LBP-12-17

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

Ronald M. Spritzer, Chairman
Dr. Gary S. Arnold
Dr. William W. Sager

In the Matter of CALVERT CLIFFS 3 NUCLEAR PROJECT, LLC, and UNISTAR NUCLEAR OPERATING SERVICES, LLC (Combined License Application for Calvert Cliffs Unit 3)	Docket No. 52-016-COL ASLBP No. 09-874-02-COL-BD01 August 30, 2012

PARTIAL INITIAL DECISION
(Ruling on Contention 10C)

Table of Contents

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

Ronald M. Spritzer, Chairman
Dr. Gary S. Arnold
Dr. William W. Sager

In the Matter of CALVERT CLIFFS 3 NUCLEAR PROJECT, LLC, and UNISTAR NUCLEAR OPERATING SERVICES, LLC (Combined License Application for Calvert Cliffs Unit 3)	Docket No. 52-016-COL ASLBP No. 09-874-02-COL-BD01 August 30, 2012

PARTIAL INITIAL DECISION
(Ruling on Contention 10C)

In this Partial Initial Decision (PID),[1] the Board rules on the merits of Contention 10C, which challenges the adequacy of the wind and solar power contribution estimates contained in the Final Environmental Impact Statement's (FEIS's) alternative based on a combination of energy sources (the combination alternative). Although Contention 10C originally challenged the Draft Environmental Impact Statement (DEIS), the Board subsequently ruled that Contention 10C would be viewed as challenging the subsequently issued FEIS.[2]

On January 26 and 27, 2012, the Board held an evidentiary hearing in Prince Frederick, Maryland on Contention 10C.[3] After considering all of the evidence and arguments presented,

---

[1] There is currently before the Board one other admitted contention, Contention 1, regarding foreign ownership and control, as well as one proposed new contention, Contention 11, regarding the implications of the findings and recommendations raised by the NRC's July 2011 Fukushima Task Force Report. See Licensing Board Order (Denying Summary Disposition of Contention 10C, Denying Amended Contention 10C, and Deferring Ruling on Contention 1) (Aug. 26, 2011) (unpublished) [hereinafter Contention 10C Summary Disposition Order]; New Contention Regarding NEPA Requirement to Address Safety and Environmental Implications of the Fukushima Task Force Report (Aug. 11, 2011) at 4 [hereinafter Contention 11].

[2] Contention 10C Summary Disposition Order at 22–25.

[3] Tr. at 305, 542.

we find that, in the FEIS, the NRC Staff (Staff) unreasonably limited the wind and solar power contributions to the combination alternative by adopting an unrealistic completion date for the proposed action and excluding all wind and solar power sources not physically located in Maryland. Nevertheless, the Board finds that the wind and solar power contribution estimates for the combination alternative, as supplemented by the evidence and testimony introduced at the evidentiary hearing and our findings of fact and conclusions of law, are adequate, and that, as so supplemented, the FEIS satisfies the requirements of the National Environmental Policy Act (NEPA) and 10 C.F.R. Part 51. Accordingly, we do not grant Joint Intervenors' request that we require a further supplement to the FEIS.

I. BACKGROUND

Applicants submitted an application to the Nuclear Regulatory Commission (NRC) in two parts on July 13, 2007 and March 14, 2008 for a COL to construct and to operate one U.S. Evolutionary Power Reactor, designated Calvert Cliffs Nuclear Power Plant Unit 3 (Calvert Cliffs Unit 3), to be located in Lusby, Calvert County, Maryland.[4] The Calvert Cliffs site currently houses two nuclear reactors, Calvert Cliffs Units 1 and 2.

The two parts of the application were accepted for docketing by the NRC on January 25, 2008 and June 3, 2008, respectively.[5] Following the NRC's publication of a notice of hearing and opportunity to petition for leave to intervene in this matter,[6] Joint Intervenors[7] filed a petition that

---

[4] See Calvert Cliffs 3 Nuclear Project, LLC, and UniStar Nuclear Operating Services, LLC Notice of Hearing and Opportunity To Petition for Leave To Intervene and Order Imposing Procedures for Access to Sensitive Unclassified Non-Safeguards Information and Safeguards Information for Contention Preparation on a Combined License for the Calvert Cliffs Nuclear Power Plant Unit 3, 73 Fed. Reg. 55,876 (Sept. 26, 2008).

[5] Id.

[6] Id.

[7] Joint Intervenors consist of Nuclear Information Resource Services, Beyond Nuclear, Public Citizen Energy Program and Southern Maryland Citizens' Alliance for Renewable Energy Solutions. LBP-09-04, 69 NRC at 177–81.

challenged several aspects of Applicants' COL application (COLA) on November 19, 2008.[8] This Board was established on December 2, 2008 to adjudicate the proceeding.[9]

On March 24, 2009, the Board issued a Memorandum and Order, in which it found that the Joint Intervenors had standing, admitted them as parties, admitted their first contention as pleaded, admitted their second and seventh contentions as modified by the Board, and granted their request for a hearing.[10] The Board later granted Applicants' Motions for Summary Disposition of Contentions 2 and 7.[11]

In April 2010 the Staff issued the DEIS for Calvert Cliffs Unit 3.[12] Chapter 9 of the DEIS described alternatives to the proposed Calvert Cliffs Unit 3 and discussed the environmental impacts of those alternatives.[13] The Staff concluded, based on its estimate of environmental impacts, that none of the viable energy alternatives was clearly preferable to construction of a new baseload nuclear power generating plant.[14] As a result, the Staff issued a preliminary recommendation to the Commission that the COL for Calvert Cliffs Unit 3 be issued.[15]

On June 25, 2010, Joint Intervenors proffered Contention 10, which alleged various

---

[8] See Petition to Intervene in Docket No. 52-016, Calvert Cliffs 3 Nuclear Power Plant Combined Construction and License Application (Nov. 19, 2008) [hereinafter Petition].

