable. Id. at 3. Dominion rejected, and the Staff agreed, any consideration of existing nuclear sites owned by other companies, as not reasonable. Id.

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[83] Affidavit of Andrew J. Kugler in Response to 'Dominion's Supplement to the Record on Alternative Sites' and Staff Supplement to the Record in this Proceeding with Respect to Alternative Sites (May 11, 2007) (Kugler Affidavit).

G. Seismic Safety

Prior to the evidentiary hearing, the Board instructed each party to produce a subject matter expert or experts to provide a brief presentation and respond to questions concerning the "geology and seismology of the proposed ESP site and nature, adequacy, and confidence levels associated with the data and the standards used by the Staff to assess the seismic safety of the proposal." Hearing Order at 6. One of the reasons the Board was concerned about this issue was because the FSER indicated that the proposed ESP Site did not meet the "reference probability" set forth in NRC Regulatory Guide 1.165 "Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion" (Mar. 1997). FSER at 2-178.

Seismic siting factors are part of the safety determination this Board must make, primarily under AEA Safety Issue 2, which requires the presiding officer to "determine whether, taking into account 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 and operated without undue risk to the health and safety of the public." 10 C.F.R. § 52.21; Supra p. 12-13. Part 100, which deals with "Reactor Site Criteria," specifies that the Commission will consider the physical characteristics of the proposed site, including the geologic and seismic siting factors. 10 C.F.R. § 100.20(c)(1). The principal geologic and seismic considerations that guide the Commission in its evaluation of the suitability of a proposed site are set forth in 10 C.F.R. § 100.23, "Geologic and seismic siting criteria." The main criterion is whether there is a "reasonable assurance that a nuclear power plant can be constructed and operated at the proposed site without undue risk to the health and safety of the public." 10 C.F.R. § 100.23. Subsections (c) and (d) of this regulation, "Geological, seismological, and engineering characteristics" and "Geologic and seismic siting factors," respectively, govern ESP siting decisions. See 10 C.F.R. § 100.23(a). For example, the regulations specify:

> The geological, seismological, and engineering characteristics of a site and its environs must be investigated in sufficient scope and detail to permit an adequate evaluation of the proposed site, to provide sufficient information to support evaluations performed to arrive at estimates of the Safe Shutdown Earthquake Ground Motion [SSE], and to permit adequate engineering solutions to actual or potential geologic and seismic effects at the proposed site.

10 C.F.R. § 100.23(c). An SSE is "the vibratory ground motion for which certain structures, systems, and components are designed, pursuant to Appendix S to 10 C.F.R. Part 50, to remain functional." Reg. Guide 1.165, App. A at 1.165-10. The regulations specify that paragraph IV(a)(1) of Appendix S to 10 C.F.R. Part 50 defines the "minimum SSE." 10 C.F.R. § 100.23(d)(1). That paragraph states that "[t]he nuclear power plant must be designed so that, if the [SSE] occurs, certain structures, systems, and components will remain functional and within applicable stress, strain, and deformation limits." 10 C.F.R. Part 50 App. S ¶ IV(a)(1)(ii).

Meanwhile, the NRC Staff issued Reg. Guide 1.165 to help it implement 10 C.F.R. § 100.23(c) and (d). Reg. Guide 1.165 at 1.165-1. That regulatory guide establishes the Staff's regulatory position with regard to "probabilistic seismic hazard analysis [PSHA] procedures" and "procedures for determining the SSE." Reg. Guide 1.165 at 1.165-6, 7, respectively. The regulatory guide establishes the "reference probability SSE" against which any proposed new reactor site in the central or eastern United States must be judged, as "Median 1 x 10^{-5}." Reg. Guide 1.165, App. B, Figure B.2. See also Staff Answer to Safety Question 58. "The reference probability (1 x 10^{-5}) is used to determine the controlling earthquakes for the site." Staff Answer to Safety Question 57.

The FSER spent over 100 pages on the subject of "geology, seismology, and geotechnical engineering" and we will not attempt to summarize that discussion here. FSER 2-140 to 2-251. We note however that the Staff examined the geology in the area of the ESP Site and concluded that "no capable tectonic faults exist in the plant site area (5 mi) that have the

potential to cause near-surface displacement" and further that "no capable tectonic sources have been identified in the [Central Virginia Seismic Zone]."[84] Id. at 2-168.

The FSER also dealt with the fact that the ESP Site does not meet the reference probability established by Reg. Guide 1.165 as a health and safety standard. The SSE reference probability under Reg. Guide 1.165 "using median hazard results, is 10^{-5} per year." FSER at 2-177. Dominion, however, requested a "higher reference probability" of a "mean hazard value of 5×10^{-5}." Id. at 2-178. Dominion sought to justify the higher SSE reference value by arguing that (1) revised ground motion models indicate that the sites used for the Reg. Guide 1.165 reference value were subject to higher ground motion (i.e., were riskier) than previously thought, (2) the mean recurrence time for certain large earthquakes in the New Madrid and Charleston regions has decreased (i.e., such earthquakes are more likely to recur) and (3) the use of a mean hazard value instead of a median hazard value results in a higher reference probability because mean hazard curves lie above median hazard curves. Id. The Staff indicated that it performed an independent analysis and "was able to verify that the

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[84] A "capable tectonic fault or source" is a

> tectonic structure that can generate both vibratory ground motion and tectonic surface deformation such as faulting or folding at or near the earth's surface, which includes "at least one of the following characteristics:
>
> a. Presence of surface or near surface deformation of landforms or geologic deposits of a recurring nature within the last approximately 500,000 years or at least once in the last approximately 50,000 years.
>
> b. A reasonable association with one or more moderate to large earthquakes or sustained earthquake activity that are usually accompanied by significant surface deformation
>
> c. A structural association with a capable tectonic source having characteristics of either section a or b in this paragraph such that movement on one could be reasonably expected to be accompanied by movement on the other.

Reg. Guide 1.165, App. A, 1.165-10. See also Staff Answer to Safety Question 52.

reference probability proposed by the applicant ($5x10^{-5}$) is sufficiently conservative." Id. at 2-200. Accordingly, the Staff concluded that the ESP Site is "consistent with Appendix S to 10 CFR Part 50," and that "the applicant's SSE was determined in accordance with Reg. Guide 1.165." Id. at 2-201.

Turning to the evidentiary hearing, the NRC Staff produced one witness, Dr. Clifford Munson, Senior Geophysicist, NRC Office of New Reactors, to provide a presentation and answer questions concerning seismic safety. EH Tr. at 645. Dr. Munson provided a slide presentation that was admitted as Staff Exhibit 23. EH Tr. at 52, 53. Likewise, the Board heard testimony on this subject from a panel of Dominion witnesses[85] and Dominion submitted a slide presentation that was admitted as Dominion Exhibit 16. EH Tr. at 692.

The presentation and testimony by the Staff's witness, Dr. Munson, elicited several key points. Dr. Munson pointed out that Reg. Guide 1.165 establishes an SSE reference probability of 1×10^{-5} median, EH Tr. at 651, and that the proposed ESP Site does not meet this criterion. Id. at 662. He stated that although Reg. Guide 1.165 allows the reference probability to be updated, NRC has not updated it. Id. at 663. However, he indicated that, because of a better understanding of the 29 sites upon which the reference value was based, it no longer reflects a current understanding of the seismic hazard, id. at 660, and that if the reference probabilities were recalculated based on current knowledge the probability of earthquakes would likely be higher. Id. at 652.

Dr. Munson went on to agree that, because the proposed ESP Site does not meet the SSE reference probability of 1×10^{-5} median, Dominion requested that the Staff accept a different SSE probability, i.e., 5×10^{-5} mean. EH Tr. at 651. Dr. Munson agreed that Dominion

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[85] Dominion's witnesses for the issue were Dr. William Lettis, Dr. Robin McGuire and John Davie. See EH Tr. at 693-94.

was asking for a more lenient standard for the seismic risk at the ESP Site. Id. at 663, 670, 676.

Although Dominion was requesting a relaxation in the otherwise applicable SSE reference probability (1 x 10^{-5} median), Dr. Munson testified that it was his opinion, and the Staff's conclusion, that the SSE probability requested by Dominion was justified. EH Tr. at 653, 678.

> The Staff concluded that the revised reference probability adequately reflects the current understanding of seismic hazard in the Central and Eastern U.S. and the ESP site is acceptable from a geologic and seismological standpoint and the applicable regulations have been met.

Id. at 653. See also Staff Exhibit 23 at 13. This conclusion was based on a number of factors, including (a) the difference between the use of median and mean values ("the mean hazard curves are higher than the median curves because the ground motion is generally normally distributed," EH Tr. at 658), (b) the fact that current hazard estimates reveal that the Reg. Guide 1.165 reference value "no longer reflects a current understanding of seismic hazard," id. at 660, and (c) the conclusion that high frequency ground motions are not a significant risk to reactors at this site. Id. at 690.

Turning to Dominion's witnesses, Dr. Lettis focused on the unnamed "fault 'a'" that traverses the proposed ESP Site. EH Tr. at 698. Most importantly, he testified that studies showed conclusively that unnamed fault 'a' is not a capable tectonic fault or source. Id. at 699. It has not been active in the last approximately 200 million years. Id.; Id. at 708, 710. In addition, Dr. Lettis testified that he studied the issue in the field and concluded that unnamed fault 'a' is not as long as Dr. Lou Pavlides, of the US Geological Survey, had suggested. Id. at 701-07. Dr. Lettis also testified that it was his opinion that the use of Dominion's alternative approach to the SSE probability is acceptable. Id. at 746.

Dr. McGuire, testifying for Dominion, acknowledged that the proposed ESP Site does not meet the 1 x 10^{-5} median SSE reference probability specified in Reg. Guide 1.165. EH Tr. at 727. But he testified that the use of the 5 x 10^{-5} mean SSE probability is conservative, id. at 725, and safe. Id. at 745. He said that Dominion's proposed value is very similar to the results that would be obtained by using a performance based calculation. Id. at 733-34.

V. DECISIONS ON THE SIX FUNDAMENTAL ESP QUESTIONS

As noted above, in an uncontested proceeding for an ESP, the Board makes six fundamental decisions. Supra p. 9-16. For three of these decisions (two AEA issues and one Overriding NEPA issue), the Board's role is analogous to that of an appellate court applying the "'substantial evidence" test, Clinton I at 39, where the Board must decide "whether the application and the record of the proceeding contain sufficient information and the review of the application by the Commission's staff has been adequate to support [the relevant findings] . . . proposed to be made . . . by the Director of [NRR]." See 10 C.F.R. § 2.104(b)(2) and 68 Fed. Reg. 67,489 (Dec. 2, 2003). For the other three fundamental issues, the NEPA Baseline Issues, the Board instead "must reach [its] own independent determination of uncontested NEPA baseline questions." Clinton I at 45. For all six fundamental issues, however, the Board is to make its decisions without conducting a "de novo" review.

The following is our analysis and decision on each of these six issues. For logical convenience, we will cover the two AEA safety issues first, the three NEPA baseline issues second, and the Overriding NEPA issue last.

A. Decision on AEA Safety Issue 1

The first decision that the Board must make is whether the application and the record of the proceeding contain sufficient information, and the review of application by the NRC Staff has been adequate to support a negative finding on the question whether the issuance of the ESP

will be inimical to the common defense and security or to the health and safety of the public. See AEA § 103d, 10 C.F.R. § 50.40(c), 10 C.F.R. §2.104(b)(2)(i), and Clinton I at 33 n.32. The Commission has referred to this as "AEA Safety Issue 1," Clinton I at 33 n.32, and characterized it as analogous to judicial "appellate review." Id. at 39 ("An analogy is to the function of an appellate court, applying the 'substantial evidence' test").

In making our decision on AEA Safety Issue 1, the Board took an independent "hard look" at the Staff's findings, but did not attempt to duplicate them. See Clinton I at 34. Rather than conducting a de novo determination, we probed the facts and logic behind the Staff's FSER to determine whether the Staff's review was adequate and whether the record supported a finding that issuance of the ESP would not be "inimical to the common defense and security or to the health and safety of the public."

After our review of the record, including relevant portions of Dominion's application, the FSER, the answers to our safety questions, the prefiled written testimony, and the live testimony heard during the evidentiary hearing, the Board concludes that the application and the record contain information that is sufficient, and the review by the NRC Staff has been adequate, to support a finding that the issuance of the ESP would not be inimical to the common defense and security or to the health and safety of the public, subject to the permit conditions, COL Action Items, site characteristics and bounding parameters contained in Appendix A to the FSER and the conditions specified in the Draft ESP Permit submitted by the NRC Staff as Exhibit 17. In particular, we reviewed section 11 "Radiological Effluent Release Dose Consequences from Normal Operations," and section 15 "Accident Analysis," in both the FSER and Supplemental FSER, and we asked over a dozen written questions (e.g., Safety Questions 72-87) concerning radiological effluents and doses. We asked a similar number of questions concerning design basis accident radiological exposures and dispersion calculations (e.g., Safety Questions (99-107)). In this regard, we are satisfied that the record is sufficient, and the

Staff review has been adequate to support the conclusion that the issuance of the ESP will not result in exceeding of any of NRC's existing numeric radiological standards for the siting of nuclear power plants.[86] Although unresolved issues exist and may be addressed if and when Dominion actually applies to construct Unit 3 and/or 4, this Board, exercising its appellate review function on AEA Safety Issue 1, finds that the issue has been satisfied.

B. Decision on AEA Safety Issue 2

The second decision that the Board must make is whether the application and the record of the proceeding contain sufficient information and the review of application by the NRC Staff has been adequate to support a positive finding that, taking into consideration the site criteria contained in 10 C.F.R. Part 100, a reactor, or reactors, having the characteristics that fall within the parameters for the site, can be constructed without undue risk to the health and safety of the public. See 10 C.F.R. §§ 52.21, 2.104(b)(2)(i) and 2.104(b)(1)(i)(d); 68 Fed. Reg. at 67,489; Clinton I at 33 n.32. The Commission has referred to this as "AEA Safety Issue 2." Clinton I at 33 n.32. We approached this decision in the same "appellate review" manner as AEA Safety Issue 1 above. We took a hard look at the FSER, probed the Staff's facts and logic, but did not conduct a de novo review.

Our first step in considering AEA Safety Issue 2 was to study the site criteria that the issue specifically refers to, i.e., 10 C.F.R. Part 100. This part establishes numerous factors to consider when evaluating a proposed site, including population density and use characteristics, the nature and proximity of man-related hazards such as airports and the physical characteristics of the site including seismology, meteorology, geology and hydrology. See 10

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[86] We recognize that an ESP, by itself, does not set numeric radiological standards, because, inter alia, it is only one step (the siting approval step), in the process for obtaining regulatory approval to build nuclear reactors. In addition, the non-numeric ALARA standard has not been resolved and will be addressed if and when a COL application is submitted. See EH Tr. at 475-76, 529-30.