[9] Calvert Cliffs 3 Nuclear Project, LLC, and UniStar Nuclear Operating Services, LLC; Establishment of Atomic Safety and Licensing Board, 73 Fed. Reg. 74,531 (Dec. 8, 2008).

[10] See LBP-09-04, 69 NRC 170, 231–32.

[11] Licensing Board Memorandum and Order (Granting Motion for Summary Disposition of Contention 2) (July 30, 2009) at 2 (unpublished); Licensing Board Memorandum and Order (Ruling on Joint Intervenors' Proposed New Contentions 8 and 9 and Applicants' Motion for Summary Disposition of Contention 7) (Apr. 5, 2010) at 1 (unpublished).

[12] NUREG-1936, Environmental Impact Statement for the Combined License (COL) for Calvert Cliffs Nuclear Power Plant Unit 3, Draft Report for Comment, Vols. 1 & 2 (Apr. 2010) [hereinafter DEIS].

[13] Id. at 9-1.

[14] Id. at 9-28.

[15] Id. at 10-29.

inadequacies in the Staff's DEIS for proposed Calvert Cliffs Unit 3.[16] As pled, Contention 10 challenged the DEIS analyses relating to need for power, energy alternatives, and costs.[17] The Board divided Contention 10 into four parts, which it designated Contentions 10A, 10B, 10C, and 10D. On December 28, 2010, the Board admitted Contention 10C but declined to admit the remaining parts.[18] As admitted by the Board, Contention 10C states:

> The DEIS discussion of a combination of alternatives is inadequate and faulty. By selecting a single alternative that under represents potential contributions of wind and solar power, the combination alternative depends excessively on the natural gas supplement, thus unnecessarily burdening this alternative with excessive environmental impacts.[19]

On May 20, 2011, the FEIS for Calvert Cliffs Unit 3 became publically available.[20] On June 20, 2011, Joint Intervenors filed their Submission of Amended Contention 10C and Applicants filed their Motion for Summary Disposition of Contention 10C.[21] The Staff filed a response in support of Applicants' Motion for Summary Disposition of Contention 10C on July 11, 2011.[22] On July 15, 2011, the Staff and Applicants filed their respective responses to Joint

---

[16] Submission of Contention 10 by Joint Intervenors (June 25, 2010) [hereinafter Contention 10]. Applicants and the Staff timely filed their respective responses to Joint Intervenors' Submission of Contention 10 on July 20, 2010, and Joint Intervenors timely submitted their reply on July 27, 2010. See Applicants' Response to Proposed Contention 10 (July 20, 2010) at 1; Staff Answer to Joint Intervenors' New Contention 10 (July 20, 2010) at 27; Joint Intervenor's [sic] Reply to Staff's and Applicant's [sic] Responses to Submission of Contention 10 (July 27, 2010) at 16.

[17] Contention 10 at 1.

[18] Id. at 1, 23.

[19] LBP-10-24, 72 NRC 720, 765 (2010).

[20] Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC; Notice of Availability of the Final Environmental Impact Statement for the Combined License Application for Calvert Cliffs Nuclear Power Plant Unit 3, 76 Fed. Reg. 29,279 (May 20, 2011); Environmental Impact Statement for the Combined License (COL) for Calvert Cliffs Nuclear Power Plant Unit 3, Final Report, NUREG-1936 (May 2011) [hereinafter FEIS].

[21] Submission of Amended Contention 10C by Joint Intervenors (June 20, 2011) at 1, 11 [hereinafter Submission of Amended Contention 10C]; Applicants' Motion for Summary Disposition of Contention 10C (June 20, 2011) at 1.

[22] Staff's Response to Applicants' Motion for Summary Disposition (July 11, 2011).

Intervenors' Submission of Amended Contention 10C.[23] On August 26, 2011, the Board issued an order in which it denied Applicants' Motion for Summary Disposition of Contention 10C because a dispute of material fact remained, and declined to admit Joint Intervenors' Amended Contention 10C because it was unnecessary.[24]

In accordance with the revised schedule, the parties submitted their direct written testimony on October 21, 2011.[25] On October 24, 2011, Joint Intervenors filed an unopposed motion requesting to withdraw their previously submitted testimony and exhibits, submit new expert testimony and exhibits, and extend all other relevant deadlines related to the evidentiary hearing by one week.[26] The Board granted the motion on October 25, 2011,[27] and Joint Intervenors filed their new expert testimony and exhibits on October 28, 2011.[28]

---

[23] Staff Answer to Joint Intervenors' Amended Contention 10C (July 15, 2011); Applicants' Response to Amended Contention 10C (July 15, 2011).

[24] Contention 10C Summary Disposition Order. In this Order, the Board also deferred its ruling on Contention 1 until the issuance of the Partial Initial Decision on Contention 10C. Id. at 25.