C.F.R. § 100.20. Non-seismic siting criteria include the requirement to have an exclusion area and a low population zone and to consider the population center distance, site atmospheric dispersion characteristics, radiological release limits and dose consequences, hydrology, and the proximity of transportation routes, industrial locations and military facilities. See 10 C.F.R. § 100.21. Geologic and seismic siting criteria include the geological, seismological and engineering characteristics of the site and the PPE, the ability to satisfy the safe shutdown earthquake ground motion criteria, the potential for surface tectonic and nontectonic deformations and other factors such as soil and rock stability, liquifaction potential, and slope stability. 10 C.F.R. § 100.23.

The Staff discussed all of these issues, and more, in the FSER. We reviewed the FSER, and some relevant parts of Dominion's application, and posed over 100 safety-related questions, many of them focusing on 10 C.F.R. Part 100 siting issues. These questions covered matters such as population densities and growth projections, Board Safety Questions 4, 5, 6; transportation routes, Board Safety Questions 7, 8; meteorology, Board Safety Questions 10, 13-6, 23, 37-39, 42-44; hydrology, Board Safety Questions 45-50; tectonic sources and faults, Board Safety Questions 52-55; safe shutdown earthquakes, Board Safety Questions 56-63, 71; and soils, Board Safety Questions 67-68. In addition, the evidentiary hearing covered four safety-related topics relevant to the 10 C.F.R. Part 100 siting criteria: (1) Site Characteristics (Hydrology, Groundwater, Isotope Transport), supra p. 28-36; (2) the Zero Release Commitment, supra p. 36-41; (3) Tritium, supra p. 41-47, and (4) Seismic Safety, supra p. 62-67.

For purposes of AEA Safety Issue 2, the first three of these topics are associated with the meaning and impact of proposed Permit Condition 4, an issue that concerned both prior

ESP Boards[87] and that has been specifically addressed by the Commission.[88] The relevant regulatory issue is whether AEA Safety Issue 2 is satisfied, given the fact that the Staff[89] and Dominion[90] both acknowledge that Dominion has not provided all of the siting information required by Part 100, such as distribution coefficients and other hydrologic information that "must be obtained from on-site measurements" under 10 C.F.R. § 100.20(c)(3).

In its most recent ESP decision on March 27, 2007, the Commission, focusing on a similar permit condition, asked the parties to brief the issue of "deferring any further site characterization relating to radionuclide transport until the construction permit or combined license (COL) stage." Grand Gulf, CLI-07-14, slip op. at 2. Without expressly saying so, the Commission approved such deferral by modifying the permit condition slightly and then issuing the ESP. Id. Accordingly, the Commission decision binds us here, with the result that, at least with regard to AEA Safety Issue 2, any gaps and questions concerning groundwater transport and hydrology safety issues are acceptable and deferred until the construction permit or combined license stage. Our discussion and analysis of these issues in Sections IV.B, C, and D supra may shed some light on these matters, however, and identify questions and issues that remain unresolved.

Inasmuch as 10 C.F.R. Part 100 also imposes seismic siting criteria, we examined this topic in our consideration of AEA Safety Issue 2. During the evidentiary hearing, we satisfied ourselves that the record supports the Staff's conclusion that "unnamed fault 'a'," which

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[87] See Clinton ESP, LBP-06-28, 64 NRC 460, 495 (2006); Grand Gulf ESP, LBP-07-01, 65 NRC at 54-61.

[88] Clinton II, CLI-07-12, 65 NRC at ___ (slip op. at 3-4); Grand Gulf ESP, CLI-07-14, 65 NRC at __ (slip op. at 2-3).

[89] EH Tr. at 216-18.

[90] EH Tr. at 286.

underlies the proposed ESP site, has been dormant for approximately 200 million years. EH Tr. at 699, 710. We also elicited the fact that although the proposed ESP Site does not meet, and is more lenient than, the safe shutdown earthquake ground motion "reference probability" of 1 x 10^{-5} median earthquake per year established by Reg. Guide 1.165, see FSER 2-178, EH Tr. at 663, 670, 676, the Staff has examined this issue and reasonably concluded that the alternative proposed by Dominion (5 x 10^{-5} mean) is sufficiently conservative and is consistent with the requirements of Appendix S to 10 C.F.R. Part 50.[91] FSER at 2-200 to 201; EH Tr. at 653, 678.

Accordingly, the Board concludes, with reference to AEA Safety Issue 2, that Dominion's application and the record of this proceeding contain sufficient information, and the review of the application by the NRC Staff has been adequate to support a positive finding that, taking into consideration the site criteria contained in 10 C.F.R. Part 100, a reactor, or reactors, having the characteristics that fall within the parameters for the site, can be constructed without undue risk to the health and safety of the public.

C. NEPA Baseline Issue 1

NEPA Baseline Issue 1 the Board must independently consider and decide, whether the requirements of NEPA Sections 102(2)(A), (C), and (E) and of the Commission's NEPA regulations at 10 C.F.R. Part 51 have been met. We are required to make this decision pursuant to 10 C.F.R. § 51.105(a)(1) and Calvert Cliffs, 449 F.2d at 1109. See also 10 C.F.R. § 2.104(b)(3)(i) and the original notice for this proceeding, 68 Fed. Reg. at 67,489. Our decision on NEPA Baseline Issue 1 is an independent executive function-type of decision (e.g., the Board is serving as a surrogate decision-maker for the Commission), rather than the "appellate review" and "substantial evidence test" decision like that called for in the two AEA Safety Issues. This is further demonstrated by the fact that the NEPA Baseline Issues do not include the

[91] Appendix S to 10 C.F.R. Part 50 is imposed as a siting criterion by 10 C.F.R. § 100.23(d)(1).

injunction that the Board decide "whether the application and the record of the proceeding contain sufficient information and the review of the application by the Commission's staff has been adequate to support [the relevant findings] . . . proposed to be made . . . by the Director of [NRR]." See 10 C.F.R. § 104(b)(2); 68 Fed. Reg. at 67,489. Instead, NEPA Baseline Issue 1 requires us to decide an ultimate question – whether the requirements of NEPA sections 102(2)(A), (C) and (E) have been met.[92]

NEPA sections 102(2)(A), (C), and (E) state:

> (2) all agencies of the Federal Government shall:
> (A) utilize 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;
>
> . . . .
>
> (C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment; a detailed statement by the responsible official on–
>
> > (i) the environmental impact of the proposed action,
> > (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
> > (iii) alternatives to the proposed action,
> > (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
> > (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.
>
> . . . . .
>
> (E) study, develop, and describe appropriate alternatives to recommend courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;

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[92] Likewise, in making our decision on the NEPA Baseline Issues, we are not acting as a reviewing court pursuant to the Administrative Procedure Act, which calls upon courts to decide the narrow issue as to whether the "agency action" was "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). See Envtl. Law and Policy Ctr. v. NRC, 470 F.3d 676, 682 (7th Cir. 2006). Instead, we are acting as the initial decision-maker (subject to Commission review), in a role akin to the Commissioners. We study the FEIS, evaluate it, ask pertinent questions, and decide whether the license should be issued, denied, or appropriately conditioned.

NEPA § 102(2)(A), (C) and (E), 42 U.S.C. § 4332(2)(A), (C) and (E). This statutory provision makes clear that NEPA Baseline Issue 1 covers three subparts, one of which includes five sub-issues.

NEPA and the Commission regulations state that "to the fullest extent possible . . . all agencies of the Federal Government shall comply with the procedures in section 102(2)." NEPA § 102(1), 42 U.S.C. § 4332(1), and 10 C.F.R. § 51.10(a). "NEPA's "dual purpose' is to ensure that federal officials fully take into account the environmental consequences of a federal action before reaching major decisions and to inform the public, Congress, and other agencies of those consequences." Private Fuel Storage, L.L.C. (Independent Spent Fuel Storage Installation), CLI-02-25, 56 NRC 340, 352 (2002) (citing Robertson v. Methow Valley Citizens Council, 490 U.S. 87, 97 (1983) and other cases). However, NEPA requires only a discussion of reasonably foreseeable impacts and its application is subject to the "rule of reason." Id. See also New York v. Kleppe, 429 U.S. 1307, 1311 (1974).

A central element of NEPA is that each agency must prepare an environmental impact statement (EIS) for any "major Federal action significantly affecting the quality of the human environment." NEPA § 102(2)(C), 42 U.S.C. § 4332(2)(C). And the "heart" of the EIS is the alternatives analysis required by NEPA Section 102(2)(C)(iii). See 10 C.F.R. Part 51, App. A, § 5 ("This section [alternatives analysis] is the heart of the environmental impact statement"). See also 40 C.F.R. § 1502.14; City of Shoreacres v. Waterworth, 420 F.3d 440, 450 (5th Cir. 2005). "All reasonable alternatives will be identified" in the EIS and "[a]n otherwise reasonable alternative will not be excluded from discussion solely on the ground that it is not within the jurisdiction of the NRC." 10 C.F.R. Part 51, App. A, § 5. See also Seabrook, ALAB-471, 7 NRC at 486 and other cases cited by the Staff in the NRC Staff Legal Environmental Brief at 22. "Agencies need only discuss those alternatives that are reasonable and will bring about the

ends' of the proposed action." Hydro Resources, Inc. (P.O. Box 777, Crownpoint, NM 87313), CLI-01-04, 53 NRC 31, 55 (2001); NRC Staff Legal Environmental Brief at 22.

The NRC regulations for ESPs implement the NEPA requirements as follows:

> The Commission shall prepare an environmental impact statement during the review of the [ESP] application, in accordance with the applicable provisions of 10 C.F.R. part 51, provided however that the draft and final environmental impact statements prepared by the Commission focus on the environmental effects of construction and operation of a reactor, or reactors, which have the characteristics that fall within the postulated site parameters, and provided further that the statement 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 alternatives to the site proposed.

10 C.F.R. § 52.18. In short, an FEIS must be prepared and it must focus on the environmental effects of construction and operation of the reactors covered by the ESP application. It need not include an assessment of benefits, such as the need for power, but it must include an evaluation of alternative sites. In this regard, the Seventh Circuit recently held that 10 C.F.R. § 52.18, whereby NRC defers the NEPA analysis of the need for power until the combined operating license stage, does not violate NEPA. Envtl. Law and Policy Ctr. v. NRC, 470 F.3d 676, 682 (7th Cir. 2006).

We now turn to our analysis and decision as to each of the three sub-parts of NEPA Baseline Issue 1.

1. NEPA Section 102(2)(A)

Section 102(2)(A) requires that the NRC use 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." NEPA § 102(2)(a), 42 U.S.C. § 4332(2)(A). Our review of the FEIS confirms that the NRC used a systematic and interdisciplinary approach covering, inter alia, meteorology, seismology, geology, hydrology, ecology, radiological health physics, socioeconomic factors,

and historic and cultural resource factors. These analyses were prepared by a diverse array of engineers, scientists, and social scientists, as shown in Appendix A to the FEIS. In addition, the NRC Staff consulted with numerous agencies and organizations with relevant expertise, as shown in Appendices B and C to the FEIS. The Board has no difficultly in concluding that NEPA Section 102(2)(A) has been satisfied.

2. NEPA Section 102(2)(C)

The second subpart of NEPA Baseline Issue 1 involves the independent consideration of whether the requirements of NEPA Section 102(2)(C) have been met. This statutory provision has five sub-elements. It requires that, for every major Federal action significantly affecting the quality of the human environment, the NRC must issue a detailed statement by the responsible official on (i) the environmental impact of the proposed action, (ii) any unavoidable adverse environmental effects, (iii) alternatives to the proposed action, (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. NEPA § 102(2)(C)(i)-(v), 42 U.S.C. § 4332(2)(C)(i)-(v). The FEIS, which this Board studied at some length, is the Staff's method of complying with NEPA Section 102(2)(C) and 10 C.F.R. Part 51.[93]

As set forth below, the majority of this Board concludes that the FEIS satisfies the requirements of NEPA Section 102(2)(C).

a. NEPA Section 102(2)(C)(i)

With regard to NEPA Section 102(2)(C)(i) (environmental impacts) the FEIS describes the environmental impacts of both the construction and operation of the two units at the proposed ESP Site, including land-use impacts, meteorological and air quality impacts, water-

[93] Appendix A to Part 51 provides NRC's basic format and instructions for doing an EIS.

related impacts, ecological impacts, socioeconomic impacts, historical and cultural resource impacts, environmental justice impacts, and radiological and non-radiological health impacts. FEIS §§ 4, 5. The FEIS also covers fuel cycle impacts, transportation impacts, and cumulative impacts. FEIS §§ 6, 7. We recognize, as discussed above, that FEIS did not address one possible environmental impact, i.e., groundwater contamination (and resulting lake impacts) from proposed Units 3 and 4. See FEIS 5-59 to 5-61; EH Tr. at 635. However, proposed Permit Condition 4 requires measures to preclude such impacts and, in any event, it is clear that the issue of groundwater impacts must be addressed at the COL stage. In addition, although we have raised the question as to whether the Staff's investigation and discussion of the impacts on minority and low-income populations satisfies the Commission's policy on environmental justice, see § VI.A infra, we believe, on balance, that the FEIS discussion on this matter did not violate NEPA Section 102(2)(i). In sum, we conclude that the FEIS provides a sufficient description of the reasonably foreseeable impacts of the proposed action.

b. NEPA Section 102(2)(C)(ii)

With regard to NEPA Section 102(2)(C)(ii), we are likewise satisfied that the FEIS provides a sufficient statement of "any adverse environmental impacts which cannot be avoided." 42 U.S.C. § 4332(2)(C)(ii). The issuance of the ESP alone would not authorize construction of Units 3 and 4, but would instead only authorize site preparation and preliminary preparatory work under a 10 C.F.R. § 50.10(e) limited work authorization. If a COL or CP is never issued or ultimately denied, Dominion would be required to redress even such limited site preparation activities and restore the site. 10 C.F.R. § 50.17(c). As the Staff states:

> there would be no unavoidable adverse environmental impacts associated with the granting of the ESP with the exception of impacts associated with the site preparation and preliminary construction activities. . . . If the ESP is granted and any or all of the activities above are performed, but [a construction permit is not issued] the ESP holder would be required to redress the site according to the site redress plan.

FEIS at 10-5 to 10-6. We agree, and conclude that NEPA Section 102(2)(C)(ii) is satisfied.

c. NEPA Section 102(2)(C)(iii)

Turning to NEPA Section 102(2)(C)(iii), we must decide whether the FEIS complies with the requirement that NRC provide a "detailed statement" of "the alternatives to the proposed action." NRC and CEQ regulations and federal case law agree that the alternatives analysis is "the heart of the environmental impact statement." 10 C.F.R. Part 51, App. A, § 5; 40 C.F.R. § 1502.14. NRC regulations specify that the EIS must include an analysis of "alternatives available for reducing or avoiding adverse environmental effects." 10 C.F.R. § 51.71(d) (Draft EIS). See also 10 C.F.R. § 51.91 (Final EIS). "All reasonable alternatives will be identified and the range of alternatives discussed will encompass those proposed to be considered by the ultimate decisionmaker." 10 C.F.R. Part 51, App. A, § 5. With regard to ESP applications, the EIS "must include an evaluation of alternative sites to determine whether there is any obviously superior alternative to the site proposed." 10 C.F.R. § 52.18.

While requiring that "all reasonable alternatives will be identified" and considered by the agency, see 10 C.F.R. Part 51, App. A, § 5; 40 C.F.R. § 1502.14, federal case law and Commission issuances have also attempted to balance the practical truth that not every alternative can be considered.[94] In 1978, the Supreme Court wrote:

> To make an impact statement something more than an exercise in frivolous boilerplate the concept of alternatives must be bounded by some notion of feasibility. . . Common sense also teaches us that the "detailed statement of alternatives" cannot be found wanting simply because the agency failed to include every alternative device and thought conceivable by the mind of man. Time and resources are simply too limited to hold that an impact statement fails because the agency failed to ferret out every possible alternative, regardless of how uncommon or unknown that alternative may have been at the time the project was approved.

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[94] See, e.g., Metropolitan Edison v. People Against Nuclear Energy, 460 U.S. 766, 776 (1983) ("The scope of the agency's inquiries must remain manageable if NEPA's goal of ensuring a fully informed and well considered decision, is to be accomplished.") (internal citation omitted).

Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 551 (1978). Federal courts now review the range of alternatives in an EIS under the "rule of reason." Westlands Water Dist. v. U.S. Dep't of Interior, 376 F.3d 853, 868 (9th Cir. 2004); City of Bridgeton v. FAA, 212 F.3d 448, 458 (8th Cir. 2000). Under this rule, "the EIS need not consider an infinite range of alternatives, only reasonable or feasible ones." Westlands Water Dist., 376 F.3d at 868. This reasonableness limitation is particularly important when considering alternative sites for a project because "the number of potential locations for any project is infinite. . . the agency is only required to consider 'all alternatives which were feasible and reasonably apparent at the time of drafting the EIS.'" Dubois v. U.S. Dep't of Agriculture, 102 F.3d 1273, 1290 (1st Cir. 1996).[95]

Which alternatives are considered reasonable is determined by the project's goals. City of New York v. U.S. Dep't of Transp., 715 F.2d 732, 742 (2d Cir. 1983). The D.C. Circuit has held that this project goal is to be determined by the applicant, not the agency: "[a]n agency cannot redefine the goals of the proposal that arouses the call for action." Citizens Against Burlington, Inc. v. Busey, 938 F.2d 190, 199 (D.C. Cir.), cert. denied, 502 U.S. 994 (1991). Thus, while the underlying goal should not be purposefully narrowed to predetermine the outcome,[96] the agency's alternative analysis should be based around the applicant's goals,

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[95] Similarly, an agency is not obligated to consider unreasonable alternatives, including those "whose effect cannot be reasonably ascertained, and whose implementation is deemed remote and speculative." California v. Block, 690 F.2d 753, 767 (9th Cir. 1982). See also Vermont Yankee, 435 U.S. at 551; Utahns for Better Transp. v. U.S. Dep't of Transp., 305 F.3d 1152, 1172 (10th Cir. 2002).

[96] See City of New York, 715 F.2d at 743 ("an agency will not be permitted to narrow the objective of its action artificially and thereby circumvent the requirement that relevant alternatives be considered"). See also City of Carmel-By-The-Sea v. U.S. Dep't of Transp.,123 F.3d 1142, 1155 (9th Cir. 1997) ("[t]he stated goal of a project necessarily dictates the range of 'reasonable' alternatives and an agency cannot define its objectives in unreasonably narrow terms"); Busey, 938 F.2d at 196 ("an agency may not define the objectives of its action in terms

(continued...)

including the applicant's economic goals. City of Grapevine v. Dep't of Transportation, 17 F.3d 1502, 1506 (D.C. Cir.), cert. denied, 513 U.S. 1043 (1994). Similarly, in the only ESP alternatives analysis case to be decided by a federal court, the United States Court of Appeals for the Seventh Circuit affirmed an NRC Commission decision approving a narrower project goal and subsequently narrower collection of alternatives partly because the applicant was "in no position to implement" the additional alternatives. Envtl. Law and Policy Ctr., 470 F.3d at 683.

The Commission's case law gives similar weight to the applicant's wishes in setting the project goal. See Hydro Resources, Inc., CLI-01-04, 53 NRC at 55 ("when reviewing a discrete license application filed by a private applicant, a federal agency may appropriately accord substantial weight to the preferences of the applicant and/or sponsor in the siting and design of the project"). The Commission has tied giving great weight to the applicant's goal directly to the selection of alternatives in the FEIS:

> The FEIS appropriately gave PFS's (and its members') goal of providing an offsite storage alternative great weight. In considering alternatives under NEPA, an agency must take into account the needs and goals of the parties involved in the application.

Private Fuel Storage, LLC (Independent Spent Fuel Storage Installation), CLI-04-22, 60 NRC 125, 146 (2004). The project goal may incorporate the applicant's "economic goals." Hydro Resources, Inc., CLI-01-04, 53 NRC at 55. The same idea was expressed by the Commission in 2006 when it criticized an intervenor who "erroneously appears to assume that the NEPA

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[96](...continued)
so unreasonably narrow that only one alternative from among the environmentally benign ones in the agency's power would accomplish the goals of the agency's action, and the EIS would become a foreordained formality").

Similarly, in its 1981 nonbinding guidance, the CEQ counseled that "reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant" and that "[i]n determining the scope of alternatives to be considered, the emphasis is on what is 'reasonable' rather than on whether the proponent or applicant likes or is itself capable of carrying out a particular alternative." Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18,026, 18,027 (Mar. 23, 1981).

analysis of 'alternatives' should ignore the stated purposes of the project and the applicant's needs." USEC, Inc. (American Centrifuge Plant), CLI-06-9, 63 NRC 451, 467 (2006) (emphasis added).

Agencies are not obliged to create alternatives to a project in an EIS and may instead rely upon the applicant's list of alternatives. An agency "is not a business consulting firm. It is in no position to conduct a feasibility study of alternative sites." River Road Alliance, Inc. v. Corps of Engineers of U.S. Army, 764 F.2d 445, 452-453 (7th Cir. 1985). Rather, it "has to depend on the parties for such information." Id. See also Friends of the Earth v. Hintz, 800 F.2d 822, 833 (9th Cir. 1986) ("The Corps was not required to conduct a further study of alternatives or to independently find possible sites overlooked by [the applicant].").

Section 9.3 of the Environmental Standard Review Plan, or NUREG-1555, is the agency's guidance on performing its NEPA alternative sites analysis. The scheme developed in the guidance has three stages: an analysis and evaluation of "the region of interest, candidate sites and a reasonable number of proposed alternative sites identified by the applicant." NUREG-1555 at 9.3-1. In addition, the Staff evaluates "the methodology used by the applicant to identify these sites." Id.

The "'Region of interest' (ROI) is the geographic area considered in searching for candidate sites." NUREG-1555 at 9.3-1. Candidate sites "are those sites (at least four) that are within the region of interest and that are considered in the comparative evaluation of sites to be among the best that can reasonably be found for the siting of a nuclear power plant." Id. Proposed sites "are those candidate sites that are specifically compared to the proposed site to determine if there is an obviously superior site." Id.

In accordance with federal case law that does not require agencies to identify alternatives on their own, supra p. 81, NRC does not require that its staff conduct an independent field survey of the ROI for purposes of identifying candidate sites, and thence

alternative sites. Instead, NUREG-1555 requires that the NRC Staff evaluate whether the applicant's selection process was adequate and whether "the candidate site areas identified by the applicant represent a reasonably complete list of such areas within the identified ROI." NUREG-1555 at 9.3-9. The NUREG then specifies certain "minimum criteria" that a candidate site must meet. Id. The guidance then calls for a screening of the candidate sites:

> Based on reconnaissance level information, the reviewer should determine if the candidate sites identified by the screening process may be considered as potentially licensable and should also determine that there is reasonable assurance that no potential alternative sites in this category have been omitted. Although there can be no specific criteria for determining that an adequate number of candidate sites have been identified, the reviewer should make such a determination, based on the ROI, the number of candidate areas, and the number and type of alternative sites evaluated by the applicant. In general, however, the identification of two or more different areas and three to five alternative sites, in addition to the proposed site could be reviewed as adequate.

Id. at 9.3-10.

Finally, NUREG-1555 addresses the special case, where, as here, the North Anna site was selected by Dominion because it is the site of an existing nuclear power plant:

> Recognize that there will be special cases in which the proposed site was not selected on the basis of a systematic site-selection process. Examples include plants proposed to be constructed on the site of an existing nuclear power plant previously found acceptable on the basis of a NEPA review and/or demonstrated to be environmentally satisfactory on the basis of operating experience. . . For such cases, the reviewer should analyze the applicant's site selection process only as it applies to candidate sites other than the proposed site, and the site comparison process may be restricted to a site-by-site comparison of these candidates with the proposed site. As a corollary, all nuclear power plant sites within the identified region of interest having an operating nuclear power plant or a construction permit issues by the NRC should be compared with the applicant's proposed site.

Id. at 9.3-6 to 7.

Based on the record of in this proceeding, including the ER, the FEIS, and the documents, testimony, and post hearing submissions covered briefly in Section IV.F supra p. 52, the majority of the Board concludes that the NRC Staff's alternative sites description and analysis satisfies NEPA Section 102(2)(C)(iii).

Dominion presented an adequate variety of alternative sites, narrowing them down using the method prescribed by NUREG-1555. Dominion's ER defined its ROI and adequately justified its large size:

> Prior to deregulation of the power industry, alternative sites were typically located within a utility's ROI, usually its service territory. Under deregulation, power producers cannot recover construction and operation costs associated with development of a commercial power generation facility through the cost-of-service rates process. Instead, a newly completed power generation facility has to generate power for sale to consumers in a competitive marketplace. Dominion would only proceed with the development of such a new facility if it is economically viable.

ER at 3-9.2. The ER discussed and identified an appropriate number of candidate sites, using the NUREG-1555 screening criteria. Id. at 3-9-2 to 6. This discussion covered sites that represented realistic options reasonably available to Dominion: two federal sites, generic greenfield sites, and existing nuclear power stations owned by DRI subsidiaries. Id. It then identified and evaluated four candidate sites: North Anna, Surry, DOE Savannah River, and DOE Portsmouth. Id. at 3-9-6 to 12.

The Staff correctly reviewed Dominion's alternatives selection process, again guided by NUREG-1555. It found that Dominion's ROI, "while broad, does not appear to be unreasonable to the Staff. Many applicants can no longer define the ROI based on a service area because of deregulation in the power industry (i.e., commonly the owner of the power generation facility is not the owner of the transmission and distribution facilities)." Staff Answer to Environmental Question 119. The Staff also evaluated Dominion's process for selecting candidate and alternative sites, comparing it to the minimum criteria in NUREG-1555 and examining whether "the process they used to identify those sites was reasonable, that the slate of sites was reasonable." EH Tr. at 572 (Kugler). See also FEIS §§ 8.3.1 to 8.3.4.

The dissent argues that, considering the large ROI, more possible sites for the project could have been found, particularly those owned by competitors. This argument ignores the

rule of reason: an EIS should not consider unreasonable or unfeasible alternatives. Dubois, 102 F.3d at 1290. It also ignores specific Commission case law instructing the agency to be guided by an applicant's goals when conducting an EIS (including economic goals). See Hydro Resources, Inc., CLI-01-4, 53 NRC at 55.

Dominion's goal is to "generate power for sale to consumers in a competitive marketplace. Dominion would only proceed with the development of such a new facility if it is economically viable." ER at Section 3-9-2. Locating the plant at a competitor's site does not meet this goal; Dominion informed the Board that "[t]he possibility of Dominion building new nuclear units at an unaffiliated utility's sites is neither reasonable, feasible, nor consistent with Dominion's business purposes." Dominion Answer to Environmental Question 121. Similarly, the company presented a compelling list of how building on the site of a current nuclear power plant, as opposed to a non-nuclear plant site or greenfield, would better meet its goal: the existing transmission lines, corridors, monitoring programs and infrastructure represent enormous savings, environmental scoping has in large part been done and the baselines established, the land is acquired, and maintenance and operation costs could be greatly reduced. ER at 3-9-4 to 3-9-5. Consequently, in accordance with Commission case law, the NRC Staff was correct to limit the EIS project goal as Dominion did and exclude non-nuclear, competitor, and greenfield sites from the considered alternatives. The Staff correctly recognized it was not its job to either change Dominion's project goals or search independently for alternatives in addition to the reasonable ones submitted by Dominion. See Hydro Resources, Inc., CLI-01-4, 53 NRC at 55; River Road Alliance, 764 F.2d at 452-453. Additionally, the Staff found the exclusions reasonable, writing in its answers to the Board that "siting a new nuclear power station at the site of an existing nuclear power station operated by another utility would likely present logistical, competitive, and regulatory complications." Staff Answer to Environmental Question 121. Having excluded unreasonable alternatives not in

keeping with Dominion's economic goals, the ER and the EIS presented an adequate survey of the reasonable or feasible alternatives, as required. See Westlands Water Dist., 376 F.3d at 868. This range of reasonable alternatives meets the requirements of NEPA's § 102(2)(C)(iii).

The dissent also suggests that Dominion and the Staff violated NEPA because they never compared North Anna against "all nuclear power plant sites within the identified [ROI]" as NUREG-1555 requires. NUREG-1555 at 9-3-7. The method prescribed by NUREG-1555 for generating alternative sites is a reasonable and fair method for conducting the alternatives analysis required by NEPA Section 102(2)(C)(iii) and 10 C.F.R. § 52.18. It meets the rule of reason test because, in following it, both the applicant and the agency considered "all alternatives which were feasible and reasonably apparent at the time of drafting the EIS." Dubois v. U.S. Dep't of Agriculture, 102 F.3d at 1290. However, it is not a statute, a regulation, or binding case law. Instead, it is guidance binding neither the Staff nor the Board. See NUREG-1555 at 9.3-1. Dominion's ROI is far larger than the ROIs in the other two ESP cases: Grand Gulf's was the seven plant sites across the country owned by Grand Gulf's parent corporation, Entergy, see Grand Gulf Final EIS (2006), NUREG-1817 at 8-31, Clinton's was the state of Illinois. See Clinton Final EIS (2006), NUREG-1815 at 8-26. Creating an ROI so much larger was perhaps a tactical mistake on Dominion's part, that made the NUREG-1555 three-step process of an ROI, candidate sites, and alternative sites difficult to implement. Under NEPA, however, this tactical mistake is of little importance. Instead, what matters is that Dominion and the Staff presented a range of realistic and very different alternatives which allowed the Staff to conduct a detailed examination of each site's various positives and negatives that, as noted below, more than satisfies NEPA's alternatives analysis requirement. See FEIS §§ 8 to 9; NEPA § 102(2)(A)(C)(iii), 42 U.S.C. 4332(2)(A)(C)(iii). The size of the "region of interest," a creation of NUREG-1555, does not affect the breadth of these alternatives nor the quality of the EIS analysis.