[25] Applicants and the Staff submitted their respective initial statements of position, witness testimony, and exhibits. See UniStar Initial Statement of Position on Contention 10C (Oct. 21, 2011); Exh. APL000001 (Direct Testimony of UniStar Witnesses Dimitri Lutchenkov, Stefano Rati, and Septimus ven der Linden (Oct. 21, 2011)) ; Staff Initial Statement of Position (Oct. 21, 2011); Exh. NRC00001 (Prefiled Direct Testimony of Laura M. (Quinn) Willingham Sponsoring NUREG-1936 into the Hearing Record (Oct. 21, 2011)); Exh. NRC000004 (Prefiled Direct Testimony of Andrew J. Kugler and Katherine A. Cort Concerning Environmental Contention 10C (Oct. 21, 2011)). Joint Intervenors did not submit an initial statement of position, but did submit testimony from their representative, Michael Mariotte, along with related exhibits. See Testimony of Michael Mariotte, Executive Director of Nuclear Information and Resource Service, on Contention 10 (Oct. 21, 2011).

[26] Motion to Allow Joint Intervenors to Withdraw Written Testimony of October 21, 2011 on Contention 10, to Submit Expert Testimony by October 28, 2011, and to Extend Other Relevant Deadlines by One Week (Oct. 24, 2011). Intervenors explained that they were unable to file the written testimony of their anticipated expert witness, Mr. Sklar, by October 21 due to an illness in the witness's family, but that they would be able to do so by October 28. Id.

[27] Licensing Board Order (Granting Unopposed Motion to Withdraw Written Testimony Filed October 21, Submit Expert Testimony by October 28, and Extend Other Relevant Deadlines by One Week; and Providing Additional Instructions to Intervenors Regarding the Re-Filing of Testimony and Exhibits) (Oct. 25, 2011) (unpublished).

[28] See Exh. JNTR00001 (Testimony of Scott Sklar, President of the Stella Group, Ltd., on

On November 18, 2011, the parties submitted their respective rebuttal written testimony.[29] On December 9, 2011, the Staff and Applicants filed proposed questions for the Board to ask at the evidentiary hearing.[30] In addition, on December 9, 2011, the Staff also filed a motion in limine to exclude portions of Joint Intervenors' direct testimony, rebuttal testimony, rebuttal statement of position, and exhibits.[31] Joint Intervenors filed their response opposing the Staff's motion in limine on December 19, 2011.[32] The Board granted the Motion in part and denied it in part, as explained in the Order of January 17, 2012.[33] None of the parties filed motions to permit cross-examination.

On January 26 and 27, 2012, the Board held an evidentiary hearing on Contention 10C in Prince Frederick, Maryland.[34] The hearing was conducted in accordance with the provisions of Subpart L to 10 C.F.R. Part 2. The parties proffered into evidence pre-filed testimony and

---

Contention 10 (Nov. 18, 2011)); Pre-Filed Testimony of Scott Sklar, President of the Stella Group, Ltd. On Contention 10 on Behalf of Joint Intervenors (Oct. 28, 2011).

[29] See Staff Rebuttal Statement of Position (Nov. 18, 2011); UniStar Rebuttal Statement of Position on Contention 10C (Nov. 18, 2011); Joint Intervenor Statement of Position (in Rebuttal) (Nov. 18, 2011); Exh. NRC000043 (Prefiled Rebuttal Testimony of Andrew J. Kugler and Katherine A. Cort Regarding Environmental Contention 10C (Nov. 18, 2011)); Exh. APL000055 (Rebuttal Testimony of UniStar Witnesses Dimitri Lutchenkov, Stefano Ratti, and Septimus Van Der Linden (Nov. 18, 2011)); Exh. JNT000030 (Rebuttal Testimony of Scott Sklar, President of the Stella Group, Ltd., on Contention 10 (Nov. 18, 2011)).

[30] UniStar's Questions for the Licensing Board on Pre-Filed Direct and Rebuttal Testimony for Contention 10C (Dec. 9, 2011); NRC Staff Proposed Questions (Dec. 9, 2011). These filings were submitted in camera and held in confidence by the Board, pursuant to 10 C.F.R. § 2.1207(a)(3)(iii).

[31] Staff Motion in Limine to Exclude Portions of the Joint Intervenors' Direct and Rebuttal Testimony, Exhibits, and Portions of the Joint Intervenors' Rebuttal Statement of Position (Dec. 9, 2011) [hereinafter Motion in Limine].

[32] Joint Intervenors Opposition to Staff Motion in Limine (Dec. 19, 2011) [hereinafter Opposition to Motion in Limine].

[33] Licensing Board Order (Granting in Part and Denying in Part Staff's Motion in Limine) (Jan. 17, 2012) (unpublished) [hereinafter Board in Limine Ruling].

[34] Tr. at 310.

exhibits,[35] and the Board received live testimony from multiple witnesses.[36] After receiving testimony, the Board afforded the parties an opportunity to suggest cross-examination or rehabilitation questions.[37]

Following the evidentiary hearing, the Board adopted certain corrections to the hearing transcript, admitted an additional exhibit submitted by Joint Intervenors, and closed the environmental evidentiary record.[38] On April 20, 2012, the parties filed proposed findings of fact and conclusions of law regarding Contention 10C.[39]

II. LEGAL STANDARDS

A. Burden and Standard of Proof

In general, an applicant in a licensing proceeding bears the burden of proving by a preponderance of the evidence that it is entitled to the applied-for license.[40] Nonetheless, for contentions based on NEPA, such as the one at issue here, the burden shifts to the Staff, because the NRC, not the applicant, bears the ultimate burden of establishing compliance with

---

[35] See id. at 317–21.

[36] Id. at 340, 490, 547.

[37] See id. at 486, 490, 533–41, 684–86.

[38] Licensing Board Order (Adopting Proposed Transcript Corrections, Admitting Additional Exhibit, and Closing the Evidentiary Record) (Mar. 6, 2012) (unpublished).

[39] Proposed Findings of Fact and Conclusions of Law Regarding Joint Intervenors Contention 10C (Apr. 20, 2012); Applicants' Proposed Findings of Fact and Conclusions of Law on Contention 10C (Apr. 20, 2012) [hereinafter Applicants' Proposed Findings of Fact]; Staff Proposed Partial Initial Decision Findings of Fact and Conclusions of Law on Contention 10C (Apr. 20, 2012) [hereinafter Staff Proposed Findings of Fact]. In addition, on April 27, 2012, the Staff filed an Errata to its Staff Proposed Partial Initial Decision Findings of Fact and Conclusions of Law on Contention 10C to correct errors in its original filing. Errata Staff Proposed Partial Initial Decision Findings of Fact and Conclusions of Law on Contention 10C (Apr. 27, 2012).

[40] See 10 C.F.R. § 2.325. Thus, for safety issues, an applicant in a licensing proceeding has the burden of establishing that it is entitled to the applied-for license by a preponderance of the evidence.

NEPA.[41]

As a practical matter, however, the Staff typically relies heavily on the applicant's Environmental Report (ER) in preparing its FEIS.[42] Consequently, while environmental contentions ultimately challenge the NRC's compliance with NEPA,[43] an applicant is free to support positions set forth in the EIS that are under challenge.[44]

B. NEPA and 10 C.F.R. Part 51

Contention 10C arises under NEPA and the NRC's corresponding implementing regulations, 10 C.F.R. Part 51.[45] "The centerpiece of environmental regulation in the United States, NEPA requires federal agencies to pause before committing resources to a project and consider the likely environmental impacts of the preferred course of action as well as reasonable alternatives."[46] The goal of NEPA is two-fold: (1) to ensure that agency decision-makers will have detailed information concerning significant environmental impacts of proposed projects when they make their decisions; and (2) to guarantee that such information will be available to the larger audience that may also play a role in the decisionmaking process.[47]

To meet these goals, NEPA mandates that agencies prepare an environmental impact

---

[41] See, e.g., Duke Power Company (Catawba Nuclear Station, Units 1 & 2), CLI-83-19, 17 NRC 1041, 1049 (1983).

[42] See 10 C.F.R. §§ 51.41, 51.45(c).

[43] Catawba, CLI-83-19, 17 NRC at 1049.

[44] La. Energy Servs. L.P. (Claiborne Enrichment Center), LBP-96-25, 44 NRC 331, 338-39 (1996) (citing Pub. Serv. Comm'n of New Hampshire (Seabrook Station, Units 1 & 2), ALAB-471, 7 NRC 477, 489 n.8 (1978)), rev'd on other grounds, CLI-97-15, 46 NRC 294 (1997).

[45] 42 U.S.C. §§ 4321–4370; 10 C.F.R. Part 51.

[46] New Mexico ex rel. Richardson v. Bureau of Land Mgmt., 565 F. 3d 683, 703 (10th Cir. 2009) (citing 42 U.S.C. § 4331(b) (congressional declaration of national environmental policy); U.S. Dep't of Transp. v. Pub. Citizen, 541 U.S. 752, 756–57 (2004); Marsh v. Or. Natural Res. Council, 490 U.S. 360, 371 (1989); Forest Guardians v. U.S. Forest Serv., 495 F.3d 1162, 1172 (10th Cir. 2007)).

[47] Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 349 (1989).

statement (EIS) before approving any major Federal action that will significantly affect the quality of the human environment.[48] The requirement to prepare an EIS is a procedural mechanism designed to assure that agencies properly consider the environmental consequences of their actions. Nevertheless, NEPA does not mandate substantive results.[49] Rather, NEPA imposes procedural restraints on agencies, which require them to take a "hard look" at the environmental impacts of a proposed action and the reasonable alternatives to that action.[50] This standard requires the agency to undertake a rigorous and objective analysis of the proposal's environmental consequences and of alternatives. By requiring this detailed analysis before the agency acts on the proposal, NEPA ensures that an agency will not act upon "incomplete information, only to regret its decision after it is too late to correct."[51] Nonetheless, NEPA's "hard look" requirement is tempered by a "rule of reason."[52] According to the "rule of reason," an agency must only consider reasonably foreseeable impacts in its EIS, and need not address those that are "remote and speculative" or "inconsequentially small."[53]

---

[48] 42 U.S.C. § 4332(2)(C).

[49] Robertson, 490 U.S. at 350 ("Although [NEPA's action forcing] procedures are almost certain to affect the agency's substantive decision, it is now well settled that NEPA itself does not mandate particular results, but simply prescribes the necessary process."); see also Vt. Yankee Nuclear Power v. Natural Res. Def. Council, 435 U.S. 519, 558 (1978). Thus, NEPA does not require agencies to "elevate environmental concerns over other appropriate considerations." Strycker's Bay Neighborhood Council, Inc. v. Karlen, 444 U.S. 223, 227 (1980).

[50] La. Energy Servs., LLP (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 87-88 (1998); see also Baltimore Gas & Elec. Co. v. NRDC, 462 U.S. 87, 97-98 (1983) (holding that NEPA requires agencies to take a "hard look" at environmental consequences prior to taking major actions).

[51] LES, CLI-98-3, 47 NRC at 88 (quoting Marsh, 490 U.S. at 371).

[52] La. Energy Servs., L.P. (National Enrichment Facility), LBP-06-8, 63 NRC 241, 258-59 (2006) (citing Long Island Lighting Co. (Shoreham Nuclear Power Station), ALAB-156, 6 AEC 831, 836 (1973)); see also Pub. Citizen., 541 U.S. at 767-69 (stating that the rule of reason is inherent in NEPA and its implementing regulations).