Finally, with regard to the alternative site analysis, there is no question that the NRC Staff complied with the regulatory requirement to compare the proposed site to the three alternative sites. The detailed discussion also fulfilled NUREG-1555's requirements. See 10 C.F.R. § 52.18; NUREG-1555 at 9.3-1. The Staff correctly examined whether any of the alternative sites were "obviously superior" and found none to be so. FEIS §§ 8, 9.3. And although each site has positives and negatives, none of the three alternatives is environmentally preferable or obviously superior to the North Anna site.

We now turn briefly to another aspect of the alternatives analysis required by NEPA Section 120(2)(C)(iii), specifically a consideration of "system design alternatives." The FEIS considered three main system design alternatives for the cooling water system for Unit 3: once-through cooling system, wet cooling and dry cooling. See FEIS §§ 8.2.1, 8.2.2 and 8.2.3 respectively. The Staff concluded that a combination of wet and dry cooling systems for Unit 3 was the best. FEIS at 10-9. It did not expressly consider system design alternatives for Unit 4. The exclusion is more than justified because (a) the universe of design options was discussed and subsumed in the discussion on Unit 3 and (b) the dry cooling system proposed for Unit 4 was obviously the option with the least environmental impact.

We also agree with the Staff that it was not reasonable or necessary to consider, as a system design alternative to the application for an ESP for Units 3 and 4, the imposition of water conservation measures on pre-existing Units 1 and 2. Units 1 and 2 already use once-through cooling, which results in approximately the same amount of water being returned to the lake as is withdrawn, albeit at higher temperatures. See Draft EIS at 3-5 ("The once-through portion of the cooling system would return approximately the same amount of water [as withdrawn] to the discharge canal and the WHTF.").

In sum, the Board concludes, under the NEPA rule of reason, that NEPA Section 102(2)(C)(iii) has been complied with. All reasonable alternatives, both alternative sites and system design alternatives, have been identified, considered, and evaluated.

d. NEPA Section 102(2)(C)(iv)

The fourth element of our decision as to whether NEPA Section 102(2)(C) has been met is a determination as to whether the FEIS adequately covers the "relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity." NEPA § 102(2)(C)(iv), 42 U.S.C. § 4332(2)(C)(iv). The Staff discusses this matter in section 10.4 of the FEIS. Its main points are (a) the only short-term impact on the environment would be from possible site preparation activities under a limited work authorization, which impacts would be eliminated under the site redress plan, and (b) any discussion of the enhancement of long-term productivity would be a discussion of "benefits" which can be deferred at the ESP stage under 10 C.F.R. § 52.18. We agree with the Staff that discussion of this element should be performed if and when the ESP holder applies for a construction permit or combined operating license.

e. NEPA Section 102(2)(C)(v)

The fifth element of NEPA Section 102(2)(C) is a description of "any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." NEPA § 102(2)(C)(v), 42 U.S.C. § 4332(2)(C)(v). As discussed with regard to the second and fourth sub-elements, above, the granting of the ESP would not, in itself, authorize any activity that would have any such irreversible or irretrievable commitments. Section 10.5 of the FEIS discusses this point and we determine that NEPA § 102(2)(C)(v) is satisfied.

3. NEPA Section 102(2)(E)

NEPA Baseline Issue 1 requires that we make one additional statutory determination -- whether or not the NRC has met the requirement to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." NEPA § 102(2)(E), 42 U.S.C. § 4332(2)(E). In this context, compliance with NEPA Section 102(2)(E), which focuses on alternatives, is substantially equivalent to compliance with the NEPA Section 102(2)(C)(iii) alternatives analysis.[97] We have already covered this issue supra, and need not repeat it here. We conclude that NEPA Section 102(2)(E) is satisfied.

4. 10 C.F.R. Part 51

Finally, NEPA Baseline Issue 1 requires that we decide whether the Staff has complied with the requirements of 10 C.F.R. Part 51. See 10 C.F.R. §51.105(a)(1) ("the presiding officer will determine whether . . . the regulations in this subpart have been met"). To a substantial extent Part 51 parallels and elaborates on the requirements of NEPA and the NEPA regulations promulgated by the Council on Environmental Quality at 40 C.F.R. Parts 1500 to 1508. In addition, the Part 51 regulations impose certain obligations on the applicant, e.g., to submit an environmental report which the NRC Staff uses as input to the draft and final environmental impact statements. See 10 C.F.R. §§ 51.45 and 51.50. For example, the ER must discuss each of the five sub-elements covered by NEPA Section 102(2)(C), see 10 C.F.R. § 51.45(b)(1)-(5). Based on our review, we conclude that the requirements of Part 51 have been met.

D. NEPA Baseline Issue 2

NEPA Baseline Issue 2 requires the Board to "independently consider [and decide] the final balance among conflicting factors contained in the record of the proceeding with a view to

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[97] The significant difference between NEPA § 102(2)(C)(iii) and (E) is that the latter requires the agency to perform an alternatives analysis, even if the proposed action is not a "major Federal action[s] significantly affecting the quality of the human environment." 42 U.S.C. § 4332(2)(C).

determining the appropriate action to be taken." 10 C.F.R. § 51.105(a)(2). This decision is required by Calvert Cliffs, 449 F.2d at 1118, and Clinton I at 45. See also 10 C.F.R. § 2.104(b)(3)(ii).

In a significant sense, the determination of the "final balance among conflicting factors" must be made at the CP or COL stage because the regulations exempt the FEIS from covering, and the Board from considering, at the ESP stage, the prospective benefits (such as the need for power). See 10 C.F.R. § 52.18. Thus, we cannot do a NEPA cost-benefit analysis, or final balance among conflicting factors at this time. Further, as we have discussed with regard to NEPA Baseline Issue 1, the issuance of the ESP by itself does not authorize construction of any nuclear reactors and thus presents no unavoidable adverse environmental impacts, irreversible and irretrievable commitments of resources, or even any environmental impacts at all (other than via the limited work authorization). What it does is to "bank" the site for twenty to forty years, for possible further developments. See supra p. 16-17.

Certainly, as discussed above, this Board has considered and probed various factors related to the issuance of the ESP. We examined the potential surface water impacts that would occur if the two units were ultimately constructed, such as the lowering of the water levels in Lake Anna and the lessening of water flows in the downstream North Anna River during certain time periods. We also asked about possible groundwater impacts, and were assured that this was partially covered by proposed Permit Condition 4 and otherwise would be deferred to the COL stage. We assessed the likely increases in radiological effluents that would be released if Units 3 and 4 were constructed and we found that, assuming the PPE is met, these releases and doses would be well within the multiple numeric levels set by NRC regulations.[98] We also recognize that the construction of two new units would ever so slightly increase the

[98] Section VI.B discusses the multiplicity of these numeric and ALARA requirements.

chance of a design basis accident, but concluded that these probabilities are so small as to not weigh against the proposed ESP.

Thus, we have independently balanced such factors as are covered within the limited ambit of the ESP FEIS, and determine that the appropriate action to be taken is to issue the proposed ESP, with the proposed permit conditions contained in Staff Exhibit 17, and subject to the permit conditions, COL action items, site characteristics, and plant parameter envelope values, representations, assumptions, and unresolved issues specified in Appendices I and J to the FEIS.

E. NEPA Baseline Issue 3

NEPA Baseline Issue 3 requires the Board to "determine . . . whether the construction permit . . . should be issued, denied, or appropriately conditioned to protect environmental values.[99] Again, as articulated in 10 C.F.R. § 51.105(a)(3) and Calvert Cliffs, the Board make this decision. 449 F.2d at 1118. See also 10 C.F.R. § 2.104(b)(3)(iii) and 68 Fed. Reg. at 67,489. Without belaboring the point, we believe that our answer to NEPA Baseline Issues 1 and 2 suffices here. It is our determination that the ESP should be issued and should include the proposed permit conditions contained in Staff Exhibit 17, and the permit conditions, COL action items, site characteristics, and plant parameter envelope values, representations, assumptions, and unresolved issues specified in Appendices I and J to the FEIS. However, none of the foregoing findings, permit conditions, COL action items, or items listed as requiring further action or follow-up shall be treated as "resolved" for purposes of 10 C.F.R. § 52.39(a)(2).

F. Overriding NEPA Issue

The final decision that the Board must make in an uncontested ESP proceeding is to "determine whether the NEPA review conducted by the NRC staff has been adequate." 10

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[99] See note 31 supra.

C.F.R. § 51.105(a)(4). See also Calvert Cliffs, 449 F.2d at 1118; Clinton I at 33 n.33. The Commission referred to this as the "overriding NEPA issue" as distinguished from the three Baseline NEPA issues. Clinton I at 33 n.33.

It is the determination of this Board that the NEPA review conducted by the NRC Staff has been adequate. As stated in our discussion of NEPA Baseline Issue 1, we believe that the Staff has complied with NEPA Section 102(2)(A), (C) and (E). Within the limitations of the ESP environmental analysis, e.g., no assessment of benefits or cost-benefit analysis, and recognizing that there are various unresolved issues under 10 C.F.R. § 52.39 that must be addressed if and when a COL or CP is sought, we conclude that the NEPA review by the NRC Staff was adequate.

VI. NOVEL AND IMPORTANT ISSUES THAT MAY MERIT COMMISSION CONSIDERATION

In Clinton II, CLI-07-12, 65 NRC __, __ (slip op. at 2), the Commission interpreted 10 C.F.R. § 2.340(f) to provide that a Board's initial decision on an ESP is not effective until the Commission reviews it and takes final agency action. Given this automatic review, the Board wishes to identify several relatively novel and important issues where Commission guidance may be useful. These are: (a) whether the Staff's environmental justice analysis in the FEIS met the "greater detail" standard mandated by the NRC Environmental Justice Policy, (b) how the NRC's multiple radiation protection standards apply to new reactors that are proposed to be added at a site with pre-existing nuclear reactors and radiological effluents; and (c) the application of the Commission's statement prohibiting partial ESPs and ESPs where adequate information is not available to a situation where significant elements of the PPE for the ESP are missing and numerous siting issues are unresolved due to lack of information.

A. Environmental Justice "In Greater Detail"

Executive Order 12898, issued in 1994, sets forth the policy that the Executive Branch should make efforts to promote "Environmental Justice" (EJ) with regard to minority and low-income populations.[100] The NRC has incorporated these EJ goals into its reviews under NEPA and issued its own "Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions" (NRC EJ Policy).[101] The Office of Nuclear Reactor Regulation (NRR), which handles ESP applications, also has issued its own guidance concerning EJ (NRR EJ Guidance).[102]

The NRC EJ Policy points out that NRC's environmental justice reviews are to be conducted as part of the general NEPA review in NRC proceedings. 69 Fed. Reg. at 52,047. As such, the issue of environmental justice focuses on the physical environment and is meant to "identify and weigh disproportionately significant and adverse environmental impacts on minority and low-income populations that may be different from those impacts on the general population." Id.

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[100] Executive Order No. 12898 (Section 1-101), Federal Actions to Address Environmental Justice in Minority and Low-Income Populations, 59 Fed. Reg. 7629 (Feb. 16, 1995).

[101] 69 Fed. Reg. at 52,040. The draft of the NRC EJ Policy was published for comment on November 5, 2003. 68 Fed. Reg. 62,642. NRC's EJ policy was previously contained in two guidance documents, one governing reactor licensing and one governing materials licensing, and in case law. NRC EJ Policy at 52,041. See also NRR EJ Guidance, infra n.105; Environmental Review Guidance for Licensing Actions Associated with NMSS Programs (Aug. 22, 2003), ADAMS Accession No. ML033550003; Louisiana Energy Services (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77 (1998); Private Fuel Storage (Independent Spent Fuel Storage Installation), CLI-02-20, 56 NRC 147, 153-55 (2002).

[102] NRR Office Instruction, LIC-203, Rev. 1, Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues (May 24, 2004), Appendix D, Environmental Justice Guidance and Flow Chart, ADAMS Accession No. ML033550002 [NRR EJ Guidance].

The core of NRC's EJ policy is a simple if/then proposition. If the percentage of minority or low-income people in the impacted area[103] exceeds by 20% the percentage of minority and low-income people in the State or County as a whole, or if minority or low-income populations in the impacted area exceeds 50% of the total population,[104] then NRC will consider EJ "in greater detail." 69 Fed. Reg. at 52,048.

> Under current NRC staff guidance, a minority or low-income community is identified by comparing the percentage of the minority or low-income population in the impacted area to the percentage of the minority or low-income population in the County (or Parish) and the State. If the percentage in the impacted area significantly exceeds that of the State or the Country percentage for either the minority or low-income population then EJ will be considered in greater detail. "Significantly" is defined by staff guidance to be 20 percentage points. Alternatively, if either the minority or low-income population percentage in the impacted area exceeds 50 percent, EJ matters are considered in greater detail.

Id. (emphasis added). In this case, the FEIS establishes that the percentages of minority and low-income people in the impacted area exceed the 20% threshold, and the question is whether the FEIS satisfied the requirement to consider EJ "in greater detail."

The NRC EJ Policy provides no explanation as to what level of "greater detail" is required. The NRR EJ Guidance, however, does address this issue to some extent, stating that

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[103] In licensing actions involving nuclear power reactors, the impacted area is generally a 50-mile radius around the plant. NRC EJ Policy at 52,047-48.

[104] The NRR EJ Guidance document specifies the procedures to be used to screen for the presence of minority or low-income populations within a 50-mile radius of the facility. NRR EJ Guidance at D-3; see also NRC EJ Policy at 52,047-48. Census data, ordinarily examined at the level of the census block group, should be used to identify minority and low income populations within this area, although populations may also be identified through the EIS scoping process or by other means. NRR EJ Guidance at D-4. A minority or low-income population exists for purposes of the EJ analysis if more than 50% of the population in a census block group falls into the relevant groups, or if the relevant population is significantly greater (ordinarily at least 20 percentage points greater) than the population in the remainder of the state or county. Id. at D-8 to D-9; see also NRC EJ Policy at 52,048. If minority and/or low-income populations meeting these screening thresholds are present within the 50-mile radius, the second part of the process outlined in the NRC EJ Policy is triggered and the NRC Staff must conduct an EJ analysis "in greater detail." NRR EJ Guidance at D-9 to D-11.

such an analysis "in greater detail" must include a determination of the environmental impacts of the proposed action on minority and low-income populations, and of their significance. NRR EJ Guidance at D-9. If there are no "potentially significant environmental impacts," or if there are no minority or low-income populations at the location of the existing impacts, then the review is complete at that stage. If there are potentially significant impacts to minority or low – income populations, a more comprehensive analysis focusing on health effects, environmental impacts, and possible mitigation measures is required. Id. at D-10 to D-11. In either case, however, the Staff should include "sufficient information to allow the public to understand the rationale for the conclusion." Id. at D-11.