[53] See, e.g., Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1), ALAB-156, 6 AEC 831, 836 (1973). According to the Council on Environmental Quality (CEQ), the "rule of reason" is "a judicial device to ensure that common sense and reason are not lost in the rubric of

Contention 10C is based upon the requirement that the EIS include "a detailed statement by the responsible official on . . . alternatives to the proposed action."[54] When considering alternatives, agencies must:

> (a) Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated.
>
> (b) Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.[55]

NRC regulations state that the alternatives analysis is the "heart of the environmental impact statement."[56] The Council on Environmental Quality (CEQ)[57] and the federal courts agree.[58] "The existence of a reasonable but unexamined alternative renders an EIS inadequate."[59] The adequacy of the FEIS's evaluation of alternatives is therefore a material issue in the licensing proceeding, and Contention 10C challenges that evaluation.

C. Supplementing the Environmental Record

The Commission has explained that "[b]oards frequently hold hearings on contentions

---

regulation." Final Rule: National Environmental Policy Act Regulations; Incomplete or Unavailable Information, 51 Fed. Reg. 15,618, 15,621 (Apr. 25, 1986).

[54] 42 U.S.C. § 4332(C)(iii); see LES, CLI-98-3, 47 NRC at 104.

[55] 40 C.F.R. § 1502.14.

[56] 10 C.F.R. Part 51, Appendix A, § 5.

[57] CEQ, which was created by NEPA in the Executive Office of the President, has promulgated regulations governing federal agency compliance with NEPA. See 40 C.F.R. §§ 1500.1–1508.28. The regulations receive substantial deference from the federal courts. See Pub. Citizen, 541 U.S. at 757; Robertson, 490 U.S. at 355–56. The Commission has also stated that "[a]lthough the CEQ's guidance does not bind us, we give such guidance substantial deference." Dominion Nuclear North Anna, LLC (Early Site Permit for North Anna ESP Site), CLI-07-27, 66 NRC 215, 222 n.21 (2007).

[58] 40 C.F.R. § 1502.14; see, e.g., Wyoming v. U.S. Dept. of Agriculture, 661 F.3d 1209, 1243 (10th Cir. 2011); Alaska v. Andrus, 580 F.2d 465, 474 (D.C. Cir. 1978), vacated in part as moot sub nom. W. Oil & Gas Ass'n v. Alaska, 439 U.S. 922 (1978).

[59] Friends of Se.'s Future v. Morrison, 153 F.3d 1059, 1065 (9th Cir.1998).

challenging the staff's final environmental review documents . . . In such cases, '[t]he adjudicatory record and Board decision (and . . . any Commission appellate decisions) become, in effect, part of the FEIS.'"[60] Thus, the Staff's FEIS, in conjunction with the adjudicatory record, become the relevant record of decision for the environmental portion of this proceeding.[61] Federal courts of appeal have approved this process in which an EIS is effectively amended through the adjudicatory process.[62] The Board's review of Contention 10C therefore encompasses all pertinent information properly before it, including the FEIS and the witness testimony and exhibits that were received into evidence at the evidentiary hearing. We will base our decision on whether the FEIS complies with NEPA on those sources of information, and that decision, along with the rest of the record for this proceeding, will in effect become part of the FEIS.

III. STAFF'S MOTION IN LIMINE

In our January 17, 2012 Order, issued in response to the Staff's Motion in Limine, we stated that we would defer our ruling on the disputed portions of the prefiled testimony of Mr. Sklar, Joint Intervenors' witness, until we had available the full evidentiary record.[63] We now resolve those issues.

In its Motion in Limine, the Staff moved to strike certain testimony concerning energy production outside of Maryland.[64] According to the Staff, the purpose and need of the proposed

---

[60] Nuclear Innovation North America LLC (South Texas Project, Units 3 and 4) CLI-11-06, 74 NRC __, __ (slip op. at 7–8) (Sept. 9, 2011) (citing LES, CLI-98-3, 47 NRC at 89 and Philadelphia Elec. Co. (Limerick Generating Station, Units 1 and 2), ALAB-819, 22 NRC 681, 705–07 (1985)).

[61] See, e.g., Pacific Gas and Electric Co. (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), CLI-08-26, 68 NRC 509, 526 (2008), petition for review denied on other grounds, San Luis Obispo Mothers for Peace v. NRC, 635 F.3d 1109 (9th Cir. 2011).

[62] New England Coalition on Nuclear Pollution v. NRC, 582 F.2d 87, 93–94 (1st Cir. 1978); Citizens for Safe Power, Inc. v. NRC, 524 F.2d 1291, 1294 n.5 (D.C. Cir. 1975); Ecology Action v. AEC, 492 F.2d 998, 1001–02 (2d Cir. 1974)).

[63] Board In Limine Ruling at 3.

[64] Motion in Limine at 4–6.

action is to "provide for additional large baseload electrical generating capacity within the State of Maryland."[65] The Staff maintains that Joint Intervenors did not challenge the requirement that any new electrical generating capacity must be physically located within Maryland, and that this precludes them from offering testimony concerning the potential for out-of-state wind and solar power to contribute to the Combination Alternative.[66]

We reject this objection. To begin with, the FEIS does not in fact consistently require that all sources of new electrical power be located in Maryland. Section 1.3.1 of the FEIS, entitled "NRC's Proposed Action," states that "[t]he purpose and need for the proposed NRC action is to provide for additional large baseload electrical generating capacity within the State of Maryland."[67] Although this statement implies that all the generating capacity must be physically located in Maryland, the Staff witnesses, citing the page of the FEIS on which this statement appears, inform us that "the purpose and need defined by the Review Team is to provide baseload power generation for the State of Maryland."[68] That purpose could be accomplished by a combination alternative that includes power generated both within and outside the State, provided the power is available for distribution in Maryland. Similarly, in Section 1.3.2, the FEIS states that "[t]he overall purpose of the project is to construct a nuclear power plant facility to provide for additional baseload electrical generating capacity to meet the growing demand in the State of Maryland."[69] Never once in Section 1.3.2 does the FEIS state that the purpose and need

---

[65] Id. at 4 (citing FEIS at 1-9).