In this case, the FEIS addresses environmental justice review in four main sections. The first, Section 2.10 "Environmental Justice" consists of two pages of text and two maps, and focuses exclusively on whether or not a more detailed EJ analysis is required, i.e., whether the percentages of minority or low-income populations within the 50 mile radius meet the 20% or 50% thresholds. FEIS at 2-76 to 2-79. However, after carefully reading Section 2.10 several times, the Board was still unable to determine whether the NRC Staff had concluded that the EJ thresholds had been met, i.e., that EJ needed to be considered in greater detail. Accordingly, we asked the NRC Staff to clarify this point, and they confirmed that indeed, the EJ thresholds had been met. See Staff Answer to Environmental Question 25.

Thus we turn to the three other EJ sections in the FEIS to see if the Staff has analyzed EJ "in greater detail."[105] The three FEIS sections – 4.7, 5.7 and 7.6 – are each less than one page. FEIS at 4-36, 5-52, and 7-7. FEIS 4.7 covers EJ impacts caused by the construction of Units 3 and 4. FEIS 5.7 covers EJ impacts caused by the operation of the facility. FEIS Section

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[105] Sections 8.5.5.5, 8.6.5.5, and 8.7.5.5 of the FEIS, each address the EJ impacts of the three alternatives considered by the Staff respectively the Dominion Surrey Site, FEIS at 8-39, the DOE Portsmouth Site, FEIS at 8-59, and the DOE Savannah River Site, FEIS at 8-79. These are not relevant to the "in greater detail" analysis required for the proposed site.

7.6 covers several subjects and is entitled "Socioeconomic, Historic and Cultural Resources, Environmental Justice." FEIS at 7-7.

FEIS Sections 4.7 and 5.7 are virtually identical and consist of three paragraphs each. The first paragraphs of each provide a general explanation about the concept of EJ, and are identical (except that section 4.7 refers to Figures 2-6 and 2-7, whereas section 5.7 replicates these figures and refers to them as Figures 5-1 and 5-2). The middle paragraphs of Sections 4.7 and 5.7 specify what the Staff did to investigate EJ, and are again identical, except that 4.7 has one extra sentence which talks about the FEIS scoping process. The third paragraphs of Sections 4.7 and 5.7 are the Staff's one-sentence conclusion that the EJ impacts are small, and are identical (except that Section 4.7 uses the word "construction" impacts and Section 5.7 uses the word "operational" impacts).

FEIS Section 7.6 addresses the Staff's thoughts on the cumulative impacts in the areas of "socioeconomic, historic and cultural and environmental justice" and merely states a short conclusion – EJ cumulative impacts would be small.[106]

During oral argument, counsel for both the Staff and Dominion argued that FEIS §§ 4.7, 5.7, and 7.6 satisfied the Commission's requirement that EJ be analyzed "in greater detail." EH Tr. at 756, 763. Accordingly, the Board examined these portions of the FEIS. At the outset we note that section 7.6 provides no analysis at all (only a conclusion) and therefore cannot serve to satisfy the EJ "analyze" in "greater detail" requirement. Turning to §§ 4.7 and 5.7, no analysis is contained in their first paragraphs (which only introduce the concept and background of EJ) and no analysis is contained in their third paragraphs (which merely state the Staff's conclusion).

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[106] The following is the complete EJ statement found in FEIS section 7.6: "The staff found no unusual resource dependencies or practices through which minority or low-income populations would be disproportionately affected. As a result, cumulative impacts of environmental justice would be SMALL." FEIS at 7-7.

Thus, we turn to the middle paragraphs of §§ 4.7 and 5.7. Do these virtually identical paragraphs analyze EJ in greater detail? Here is the longer of the two EJ paragraphs (with each of the sentences numbered for easier reference):

> [1] The staff identified the pathways through which the environmental impacts associated with the construction of Units 3 and 4 at the NAPS site could affect human populations. [2] The staff then evaluated whether minority and low-income populations could be disproportionately affected by these impacts. [3] In its December 2003 site audit, the staff interviewed local government officials and the staff of social welfare agencies concerning potentially disproportionate impacts to low income and minority populations – (Jaksch and Scott 2005). [4] The staff found no unusual resource dependencies or practices, such as subsistence agriculture, hunting or fishing, through which the populations could be disproportionately impacted by construction of Units 3 and 4 at the North Anna ESP site and that would result in those populations being adversely affected. [5] In addition, the staff did not identify any health-related or location dependent disproportionately high and adverse impacts affecting these minority and low-income populations. [6] In addition, no disproportionately high and adverse impacts on minority and low-income groups were identified during the scoping process, from comments on the DEIS or SDEIS, or from other public outreach activities.

FEIS at 4-36.

The key activity and document, cited in the third sentence of foregoing paragraph of sections 4.7 and 5.7 is “Jaksch and Scott 2005." This is a report concerning a trip from December 8-12, 2003, the “December 2003 site audit” described by NRC staffers to investigate socioeconomic matters which also includes notes from additional telephone interviews conducted in 2004 and 2005.[107] However, the 32-page document focuses on socioeconomic matters unrelated to EJ and includes very few references to EJ or to low-income or minority populations. More startlingly, the Jaksch and Scott 2005 report reveals that no one from the NRC made any attempt to contact and discuss EJ issues with any officials or representatives from the two jurisdictions with the largest areas of low-income and minority populations

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[107] FEIS at 4-36 and 5-52 (citing J. Jaksch and M. Scott, North Anna ESP Site Audit Trip Report – Socioeconomic 12-8-2003 through 12-12-2003 with Additional Telephone Interviews 2-26-2004, 2-26-2004 through 9-29-2004 and 7-11-2005 through 7-15-2005 (2005), ADAMS Accession No. ML052170374).

(Caroline County, Virginia and Richmond, Virginia), within the 50- mile impact area. See FEIS Figures 2-6, 2-7; FEIS at 2-78 and 2-79. NRC only contacted officials and representatives of the three counties closest to the facility (Louisa, Spotsylvania, and Orange Counties). Based on the FEIS, these three counties apparently have no low-income populations triggering the EJ analysis, see FEIS Figure 2-7 at 2-79, and only two small minority population tracts, both of which are upstream and upwind of the proposed Units 3 and 4. See FEIS Figure 2-6 at 2-78. The Jaksch and Scott 2005 report thus does not provide meaningful support for the Staff's subsequent statements that it "found no unusual resource dependencies or practices" [sentence # 4 above] and "did not identify any health-related or location-dependent disproportionately high and adverse impacts affecting these minority and low-income populations [sentence # 5 above].

The paucity of EJ analysis, investigation, and information in the FEIS raises doubts as to whether the Staff has complied with the NRC EJ Policy that requires it provide an EJ analysis in greater detail when the low-income or minority population thresholds are met. The analysis that the Staff carried out may have been excellent, but the Board cannot assess it when information supporting the conclusion is neither included in the FEIS nor provided by reference. According to the Staff's own guidance, the EJ review ought to include "sufficient information to allow the public to understand the rationale for the conclusion," NRR EJ Guidance at D-11, a requirement that does not appear to be satisfied here. Therefore, although the Staff's conclusions are plausible given the nature of the application being considered, the Board has doubts as to whether the Staff's EJ analysis satisfies the NRC EJ Policy requirement for an analysis "in greater detail."

Under these circumstances, and given that the Commission will necessarily review any initial decision such as this one, the Board suggests that the Commission consider addressing the somewhat novel question as to what it expects the Staff to do when, under the NRC EJ Policy, an EJ analysis "in greater detail" is required. Does the one paragraph quoted above

meet this requirement?[108] And more specifically, perhaps the Commission can address whether an EJ analysis, where the Staff does not discuss EJ issues with representative or officials from the jurisdictions with the main and largest minority and low-income populations in the area of interest, satisfies the 'in greater detail" requirement of the NRC EJ Policy.[109]

B. Application of Regulatory Standards When New Reactors are Added to Pre-existing Reactors

The defining characteristic of the proposed ESP Site is that it is located wholly within the NAPS Site where two nuclear reactors already exist. Dominion is proposing to add up to sixteen new reactors (eight per "Unit") to the site. Supra p. 3. While there are advantages to locating new nuclear reactors adjacent to existing ones (use of pre-existing transmission lines, efficiencies of scale regarding nuclear operations), it would also have the disadvantage of

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[108] We note that quality, not quantity, is the measure of compliance. Thus, shortness alone is not sufficient to render the quoted paragraph inadequate. Our concern focuses on the substance of the Staff's EJ investigation, discussion, and analysis.

[109] The problem of the nature and extent of the "in greater detail" analysis required under the NRC EJ Policy is not unique to Dominion's ESP application for North Anna. First, a preliminary review indicates that the 20% to 50% EJ trigger is met in most if not all cases. For example, the requirement for an analysis "in greater detail" has been triggered in all thirty-one of the reactor license renewals considered by the NRC for which a final or draft EIS had been prepared as of June 8, 2007. See, e.g., Generic Environmental Impact Statement for License Renewal of Nuclear Plants [GEIS for LR], Edwin I. Hatch Nuclear Plant, Units 1 and 2 (NUREG-1437, Supplement 4) Final Report (May 2001) at § 4.4.6; GEIS for LR, Peach Bottom Atomic Power Station, Units 2 and 3 (NUREG-1437, Supplement 10) Final Report (Jan. 2003) at 4-38; GEIS for LR, Dresden Nuclear Power Station, Units 2 and 3 (NUREG-1437, Supplement 17) Final Report (June 2004) at 4-37; GEIS for LR, Brunswick Steam Electric Plant, Units 1 and 2 (NUREG-1437, Supplement 25) Final Report (Apr. 2006) at 4-31; GEIS for LR, Vermont Yankee Nuclear Power Station (NUREG-1437, Supplement 30) Draft Report for Comment (Dec. 2006) at 4-38. Does the Commission intend to require an "in greater detail" EJ analysis in every case? Does this devalue the "in greater detail" analysis? Second, it appears that the relatively perfunctory review found in Dominion FEIS, is not unusual. For example, the EJ analysis in the recent Clinton ESP FEIS is almost verbatim (except for changes in names and dates and the lack of citation to a trip report document) to the language in the North Anna FEIS. (continued) Compare FEIS at 4-36 with Clinton EIS at 4-38; FEIS at 5-52 with Clinton EIS at 5-43.

incrementally increasing the impact on the local environment and the amount of radiological effluent to which the local population is exposed. For example, the ESP would authorize the amount of tritium in Lake Anna to triple (from 3,050 to 9,400 pCi/L, supra p. 45) and would authorize a twenty-fold increase in the estimated annual dose to the reasonably maximally exposed individual (from 0.32 mrem/yr to 6.4 mrem/yr, supra p. 50). Although these levels are clearly within the relevant numeric regulatory standards, it is important to understand what these limits are, and how they apply, and how they are allocated as between the existing and new reactors and licenses. It would also be helpful for NRC to articulate how the ALARA concept applies when a company proposes to place multiple additional nuclear reactors on a site where such facilities are already located.

One difficultly arises from the fact that NRC's regulatory limits are expressed in terms of different entities. Some of NRC's radiation doses and standards for members of the public apply on a per-reactor basis. See 10 C.F.R. Part 50, App. I, ¶ II.A ("each . . . reactor . . . will not result in an estimated annual dose . . . from liquid effluents for any individual in an unrestricted area . . . in excess of 3 [mrems/yr] to the total body"). Other of NRC's radiation standards for members of the public apply on a per-license basis. See 10 C.F.R. § 20.1301(a)(1) ("each licensee shall conduct operations so that the total effective dose equivalent to members of the public from the licensed operation does not exceed [100 mrem/yr]").[110] Still another radiation

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[110] Would 10 C.F.R. § 20.1301(a)(1) allow Dominion to emit up to 300 mrem/yr (because it would have 3 licenses – one for Units 1, one for Unit 2 and one for Units 3 and 4) or would it be limited to 200 mrem/yr (because it has two licensees – Virginia Electric Power Company and Dominion)? Dominion asserts that 200 mrem/yr is appropriate. See Dominion's Response to the Licensing Board's January 18, 2007 Order (Issuing Safety-Related Questions) (Feb. 8, 2007) (Dominion Exhibit 1) at 12 n.5 ("Dominion interprets these provisions as meaning that the 100 mrem limit applies to the combined dose from all units operated by a particular licensee at a site. Under this reading, a single 100 mrem limit would apply [sic] radioactively released Virginia Power's operation of Units 1 and 2, and a separate limit would apply to radioactivity releases from Dominion's operation of any additional units."). In contrast, the NRC Staff says that this regulation is not applicable to nuclear reactors at all: "Section 20.1301(a) applies to

(continued...)

standards that NRC uses for members of the public appear to apply on a per-site basis. See 10 C.F.R. § 20.1301(e) (specifying that licensees shall comply with 40 C.F.R. Part 190 standards, which in turn specify that "[o]perations covered by this subpart shall . . . provide reasonable assurance that . . . the annual dose equivalent does not exceed 25 mrems to the whole body . . . as a result of exposures . . . from uranium fuel cycle operations").[111]

This regulatory structure might make more sense if each regulated entity or unit, and the corresponding amount of radiation it is allowed to release, were increasingly large (e.g., 3 mrem per-reactor, 100 mrem per-licensee, something greater than100 mrem per-site). But this is not the case, because the per-site level (25 mrem) is less than the per-licensee level (100 mrem). This appears to render 10 C.F.R. § 20.1301(a) (the per-licensee level of 100 mrem moot in most cases. Indeed, this is essentially what Dominion and the NRC Staff have asserted here.[112] In addition, none of NRC's regulations apply on a per "unit" basis, or tell us expressly what amount of radiation can be released from a "unit," such as "Unit 3," for example.

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[110](...continued)
NRC licensees other than those who operate power reactors." NRC Staff Legal Environmental Brief at 23 n.15.

[111] The NRC Staff and Dominion both assert the EPA radiation standard of 25 mrem, 40 C.F.R. § 190.10, applies on a per-site basis. NRC Staff Legal Safety Brief at 9; Dominion's Memorandum Responding to the Legal Questions in the Licensing Board's January 18, 2007 Order (Feb. 8, 2007) at 9. The parties were unable to cite any statute, regulation, case-law or even agency statement of consideration stating this proposition. See NRC Staff Legal Safety Brief at 9; Dominion's Memorandum Responding to the Legal Questions in the Licensing Board's January 18, 2007 Order (Feb. 8, 2007) at 9.

Meanwhile, the regulation itself is not expressed in terms of a particular site, but instead applies the 25 mrem/yr dose limit to radiation "from uranium fuel cycle operations." 40 C.F.R. § 190.10. The term, "uranium fuel cycle operations" includes many activities (milling, conversion, enrichment, fabrication, use, and reprocessing of fuel) that occur at different sites. See 40 C.F.R. § 190.02(b).