[66] Id. at 4–6.

[67] FEIS at 1-9.

[68] Exh. NRC000015 at 14 (citing FEIS at 1-9) (emphasis added).

[69] FEIS at 1-11. In addition to obtaining a COL for Calvert Cliffs Unit 3, Applicants must apply for and receive a Department of the Army Individual Permit pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Appropriation Act of 1899. Id. at 1-1. The Corps verifies whether the information presented in the EIS is adequate to fulfill Corps regulations and the Clean Water Act Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged of Fill Material. Id. at 1-2. "The Corps has the authority to issue permits for proposed

of the proposed action requires new baseload generating capacity located entirely within the State of Maryland. Rather, in Section 1.3.2, the FEIS simply states that the purpose of the proposed project is to meet the growing electrical demands of the State of Maryland—a purpose which can be met by out-of-state power sources. The Staff's willingness to allow out-of-state sources to meet the purpose and need of the proposed project is reiterated again in Section 9.2, "Energy Alternatives," when the Staff states that "[t]he purpose and need for the proposed project . . . of this EIS is to generate baseload power for use by the applicant and for possibly future sale on the wholesale market."[70]

Moreover, regardless of how the Staff defined the purpose and need, the Joint Intervenors challenge to the Staff's blanket exclusion of sources outside Maryland falls within the "basis" or "envelope" of Contention 10C. "Where an issue arises over the scope of an admitted contention, NRC opinions have long referred back to the bases set forth in support of the contention."[71] Information offered in evidence–even if not specifically stated in the original contention and bases–may be relevant if it falls within the "envelope," "reach," or "focus" of the contention when read with the original bases offered for it.[72] Thus, as long as the facts relied on by Joint Intervenors fall within the "envelope" of the contention, they are properly before the Board. A petitioner is not required to set forth all its evidence or to prove its contentions at the admissibility stage.[73] The Commission has instructed licensing boards that they may not stretch "the scope of

---

work or structures in, over, and under navigable waters and for the discharge of dredged or fill material into waters of the United States. The Corps would regulate activities that would temporarily or permanently affect wetlands and waterbodies involved in this project." Id.

[70] Id. at 9-3.

[71] Duke Energy Corp. (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-02-28, 56 NRC 373, 379 (2002).

[72] Duke Energy Corp. (Catawba Nuclear Station, Units 1 & 2), LBP-04-12, 59 NRC 388, 391 (2004).

[73] Miss. Power & Light, Co. (Grand Gulf Nuclear Station, Units 1 & 2), ALAB-130, 6 AEC 423, 426 (1973).

admitted contentions beyond their reasonably inferred bounds," but this statement also implies that we may consider issues that, although not expressly stated, can reasonably be inferred from the arguments presented.[74]

In proposed Contention 10, from which the Board derived Contention 10C, Joint Intervenors argued that the Combination alternative "grossly underestimated" wind power potential because it omitted proposed new offshore wind power to be generated outside Maryland as well as within the State.[75] Joint Intevenors also criticized the DEIS for failing to "acknowledge the reality that there is enormous offshore wind power potential off Maryland's coast and the PJM region generally,"[76] for ignoring "actual offshore wind projects that have been both proposed and approved that will feed directly into Maryland and the PJM service area," and for failing to analyze "solar power potential of any kind . . . anywhere else in the PJM service area besides Maryland."[77] Thus, Joint Intervenors did challenge the Staff's refusal to include wind and solar power sources located outside Maryland in the combination alternative. This necessarily puts at issue the validity of the NRC's blanket exclusion of all such sources, whether based on its asserted definition of the purpose and need of the action or any other reason. The argument that the Staff unreasonably limited wind and solar power sources to those located in Maryland accordingly falls within the scope of Contention 10C because it is obvious from the argument expressly presented.

---

[74] See Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc. (Pilgrim Nuclear Power Station), CLI-10-11, 71 NRC 287, 309 (2010).

[75] Contention 10 at 9.

[76] Maryland is in a regional electric grid operated by PJM Interconnection, LLC (PJM). PJM is the largest power grid in North America and coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia. While PJM operates the transmission systems in its territory, it does not own them. FEIS at 8-2.

[77] Id. at 8. These statements appear in the part of Contention 10 that the Board identified as "Contention 10B," which the Board declined to admit. The Board pointed out, however, that "Contention 10C is derived from Joint Intervenors' challenge in Contention 10B to the Staff's analysis of the potential contributions of wind and solar power." LBP-10-24, 72 NRC at 759. Thus, the statements are relevant to determining the scope of Contention 10C.

The Staff makes similar arguments to support its claim that issues related to the timeframe for completion of Calvert Cliffs Unit 3 and uncertainty concerning the completion date are outside the scope of Contention 10C.[78] The Staff argues that questioning the completion date amounts to an attack upon its definition of the purpose and need of the proposed action.[79] But the Staff has not identified any statement of the purpose and need that requires Calvert Cliffs Unit 3 to be completed by a specific date. Moreover, the evidence presented at the hearing concerning the estimated date for completing construction falls within the "envelope" of Contention 10C. The admitted contention maintains that the FEIS's discussion of a combination of alternatives "is inadequate and faulty" because it "under represents potential contributions of wind and solar power." As explained below, the potential wind and solar power contribution to the Combination Alternative is heavily dependent upon the estimated completion date for Calvert Cliffs Unit 3.[80] Thus, the completion date and uncertainty concerning that date are directly relevant to the issue raised by Contention 10C. And, in their proposed Contention 10, Joint Intervenors identified proposed offshore wind power projects "likely to be in operation before construction of Calvert Cliffs-3 could be completed."[81] Thus, to resolve the issue raised by Contention 10C, the Board must necessarily have a realistic estimate of the completion date. The completion date is therefore within the scope of the contention.

We agree with the Staff, however, that Contention 10C applies only to the potential contributions of wind and solar power to the combination alternative.[82] Accordingly, we find that evidence regarding alternatives other than wind and solar is outside the scope of the admitted

---

[78] Motion in Limine at 9.

[79] Staff Proposed Findings of Fact at 27.

[80] Infra pp. 39-46.

[81] Contention 10 at 9.

[82] Motion in Limine at 6; see LBP-10-24, 72 NRC at 761.

contention, and therefore immaterial to the issues before us. We also agree that arguments to the effect that Calvert Cliffs Unit 3 is not a source of baseload power, because of the lack of back-up power or for any other reason, are outside the scope of the admitted contention.[83] Finally, we agree with the Staff that:

> [t]he Joint Intervenors' discussion of the [Maryland Renewable Portfolio Standard] requirements and renewable energy development incentives, and what impact these requirements and incentives might have on projected solar and wind development in Maryland, is within the scope of this proceeding. But their arguments alleging non-compliance with Maryland law are outside the scope of this proceeding and outside NRC adjudicatory jurisdiction.[84]

We have considered evidence related to the Maryland Renewable Portfolio Standard (RPS) solely for the purpose of evaluating the potential role of wind and solar power in the combination alternative.

IV. EVIDENTIARY SUMMARY AND FINDINGS OF FACT

A. Witnesses and Exhibits

The Staff presented the prefiled direct testimony of Laura M. (Quinn) Willingham[85] to sponsor the introduction of the Staff's FEIS into the record of this proceeding. The Staff also presented the prefiled direct testimony of Andrew J. Kugler, Senior Project Manager in the NRC's Office of New Reactors Division of Site and Environmental Review, Environmental Projects Branch 2, and Katherine A. Cort, Staff Scientist and Economist at Pacific Northwest National Laboratory (PNNL), operated for the U.S. Department of Energy (DOE) by Battelle Memorial Institute, to present the Staff's position with regard to Contention 10C and to discuss the process used to develop and to evaluate the combination of energy alternatives.[86] The professional

---

[83] Motion in Limine at 7.

[84] Motion in Limine at 8; see also supra section IV.G (discussing the Maryland Renewable Portfolio Standard).

[85] Exh. NRC000001.

[86] See Exh. NRC000004.

qualifications of the Staff's witnesses were submitted together with their prefiled testomony.[87] Both Mr. Kugler and Ms. Cort testified at the hearing.[88] The parties stipulated to the admission of the FEIS into evidence,[89] and accordingly it was not necessary for Ms. Willingham to testify.

Applicants presented three witnesses: (1) Dimitri Lutchenkov, Director, Environmental Affairs and Special Projects for UniStar Nuclear Energy, LLC; (2) Stefano Ratti, founder and owner of Chaberton Consulting; and (3) Septimus van der Linden, founder, co-owner, and President of BRULIN Associates LLC.[90] The professional qualifications of the Applicant's witnesses were submitted together with their prefiled testimony.[91] All of Applicants' witnesses testified at the hearing.[92]

Joint Intervenors offered the prefiled testimony of Scott Sklar, principal of the Stella Group.[93] Mr. Sklar's qualifications were submitted together with his prefiled testimony.[94] Mr. Sklar testified at the hearing.[95]

The prefiled testimony other than that of Ms. Willingham, and the testimony presented at the January 26 through 27 hearing, included expert opinion on the potential contributions of wind

---

[87] Exh. NRC000002 (Statement of Professional Qualifications for L.M. (Quinn) Willingham (Oct. 21, 2011)); Exh. NRC000005 (Statement of Professional Qualifications for Andrew J. Kugler (Oct. 21, 2011)); Exh. NRC000006 (Statement of Professional Qualifications for Katherine A. Cort (Oct. 21, 2011)).

[88] Tr. at 312.

[89] See id. at 319–20.

[90] See Exh. APL000001 at 1–3, 4–5.

[91] Exh. APL000002 (Affidavit of Dimitri Lutchenkov (Oct. 21, 2011)); Exh. APL000003 (Affidavit of Stefano Ratti (Oct. 21, 2011)); Exh. APL000004 (Affidavit of Septimus van der Linden (Oct. 21, 2011)).

[92] Tr. at 340, 490.

[93] Exh. JNTR00001.

[94] Exh. JNT000002 (Statement of Professional Qualifications for Scott Sklar (Oct. 28, 2011)).

[95] Tr. at 547.

and solar power to the Combination Alternative. The qualifications of the witnesses to provide such opinion testimony were not challenged.[96]

B. The Proposed Action

The proposed action relevant to this proceeding is the NRC's issuance of a COL for a new power reactor unit (Unit 3) at the Calvert Cliffs Nuclear Power Plant (CCNPP) in Calvert County, Maryland.[97] The FEIS considers and weighs the environmental impacts of constructing and operating a new nuclear unit at the Calvert Cliffs site and at alternative sites and mitigation measures available for reducing or avoiding adverse impacts.