[112] NRC Staff Legal Safety Brief at 9-10; NRC Staff Legal Brief in Response to Licensing Board's Environment- Related Questions (Mar. 1, 2007) at 23-24; Dominion's Memorandum Responding to the Legal Questions in the Licensing Board's January 18, 2007 Order (Feb. 8, 2007) at 12.

Another difficultly is the regulatory gaps that arise from the multiplicity of reactor designs included within Dominion's PPE. For example, the plain language of some of the most important regulations that NRC has specified in this ESP makes clear that it only applies to "light-water-cooled" power plant reactors. For example, 10 C.F.R. Part 50, Appendix I only covers "Numerical Guides for Design Objectives and Limiting Conditions . . . for Radioactive Material in Light-Water-Cooled Nuclear Power Reactors." Similarly, the EPA standard of 25 mrem, only applies to the "uranium fuel cycle," which only includes the "generation of electricity by a light-water-cooled nuclear power plant." See 40 C.F.R. § 190.02(b) (defining the "uranium fuel cycle"). This is problematic, because, if granted, the ESP would cover a spectrum of 7 different reactor designs, including two reactor designs (the PBMR and the GT-HMR) that are not light-water-cooled. NRC has yet to promulgate standards for the PBMR and GT-HMR. How do we assess whether these proposed reactor designs will meet the site safety standards, when the main safety standards used by NRC do not apply to PBMRs and GT-HMRs?

The absence of standards for the gas-cooled reactors is complicated further. First, as stated above, neither 10 C.F.R. Part 50, Appendix I nor 40 C.F.R. § 190.10 apply to gas-cooled reactors. Second, the NRC Staff asserts that the main remaining radiation standard – the 100 mrem limit of 10 C.F.R. § 1301(a)(1) – doesn't apply to any kind of nuclear reactor. NRC Staff Legal Environmental Brief at 23 n.15. How do we determine whether Dominion's two gas-cooled reactor designs will meet the NRC safety standards for the ESP Site?

Next, assuming arguendo that the 25 mrem standard of 40 C.F.R. § 190.10 and 10 C.F.R. § 20.1301(e) applies on a per-site basis, the third issue that concerns us is how this limit is to be allocated. Consider the following. Virginia Electric Power Company (VEPCO) and ODEC, the joint licensees for Units 1 and 2, are currently subject to the 25 mrem limit for the NAPS Site. Thus, under this regulation VEPCO/ODEC can emit radiation up to the 25 mrem

dose. Now a different entity, Dominion,[113] proposes to locate additional reactors or units at the same site. We are told that, under 40 C.F.R. §§ 190.10, 20.1301(e), Dominion is limited to the same 25 mrem dose. Dominion and the NRC Staff agree that the entire NAPS Site is subject to the same 25 mrem limit, and the fact that there are two "sites" (NAPS and the ESP Site) or two different licensees does not double the maximum doses to 50 mrem.[114] So far so good. But how is the 25 mrem limit to be allocated between VEPCO/ODEC and Dominion? Does each licensee get 12.5 mrem? The NRC Staff dismisses this issue, and indicates that it will handle any violations or exceedances on an ad hoc basis:

> The Staff does not allocate doses considered among multiple reactors on the same site for any reason; rather, the dose is considered to be a cumulative dose for all operations at a given site. Consequently, the Staff would consider the cumulative contribution of the two existing reactors as well as the two proposed units in assessing compliance with the 40 C.F.R. Part 190 dose limits, but it would not assign specific proportional limits to individual units.

NRC Staff Legal Safety Brief at 9. This approach leaves the licensee, NRC, and the public in limbo. What legal standard will the NRC Staff use in allocating legal liability if the 25 mrem standard is exceeded. For example, who is liable when VEPCO/ODEC releases a 12 mrem dose and Dominion releases 14 mrem? Each, alone, would seem to be compliant with 40 C.F.R. § 190.10, and would likely so argue if charged with a violation. What if the ratio is VEPCO/ODEC with 3 mrem and Dominion with 24 mrem? Is VEPCO/ODEC legally liable for such an exceedance? What rational principle, other than a 50-50 split, should be used to allocate the 25 mrem? As a matter of regulatory clarity for the licensees and the public, it might be prudent for NRC to articulate this rational principle and/or allocate the 25 mrem limit of 10 C.F.R. § 190.10 in a permit condition at the outset.

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[113] Although Dominion and VEPCO are owned by the same company, ODEC is not.

[114] NRC Staff Legal Safety Brief at 9; Dominion's Memorandum Responding to the Legal Questions in the Licensing Board's January 18, 2007 Order (Feb. 8, 2007) at 11-12.

Given that the Commission will review this initial decision, supra p. 1, the Board believes that this aspect of the ESP (multiple reactors/multiple licensees/multiple numeric limits) involves some "novel issues" that merit Commission consideration. See 10 C.F.R. § 2.323(f). For the first time in many years, the NRC is entertaining applications for new reactors to be added to sites where reactors already exist. Under these circumstances, this Board believes that it would be helpful for the Commission to clarify its views on the following issues:

(1) How do the per-reactor, per-licensee, and per-site radiological limits apply when there are multiple reactors and multiple licensees being added to a site? Are they additive, increasing the amount of dose and exposure to the public? If not, how should they be applied?

(2) How is ALARA satisfied under these circumstances?

(3) How can the gas-cooled reactor designs in the ESP application be deemed to meet the NRC safety regulations, when there are no specific standards for them and most of the standards apply only to light-water-cooled reactors?

(4) How should the 25 mrem dose limit imposed by 10 C.F.R. § 20.1301(e) and 40 C.F.R. § 190.10 be allocated as between pre-existing reactor effluents and new reactor licensees on the same site?

C. Prohibition of Partial ESPs and ESPs Where Adequate Information is Lacking

As we discussed in Section II.C, supra p. 16-17, the regulations establish the general rule that once an ESP is issued "the Commission may not impose new requirements . . . on . . . the site." 10 C.F.R. § 52.39(a)(1). In addition, the Commission has stated that it will not issue "partial ESPs," nor issue them where the "operational parameters" are lacking.[115] 54 Fed. Reg.

[115] "It is just such information which both the proposed rule and the final rule would (continued...)

at 15,377-15,778. In cases where the information is limited, the applicant can pursue an "Early Partial Decision on Site Suitability." See 10 C.F.R. Part 2, Subpart F; 10 C.F.R. Part 50 App. Q. Faced with this regulatory background, this Board identified a number of questions concerning various gaps and unresolved issues in the ESP application.[116]

As an initial matter, the Board recognizes that an ESP applicant is not required to provide "detailed design" information concerning each of the types of reactor designs covered by the application. This is because, at the ESP stage, the applicant often will not have selected the specific reactor design (e.g., ABWR, PWR, gas-cooled, AP1000, etc.) that it may want to build on the site. For example, in this case Dominion wants to keep its ESP options open for seven different reactor designs. In lieu of detailed design information, however, the applicant needs to provide a "plant parameter envelope" which is the set of values of plant design parameters that an ESP applicant expects will bound the design characteristics of the reactor or reactors that might be built at a selected site." Staff Answer to Environmental Question 3. The PPE, which serves as the surrogate for the actual reactor design information, is defined in the FEIS as follows:

> 1.1.1 Plant Parameter Envelope
>
> The applicant for an ESP need not provide a detailed design of a reactor or reactors and the associated facilities, but should provide sufficient bounding parameters and characteristics of the reactor or reactors and the associated facilities so that an assessment of site suitability can be made. Consequently, the ESP application may refer to a plant parameter envelope (PPE) as a surrogate for a nuclear power plant and its associated facilities.

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[115](...continued)
require of applicants for early site permits." 54 Fed. Reg. at 15,378.

[116] See Board Safety Questions 111 and 116; Board Environmental Questions 1A, 1B, 1C, 1D, 3, 5A, 5B, 26, 36, 51 107, 108, 125.

> A PPE is a set of values of plant design parameters that an ESP applicant expects will bound the design characteristics of the reactor or reactors that might be constructed at a given site. The PPE values are a bounding surrogate for actual reactor design information.

FEIS at 1-3. The PPE serves in lieu of a specific reactor design.

But what if the ESP application doesn't include significant PPE values? How does this comport with the "no partial ESP" policy? How does it meet the requirement that an ESP applicant provide "adequate information?"

There are numerous examples where the Dominion ESP application fails to include significant PPE information. At the outset, the FEIS states:

> In its application and in responses to requests for additional information (RAIs), Dominion did not or was unable to provide information and analysis for certain issues sufficient to allow the NRC staff to complete its analysis. For such issues, Dominion did not offer, nor did the staff identify, bases for assumptions that would allow resolution. The staff was unable to determine a unique significance level for such issues, and therefore these issues are not resolved for the North Anna ESP site.

FEIS at 1-5. Specific examples include the following:

1. The Staff stated "[b]ecause no specific design has been selected, the water treatment systems for the proposed Units 3 and 4 are not specified." FEIS at 3-7. We recognize that the specific design had not been selected, and that this explains the need for a PPE. But should Dominion have at least been required to provide a bounding PPE value?

2. The Staff stated that "[a]dequate design information to estimate liquid and gaseous radioactive effluents was available for four of the seven reactor designs considered in establishing the PPE values. The four reactors were LWRs . . . Limited information was available for liquid and gaseous effluent releases from the gas-cooled reactor designs." FEIS at 3-13. This tells us "adequate design information" for the other three designs was lacking.

3. The Staff stated that "[a]lthough Dominion chose the PPE approach in the overall ESP application, it based its evaluation of the environmental impacts of severe accidents on

characteristics of the ABWR, the surrogate AP1000, and the surrogate ESBWR reactor designs with the explicit representation that these impacts would bound the impacts of other ALWR designs." FEIS at 5-89. This means there was no PPE information for the non-ALWR designs, such as the gas-cooled designs. "The environmental impacts of severe accidents for designs not evaluated in this EIS, including gas-cooled designs, are not resolved because necessary design information is lacking." Id.

4. The Staff stated that "[i]n its evaluation of uranium fuel cycle impacts for the North Anna ESP site, [Dominion] used the plant parameter envelope approach for the LWR designs, but not for the two gas-cooled reactors." FEIS at 6-1.

5. Transportation-related "risk[s] to the public from radiation exposure . . . are not resolved for other than LWR designs and would need to be assessed at the CP or COL stage." FEIS at 6-26 (emphasis added).

The Staff listed over thirty-five instances where the FEIS specified that matters such as the foregoing were unresolved. Staff Answer to Environmental Question 5. The PPE gaps were most prevalent for the two gas-cooled reactor designs.

We asked the Staff to explain why it did not require the applicant to "at least require the PPE information on these matters." Board Environmental Question 1A. The Staff explanations depended on the subject. In some instances, such as water quality and waste streams, the Staff did file an RAI but Dominion didn't provide the information because "design level information is not available." Staff Answer to Environmental Question 1A. In other cases, the Staff answered that "a design was not selected." Id. This begs the question, because the whole point of a PPE is to serve in lieu of a specifically selected design. With regard to gas-cooled reactors, the Staff stated that there is "insufficient information concerning these designs" and there is a "lack of verifiable information on these designs." Id. In some instances, the Staff answered that "detailed" design information is not available. Id. But no one was asking for

detailed design information because a PPE does not require it. We were only focusing on an envelope of parameters, especially in those situations where the Staff acknowledged that even the PPE was missing.

The ultimate answer to our questions seems to be – yes, there are a number of instances where significant components of the PPE are missing, but this is okay because in those instances we will treat the matter as "unresolved" and it will be addressed at the CP or COL licensing stage. While we see no regulatory prohibition to this approach, we are not sure that it comports with the Commission's stated policy prohibiting the issuance of partial ESPs and indicating that ESPs will not be issued unless adequate information is available. How many holes or "unresolved issues" can there be in a PPE before it runs afoul of the Commission's policy? When should the Staff decline to issue an ESP and advise the applicant to instead consider an Early Partial Decision on Site Suitability?

Given the novelty and importance of this issue, it may be appropriate for the Commission to address it when the Commission conducts its automatic review of this ESP pursuant to 10 C.F.R. § 2.340(f).

VII. CONCLUSION

The Board has, in fulfilling the mandatory hearing obligations imposed by AEA §189a and the case law and regulations discussed above, reviewed material portions of the record in this proceeding and has required the NRC Staff and Dominion to provide additional testimony and documentary evidence with respect to certain areas for which review indicated that the information was insufficient to allow the Board to decide the six fundamental questions (see Appendix A) specified for uncontested ESP proceedings. In our ruling, we have not conducted a de novo review and, except where noted, have relied upon and assumed, without independent investigation, the accuracy, veracity, and thoroughness of the content of the Staff documents, such as the FEIS and FSER, the Staff and Dominion answers to the Board's written safety and

environmental questions, and the testimony of the witnesses during the oral evidentiary hearing. As described above, the Board determines that the NRC Staff's review of the early site permit application of Dominion Nuclear North Anna, LLC (Dominion) has been adequate, and the record of this proceeding sufficient, to support the Atomic Energy Act safety-related findings necessary for issuance of the ESP. Further, we have independently determined that the relevant requirements of the National Environmental Policy Act and NRC's NEPA regulations have been satisfied and decide that the ESP should be issued, subject to the proposed permit conditions included in Staff Exhibit 17, and subject to the permit conditions, COL action items, site characteristics, and plant parameter envelope values, representations, assumptions and unresolved issues specified in Appendices I and J to the Staff's Final Environmental Impact Statement and Appendix A of the Final Safety Evaluation Report.

Pursuant to 10 C.F.R. § 2.1212, parties may file a petition for review of this initial decision in accordance with the procedures set out in 10 C.F.R. § 2.341. Any such petition for Commission review must be filed within 15 days after the initial decision has been served. See 10 C.F.R. § 2.341(b)(1). Unless otherwise authorized by law, a party to an NRC proceeding must file a petition for Commission review before seeking judicial review of an agency action.

Pursuant to 10 C.F.R. § 2.340(f), this initial decision is not effective until the Commission reviews it and takes final agency action.

It is so ORDERED.

THE ATOMIC SAFETY
AND LICENSING BOARD[117]

/RA/

Thomas S. Elleman
ADMINISTRATIVE JUDGE

/RA/

Richard F. Cole
ADMINISTRATIVE JUDGE

Rockville, Maryland
June 29, 2007

[117] Copies of this order were sent this date by Internet e-mail transmission to counsel for (1) applicant Dominion; (2) the Intervenors; and (3) the NRC Staff.

SEPARATE OPINION BY JUDGE KARLIN

CONCURRING IN PART AND DISSENTING IN PART

Although I concur with my colleagues' rulings on the remainder of the initial decision, I must respectfully dissent from their determination that the NRC Staff adequately considered all reasonable alternatives to Dominion's proposed ESP as required by sections 102(2)(C)(iii) and 102(2)(E) of NEPA. Specifically, I conclude that, starting with Dominion's large region of interest (ROI), the NRC Staff failed to consider and search for (or demand that Dominion search for) the "best alternative sites that could reasonably be found" within the ROI, and instead short-circuited the alternatives analysis by fixating on a very small "slate of sites" proffered by Dominion. Once NRC's vision was narrowed to this short slate of three sites, the result was predetermined because none of them were "obviously superior" to the site preferred by Dominion – the North Anna ESP site. Thus, NRC's alternative sites analysis was, in my judgment, inconsistent with both the letter and spirit of NEPA.

In addition, given the significant incremental surface water impacts that will be caused by proposed Unit 3 (evaporation of 8,707 gpm), it is my opinion that the NEPA system design alternatives should have included the alternative of imposing some form of water saving measures on the two nuclear reactors that already exist on the site, as a form of offset to the impacts of the proposed new reactors. I reject the Staff's position that such an offset alternative, such as, for example, diverting some of the 1.9 million gpm once-through cooling water from Units 1 and 2 into the cooling towers that would be constructed for Units 3 and 4, is per se unreasonable under NEPA. Instead, consideration of such offsets to the incremental impacts of the new reactors is reasonable and necessary under NEPA where, as here, the applicant and its affiliates seek to add new nuclear reactors at the same location of existing nuclear operations.

There is no dispute that the NEPA alternatives analysis "is the heart of the environmental impact statement." 10 C.F.R. Part 51, App. A, § 5; 40 C.F.R. § 1502.14; City of Shoreacres v. Waterworth, 420 F.3d 440, 450 (5th Cir. 2005). Likewise, the law is clear that all reasonable alternatives must be considered,10 C.F.R. Part 51, App. A, § 5, and that the "rule of reason" applies. Westlands Water Dist. v. U.S. Dept of Interior, 376 F.3d 853, 868 (9th Cir. 2004). While I do not know whether a NEPA alternatives analysis that seriously searched for the "best" candidate and alternative sites within the ROI, or looked at on-site trade-offs between existing nuclear reactor and new ones, would have produced a different result, it is clear to me that the failure of the Staff to consider such alternatives fails to comply with the requirements of NEPA. Accordingly, I conclude that the ESP can not be granted unless a supplemental EIS is performed. My reasons are explained, briefly, as follows.

First, as a factual matter it is instructive to review the NRC Staff's guidance for conducting a NEPA alternative sites analysis. This is found at Section 9.3 of the NRC's Environmental Site Review Plan (ESRP) for nuclear reactors, NUREG-1555. The guidance creates the following alternatives analysis process: (1) start with the ROI, (2) identify candidate sites within the ROI, (3) select alternative sites from among the candidate sites, and (4) then analyze whether any of the alternative sites are obviously superior to the proposed site. NUREG-1555 at 9.3-1. With regard to the second step, the guidance states that candidate sites should be "the best that can reasonably be found for the siting of a nuclear power plant" within the applicant's region of interest (ROI). Id. (emphasis added). The NRC Staff is told to determine that there is reasonable assurance that no potential alternative sites in this category have been omitted. Id. at 9.3-10 (emphasis added). In evaluating candidate sites, the Staff must make the determination that "no site within the appropriate study area (by this or any other acceptable and accurate procedure based on reconnaissance level data) [is] obviously superior

to the applicant's proposed site. Id. at 9.3-6 (emphasis added). Finally, the Staff guidance states:

> [A]ll 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 applicants proposed site.

Id. at 9.3-7 (emphasis added).

The relevant facts, as set forth in the majority opinion, make clear that the Staff, much less Dominion, failed to comply with the Staff's own guidance. First, I focus on Dominion. Dominion chose to designate a very large ROI, encompassing most of the eastern United States and a substantial portion of numerous states west of the Mississippi river. ER Figure 9.3-1, see Appendix B. However, within this ROI, Dominion identified only three candidate sites, two federal sites (the DOE Portsmouth, Ohio site and the DOE Savannah River, South Carolina site) and one other nuclear power plant site owned by DRI (the Surry site). ER at 3-9-6. Dominion briefly considered and rejected "a generic greenfield site" as not reasonable. Id. at 3-9-4. With regard to existing nuclear power plant sites, Dominion only considered two sites owned by its DRI and its subsidiaries (rejecting one of them). Id. at 3-9-5 to 6. Thus, Dominion quickly narrowed the field to a slate of three alternative sites. Dominion then evaluated this slate of sites and concluded that none of them were "obviously superior" to Dominion's preferred site (North Anna). ER at 3-9-6 to 11.

Turning to the activities of the NRC Staff, contrary to NUREG-1555, the FEIS never analyzed or even discussed whether Dominion's small slate of alternative sites represented the "best that can reasonably be found for the siting of a nuclear power plant" within the ROI. NUREG-1555 at 9.3-1. See Testimony of Mr. Kugler at EH Tr. at 563-64. The Staff never examined whether any potential candidate sites had been omitted. When asked whether Surry, Savannah River, and Portsmouth were, in fact, the best candidates or alternative sites that could reasonably be found within Dominion's ROI, Mr. Kugler of the Staff demurred, citing the

"special cases" exemption found at NUREG-1555 at 9.3-6. EH Tr. at 570. Later he corrected himself and agreed that the special cases exemption did not excuse the Staff from searching for the best alternative sites. Id. at 575. This is because the special cases provision only exempts the proposed site, but still requires that the candidate and alternative sites be the "best that can reasonably be found" within the ROI.[1] Continuing, Mr. Kugler, said that the Staff simply "used the slate of sites that the applicant had identified" and "determined whether the process that [Dominion] used to identify those sites was reasonable." EH Tr. at 572.

It is also uncontroverted that the NRC Staff failed to comply with the its own guidance requiring that the proposed site be compared against "all nuclear power plant sites within the identified region of interest." NUREG-1555 at 9.3-7 (emphasis added). The NRC alternatives analysis never considered any of the dozens of other nuclear power plant sites within Dominion's ROI (but not owned by DRI). Could some of these sites be among the "best that can reasonably be found for the siting of a nuclear power plant" within the ROI? Did the Staff determine that there was "reasonable assurance" that no legitimate candidate site had been "omitted?" No. Did the Staff determine that "no site within the appropriate study area" evaluated by "any other acceptable and accurate procedure" is "obviously superior to the applicants proposed site?" No. When asked, Mr. Kugler stated that "it was not considered reasonable to consider sites that are owned by another utility as alternative sites," EH Tr. at 567, citing Public Service Co. of New Hampshire (Seabrook Station, Units 1 and 2), CLI 77-8, 5 NRC 503, 536 (1977)).

It seems clear that Seabrook does not support a per se rule that consideration of sites owned by other utilities is automatically unreasonable. It neither held, stated, nor implied any

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[1] NUREG-1555 at 9.3-1. "For such cases, the reviewer should analyze the applicant's site selection process only as it applies to candidate sites other than the proposed site." Id. at 9.3-7.

such rule. To the contrary, Seabrook involved a tiny ROI (New Hampshire and a portion of southern Maine) wherein the NRC Staff examined the proposed site and 18 alternative sites. In this context, the Commission held that the Staff's analysis of alternative sites complied with NEPA. In contrast, in the North Anna case, the Staff only considered the proposed site and three alternative sites within a 20+ state ROI. And while Seabrook did recognize that there were numerous factors to consider in conducting the alternative site analysis under NEPA, including "possible institutional and legal obstacles associated with a construction at an alternate site," Seabrook, CLI 77-8, 5 NRC at 540, it did not suggest that consideration of sites owned by other utilities is per se unreasonable. Comparing the North Anna alternative site analysis to Seabrook only demonstrates how inadequate the North Anna analysis was.

The Staff's per se rejection of all alternative sites owned by other utilities violates the NEPA requirement to consider all reasonable alternatives for another reason – the use of joint ventures, which are common in the nuclear industry. For example, Units 1 and 2 on the NAPS Site are owned and operated by a joint venture between VEPCO and Old Dominion Electric Cooperative (ODEC). FEIS at 2-1. Likewise, Dominion, which has no right, title, or interest in the proposed ESP Site, would have to form a joint venture of sorts with VEPCO and ODEC in order to build Units 3 and 4. Joint ventures are common within the nuclear industry and numerous NRC cases, often dealing with anti-trust considerations, address the option of "joint ventures by two or more utilities."[2] Indeed, as recently as June 13, 2007, PPL Corporation, the owner and operator of two nuclear power plants, expressed its interest in forming a joint venture

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[2] See Alabama Power Co. (Joseph M. Farley Nuclear Plant, Units 1 and 2) ALAB 646, 13 NRC 1027, 1054 n.70; Georgia Power Co. (Alvin W. Vogtle Nuclear Power Plant, Unit Nos. 1 and 2) DD 79-18, 10 NRC 617, 619-20 (1979); Public Service Co. of Indiana, Inc. (Marble Hill Nuclear Power Generating Station, Units 1 and 2), ALAB-459 7 NRC 179, 182 (1978); Consumers Power Co. (Midland Plant, Units 1 and 2), ALAB-452, 6 NRC 892, 902 (1977).

to build an additional nuclear reactor within Dominion's ROI. See Tim Mekeel, PPL Aims to Keep Option to Build Nuclear Reactor, Lancaster New Era (June 13, 2007).

The Staff's position, that it is per se unreasonable to consider sites owned by other companies when considering the "best sites that can reasonably be found" within an ROI, leads to absurd results. First, it would mean that two different utilities, with overlapping or identical ROIs would have mutually exclusive lists of the "best sites" for nuclear reactors within the same ROI. Second, restricting the NEPA alternative site analysis essentially only to those sites owned by the applicant would mean that, even if all of them were clearly unacceptable, they would necessarily be the "best" "reasonable" options within the ROI, and NEPA could be dispensed with. Although the applicant's general objectives properly serve to focus the alternatives analysis, they cannot dominate it, and "best" cannot be defined exclusively as "what the applicant owns or wants." Otherwise, the NEPA alternatives analysis is vitiated.

The Dominion and NRC consideration of candidate and alternative sites not owned by other utilities is equally crabbed. The only such sites even considered are two federally owned sites, the DOE Savannah River site and the DOE Portsmouth site. FEIS at §§ 8.6, 8.7. There is no explanation why other federally owned sites were not considered. What about other sites owned by DOE? What about the numerous power plant sites, including nuclear sites, owned and operated by the Tennessee Valley Authority, a federally owned entity, whose service area overlaps with Dominion's ROI? See 16 U.S.C. § 831 et seq.; TVA Reservoirs and Power Plants, http://www.tva.gov/sites/sites_ie2.htm (last visited June 20, 2007). What about U.S. Department of Defense facilities within Dominion's ROI? In the search for the "best [sites] that can reasonably be found" within the ROI, the NRC Staff's NEPA alternative sites analysis doesn't even discuss these options.

Ultimately, the Staff defends its NEPA alternative sites analysis by citing NUREG-1555 to the effect that all the Staff needs to do is to "determine if the selection process used [by the

applicant] to identify candidate sites was adequate." NUREG-1555 at 9.3-9. Given that the NEPA alternatives analysis is the heart of NEPA, and the duty to examine all reasonable alternatives is imposed on NRC, not the applicant, this provision of the NUREG-1555 improperly delegates NEPA compliance to the applicant and allows the NRC Staff to conduct a mere "appellate review" to determine whether the applicant's effort was adequate. NEPA does not require federal agencies to decide whether the applicant's ER is adequate. NEPA requires federal agencies to examine all reasonable alternatives. See NEPA § 102(2)(C)(iii), 42 U.S.C. 4332(2)(C)(iii) ("all agencies of the Federal Government shall . . . [issue] a detailed statement by the responsible official on . . . alternatives to the proposed action."). And while no one expects NRC to send a team out into the field to survey Dominion's entire ROI for candidate or alternative sites, NRC can and should probe and push to assure that a rigorous alternatives analysis is performed. The Staff could have filed requests for additional information that would have required Dominion to develop a more thorough alternative sites analysis and to survey the ROI to assure that the best sites have not been missed. Even without leaving the office, the Staff could have reviewed maps, and its own institutional knowledge and information, to consider and possibly identify other candidate sites within Dominion's ROI that might be in lower population areas and otherwise potentially suitable or preferable. Some agencies even hire independent consultants to help to identify candidate and alternative sites, rather than just relying on the submissions of the applicant.

Even assuming arguendo that all that the NRC Staff needs to do is to "determine if the selection process used [by the applicant] to identify candidate sites was adequate," NUREG-1555 at 9.3-9, it is clear to me that the NRC Staff failed to meet this standard or to seriously scrutinize the Dominion's process here. At hearing, for example, the Staff's witness offered no detail as to how the review was conducted:

> Judge Karlin: I would propose to you that if I had a proposed site A, and if you give me the ability to select the three alternative sites against which A needs to be compared, I can rig that game very quickly so that you would have to pick A.
> Mr. Kugler: Yes, you could.
> Judge Karlin: How do you know that didn't happen?
> Mr. Kugler: That was part of our review. . . . we took a look at the process they use, and we took a look at the candidates that they came up with.

EH Tr. at 582-83. The witness went on to describe the steps the Staff employed to evaluate the three sites Dominion proposed, but offered no further testimony regarding the Staff's scrutiny of Dominion's candidate site selection process. EH Tr. at 583-84.

As far as can be determined from the testimony, the FEIS and the parties' supplemental filings, the NRC Staff accepted, without raising a single question, Dominion's perfunctory process for identifying the best candidate and alternative sites that could reasonably be found within the ROI. No discussion at all of why Dominion did not comply with the NUREG requirement that all nuclear sites within the ROI be considered. No question as to why only DOE sites were considered. Not even a serious look at other non-nuclear power plant sites owned by Dominion and its affiliates. It is clear to me that, in reviewing the applicant's process for identifying the best alternative sites that could reasonably be found within the ROI, the NRC Staff failed to "rigorously explore," 40 C.F.R. § 1502.14(a), or to exercise any "skepticism in dealing with [the] self serving statements from the primary beneficiary of the project." Envtl. Law and Policy Ctr. v. NRC, 470 F.3d 676, 683 (7th Cir. 2006).

The majority asserts that the applicant's goal serves to focus the NEPA alternatives effort. This legal proposition is correct, but I am unable to see how it makes any difference here. This is because Dominion has articulated a rather broad goal, i.e., to "generate power for sale to consumers in a competitive marketplace. Dominion would only proceed with the development of such a new facility if it is economically viable." ER at 3-9-2. This goal is general, typical, and unremarkable. The only thing worth noting is that the "marketplace" that Dominion has selected is a quite large ROI.

Given Dominion's broad goal and large ROI, decisions like Citizens Against Burlington, Inc. V. Busey, 938 F.2d 190, 196 (D.C. Cir 1991), cert denied, 502 U.S. 994 (1991) are completely inopposite. In Busey the goal of the applicant, the Toledo Port Authority, was very narrow ("to launch a new cargo hub in Toledo and thereby helping to fuel the Toledo economy") id., and the Court held that the NEPA alternative sites analysis did not need to include non-Toledo sites. In contrast here, not even Dominion is asserting that its goal is so narrow, e.g., to help fuel the Louisa, Virginia economy, or that the alternatives analysis should be limited to Louisa County or even to the Commonwealth of Virginia. Dominion simply wants to generate power and sell it, at some profit, to customers within the ROI.

Further, the unassailable fact that Dominion, like all companies, wants to make a profit for its investors and will not proceed unless it deems a course of action economically viable, does not mean that the NEPA alternative sites analysis is limited to sites owned by Dominion or sites where Dominion can make the best profit and does not guarantee Dominion a permit. As the Council on Environmental Quality has stated: "reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant" and that "[i]n determining the scope of alternatives to be considered, the emphasis is on what is 'reasonable' rather than on whether the proponent or applicant likes or is itself capable of carrying out a particular alternative." Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18,026, 18,027 (Mar. 23, 1981). The environmental impacts of the siting of nuclear power plants within the United States are too important for NRC to limit the universe to those alternative sites, if any, currently owned by the applicant.

Even when the project sponsor or applicant is a federal agency, NEPA is clear that the project goals cannot be artificially narrowed to circumvent the NEPA alternatives analysis. See City of New York v. U.S. Dep't of Transp., 715 F.2d 732, 743 (2d Cir. 1983) ("an agency will not

be permitted to narrow the objective of its action artificially and thereby circumvent the requirement that relevant alternatives be considered"). See also City of Carmel-By-The-Sea v. U.S. Dep't of Transp.,123 F.3d 1142, 1155 (9th Cir. 1997) ("[t]he stated goal of a project necessarily dictates the range of 'reasonable' alternatives and an agency cannot define its objectives in unreasonably narrow terms"); Busey, 938 F.2d at 196 ("an agency may not define the objectives of its action in terms so unreasonably narrow that only one alternative from among the environmentally benign ones in the agency's power would accomplish the goals of the agency's action, and the EIS would become a foreordained formality").

When the project sponsor and applicant is a private party, an equal, if not greater, degree of caution should be exercised.

> We have held that blindly adopting the applicant's goals is "a losing proposition" because it does not allow for the full consideration of alternatives required by NEPA. [Simmons v. U.S. Army Corps of Eng'rs, 120 F.3d 664, 669 (7th Cir, 1997).] NEPA requires an agency to "exercises a degree of skepticism in dealing with the self-serving statements from the prime beneficiary of the project" and to look at the general goal of the project, rather than only those alternatives by which a particular applicant can reach its own specific goals. Id.

Envtl. Law and Policy Ctr. v. NRC, 470 F.3d at 683 (emphasis added).

Dominion seeks to limit the NRC NEPA alternatives analysis by asserting that "the possibility of Dominion building new nuclear units at an unaffiliated utility's sites is neither reasonable, feasible, nor consistent with Dominion's business purpose." Dominion's Answer to Environmental Question 121. There is no reason, compelling or otherwise, to accept this proposition. (Dominion's proposition is a bit tautological, as it would obviously end up "affiliating" with the utility with which it teamed or formed a joint venture.) There is nothing per se infeasible or technically unacceptable about Dominion working with another utility or company within this ROI to achieve Dominion's purpose – to build 9,000 MWt of nuclear power to serve customers within the ROI and make money in the process. Indeed, to accept

Dominion's position is to render the NEPA alternatives analysis a "foreordained formality." See Busey, 938 F.2d at 196.

In addition to limiting alternatives to sites owned by the applicant, Dominion and the NRC gave similar short-shrift to Dominion-owned sites. Other sites owned by Dominion are rejected because they "typically" lack sufficient land, or "typically" lack excess transmission capacity, or are "often" sited in more urban locations. Declaration of Marvin L. Smith at 3. This does not tell us whether any specific sites might be better or at least considered. It assumes a fact not in evidence, i.e., that the North Anna site has "excess transmission capacity." See note 82 supra. It fails to consider that Dominion might purchase additional land, adjacent to its existing brownfields sites, as a development option. These are concrete, practical, and feasible options that were not considered.

Once the Staff fixed solely on Dominion's short slate of three alternative sites, skipping any serious questioning or review as to whether it was the right slate or whether the process used by Dominion to generate it was adequate, the outcome of the alternative site analysis was foreordained. No matter how thoroughly the NRC Staff might compare the three sites against the proposed North Anna site, the result would be the same – the three alternatives are not "obviously superior" to North Anna, and therefore Dominion's preferred site became the site endorsed by the Staff in the FEIS. Neither the FEIS nor the Staff's post-hearing submission establishes that the NRC Staff rigorously, skeptically, and adequately reviewed even the process that Dominion used to pre-select the short slate of three alternatives.

My dissent is also based on the fact that Section 8.2 of the FEIS, entitled "System Design Alternatives," and the NRC Staff, excluded, per se, even considering the alternative of asking or requiring Dominion's affiliates to install additional water conservation measures on the existing nuclear power reactors Units 1 and 2, to compensate or mitigate against the significant and adverse incremental impacts that will be caused by proposed Units 3 and 4. For example,

if the process cooling water for Units 1 and 2 is cooled using the once-through cooling system, this water could be cooled (as is done at other sites) using the dry cooling tower (or an enlarged version of it) that is planned for Unit 4. While this diversion of process water might be small, it would offset some of the impacts of Unit 3. When a company operates an existing facility that emits pollution and/or has adverse environmental impacts, it is common for a regulator to at least consider, and sometimes impose, additional environmental controls on the existing units as a trade-off for obtaining approval to construct additional units. Indeed, imposing additional controls on old and otherwise "grandfathered" operations is sometimes a very cost-effective way to reduce the total pollution or environmental impact of an expanding industrial facility. It should at least be considered in any NEPA analysis of all reasonable alternatives. And, as the Commission has noted, "the fact that a possible alternative is beyond the Commission's power to implement, does not absolve us of any duty to consider it." Seabrook, CLI 77-8, 5 NRC at 540; 10 C.F.R. Part 51, App. A, § 5. It seems to me that creative nuclear engineers and environmental scientists, if properly motivated, might very well propose realistic offsets or mitigation measures that could be applied to the pre-existing reactors on the same site. In any event, I see no reason to dismiss peremptorily the reasonable option of considering possible trade-offs or mitigation on the existing units as part of the NEPA alternatives analysis for the new units.[3]

It is for these reasons that I conclude that the NRC Staff failed to comply with NEPA Section 102(2)(C)(iii) as required by NEPA Baseline Issue 1. Nor do I think that the above-stated defects have been remedied by the supplemental evidence and material that we

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[3] I reject the suggestion that the NEPA alternatives analysis for ESPs is limited solely to consideration of alternative sites. The ESP regulations state that the EIS "must include an evaluation of alternatives sites," but does not exclude consideration of system design alternatives. See 10 C.F.R. § 52.18 (emphasis added). The FEIS itself includes a discussion of "System Design Alternatives." FEIS Section 8.2.

gathered during the evidentiary hearing and/or that was submitted by Dominion and the NRC Staff after the hearing. Thus, even if we were to amend the FEIS pro tanto, as we are authorized to do, the conclusion is the same. The failure of the NRC Staff to rigorously look at the process whereby all possible sites within this large ROI were short-circuited to three alternative sites, is not something that can be remedied by a quick post-facto addendum.

Accordingly, I must also conclude that, under NEPA Baseline Issues 2 and 3, on balance the ESP should not be issued.

In closing, I note that I do not think that the denial of the ESP would necessarily require Dominion and the Staff to re-start the process from scratch. It is not within the power of a Board to order or instruct the NRC Staff to redo the alternatives analysis in the FEIS and to issue a supplemental draft EIS and final EIS covering that subject. But if it were, I would do so. This would need to be done scrupulously and with public input, so that it did not simply lead to a pre-determined re-approval of the North Anna site.

_____***/RA/***_____

Alex S. Karlin
ADMINISTRATIVE JUDGE

APPENDIX A

SIX FUNDAMENTAL QUESTIONS THAT ESP BOARD MUST ANSWER IN AN UNCONTESTED MANDATORY PROCEEDING

The following are the six questions that a Board must answer when handling an uncontested proceeding for an early site permit. These are sometimes referred to as the "mandatory findings." These findings are required by (a) the notice that the Commission published in the Federal Register when it issued the Notice of Hearing, see 68 Fed. Reg. 67,489 (Dec. 2, 2003) regarding Dominion North Anna, (b) NRC regulations, including 10 C.F.R. §§ 2.104(b) and 51.105(a)(1)-(3), and (c) Exelon Generation Company, LLC (Early Site Permit for Clinton ESP Site), CLI-05-17, 62 NRC 5 (2005).

1. Safety Issue 1: The Director of NRR is obligated to propose a finding as to whether issuance of the ESP will be inimical to the common defense and security or to the health and safety of the public.

   The Board must decide whether the application and the record of the proceeding contain sufficient information, and the review of application by the NRC Staff has been adequate to support a finding that the issuance of the ESP will NOT be inimical to the common defense and security or to the health and safety of the public.

2. Safety Issue 2: The Director of NRR is obligated to propose a finding as to whether, taking into consideration the site criteria contained in 10 C.F.R. Part 100, a reactor, or reactors, having the characteristics that fall within the parameters for the site, can be constructed without undue risk to the health and safety of the public.

   The Board must decide whether the application and the record of the proceeding contain sufficient information, and the review of application by the NRC Staff has been adequate to support a finding that, taking into consideration the site criteria contained in 10 C.F.R. Part 100, a reactor, or reactors, having the characteristics that fall within the parameters for the site, can be constructed without undue risk to the health and safety of the public.

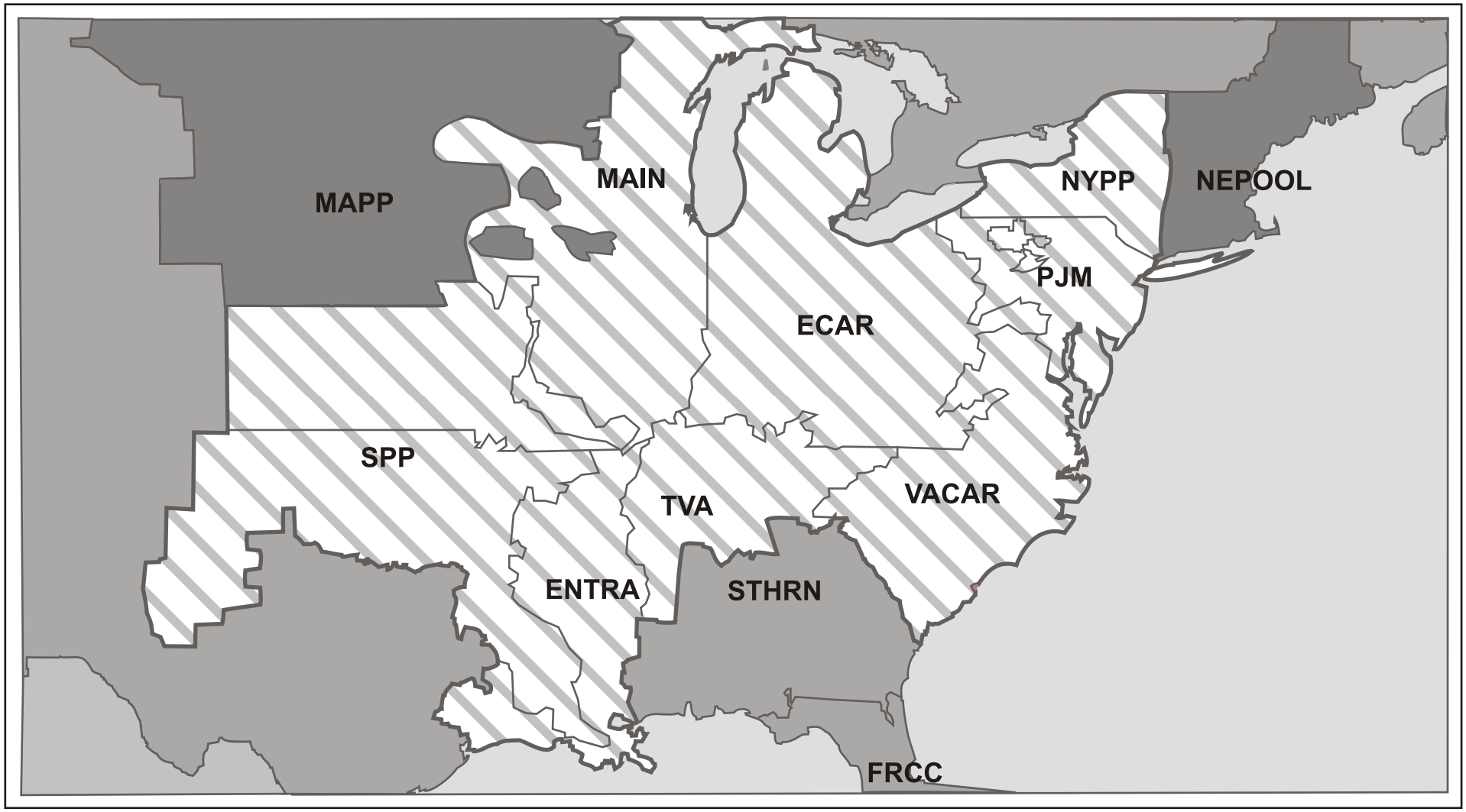
3. NEPA Issue: The Director of NRR is obligated to propose a finding as to whether, in accordance with the requirements of subpart A of 10 C.F.R. Part 51, the ESP should be issued as proposed.

   The Board must decide whether the review conducted by the Commission pursuant to NEPA has been adequate.

4. NEPA Baseline Issue 1: The Board must decide whether the requirements of Section 102(2)(A), (C), and (E) of NEPA and Subpart A of 10 C.F.R. Part 51 have been complied within the proceeding.

5. NEPA Baseline Issue 2: The Board must independently consider the final balance among the conflicting factors contained in the record of the proceeding and must determine the appropriate action to be taken.

6. NEPA Baseline Issue 3: The Board must determine, after considering reasonable alternatives, whether the ESP should be issued, denied, or appropriately conditioned to protect environmental values.



Appendix B: Dominion's Region of Interest

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
DOMINION NUCLEAR	)	Docket No. 52-008-ESP
NORTH ANNA, LLC	)	
	)	
(Early Site Permit for North Anna ESP Site)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing LB INITIAL DECISION (LBP-07-09) have been served upon the following persons by U.S. mail, first class, or through NRC internal distribution.

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Washington, DC 20555-0001

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Washington, DC 20555-0001

Administrative Judge
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Docket No. 52-008-ESP
LB INITIAL DECISION (LBP-07-09)

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Evangeline S. Ngbea
Office of the Secretary of the Commission

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