C. The FEIS's Evaluation of Alternatives to the Proposed Action

Because the proposed project is intended to supply 1600 MW(e) of baseload power, the Staff determined that a reasonable alternative to the proposed project would also need to be capable of supplying that amount of baseload power.[98] In Section 9.2 of the FEIS, the Staff evaluated potential energy alternatives to the proposed action to determine if they would meet that purpose and need.[99] Mr. Kugler explained that, to be accepted as a reasonable alternative, an alternative source of baseload power had to be technically feasible and commercially exploitable. The alternative source also had to be physically located in the region of interest, which the Staff defined as the State of Maryland. A reasonable alternative also had to be able to meet the purpose and need of the proposed project within the timeframe of the proposed project.[100]

---

[96] Id. at 342, 565–66.

[97] FEIS at 1-9. The second proposed action evaluated in the FEIS is the U.S. Army Corps of Engineers' action on an individual permit application to perform certain activities on the site. The Corps participated with the NRC in preparing this FEIS as a cooperating agency. Id. at 1-7 to 1-8.

[98] Id. at 9-3.

[99] Id. at 9-3 to 9-32.

[100] Exh. NRC000004 at 10–12.

The Staff concluded that coal-fired and natural gas-fired plants were feasible alternatives to the proposed project.[101] The Staff evaluated a number of other individual alternatives to the operation of an additional nuclear unit at the proposed site.[102] The Staff opined that none of the other energy alternatives evaluated, including oil, wind, solar, hydropower, geothermal, wood waste, municipal solid waste, other biomass, and fuel cells, would be capable, individually, of meeting the purpose and need of the proposed action.[103]

In Section 9.2.4 of the FEIS, the Staff acknowledged that, although individual alternatives to Calvert Cliffs Unit 3 might not be sufficient to generate Applicants' target value of 1600 MW(e) of new baseload power, a combination of alternative power sources might be a cost-effective way of meeting that objective.[104] The FEIS states that, given Applicants' objective, "a fossil energy source, most likely coal or natural gas, would need to be a significant contributor to any reasonable alternative energy combination."[105] The Staff also noted that there are many possible combinations of fossil energy sources and alternative power sources that might be cost-effective ways of satisfying the project's purpose. It decided to focus on one combination, which included specified contributions from wind power, solar power, hydropower, biomass sources, conservation and demand-side management programs, and natural gas combined-cycle generating units (the "combination alternative").[106] In the FEIS, the Staff compared the environmental consequences of the combination alternative and two other "viable energy

---

[101] FEIS § 9.2.2.

[102] Exh. NRC000004 at 13–16; FEIS § 9.2.3.

[103] Exh. NRC000004 at 15–16, FEIS § 9.2.3.

[104] Id. at 9-27.

[105] Id. at 9-28.

[106] Id.

alternatives" to the proposed action.[107] The Staff estimated that the combination alternative would result in 4.2 million tons of carbon dioxide emissions per year, as well as the emission of other air pollutants, from the operation of the natural gas plant.[108] The Staff concluded "from an environmental perspective, none of the viable energy alternatives are clearly preferable to construction of a new baseload power generating plant located within Applicants' ROI."[109]

In Contention 10C, Joint Intervenors maintain that, because the Staff underestimated Maryland's wind power potential and failed to quantify its acknowledged solar power potential, the Staff underestimated the contribution wind and solar power could make to the combination alternative. Joint Intervenors argue that greater contributions from wind and solar power would reduce the air emissions from the combination alternative. The Staff's alleged errors therefore undermine its analysis of the estimated air emissions from the combination alternative. Joint Intervenors contend that the Staff's alternatives analysis is accordingly inaccurate and incomplete and cannot support the granting of a license for Calvert Cliffs Unit 3 until it is revised to provide a realistic comparison of viable alternatives.

D. Maryland's Renewable Energy Portfolio Standard (RPS)

One factor influencing the future availability of wind and solar power in Maryland is the State's RPS. It was enacted under the 2004 Maryland Renewable Energy Portfolio Standard and Credit Trading Act.[110] Since then, Maryland's RPS has been amended three times—in 2007, 2008, and 2010.[111]

---

[107] Id. at 9-30 (tbl. 9-4).

[108] Id. at 9-29.

[109] Id. at 9-31.

[110] Exh. JNT000008 ("Maryland's Energy Future," Energy Transition Report 2007, Prepared for Governor Martin O'Malley (2007)) at 6.

[111] Exh. JNT000011 at 2.

Under the RPS, every year an increasing amount of Maryland's energy sales must come from renewable energy, with 20 percent of Maryland's energy sales coming from Tier 1 renewable energy sources by 2022.[112] To meet this requirement, the Maryland RPS permits suppliers to purchase renewable energy certificates, or RECs, from renewable energy sources as an alternative to generating power from renewable energy sources themselves.[113] A single REC is equal to one MWh of electrical energy generated by whatever resource is being used to meet the RPS standard.[114] The RPS, however, does not require Maryland utilities to actually purchase power generated by the renewable energy sources from which they purchase RECs.[115]

In general, Maryland energy suppliers can purchase RECs from renewable power sources located outside of Maryland in order to meet the RPS requirements.[116] By 2022, 18 percent of Maryland's energy sales must come from Tier 1 renewable sources, such as wind power or geothermal sources, all of which may be located either inside or outside Maryland.[117] The RPS contains a specific carve-out for solar power, however, which requires that, by 2022, at least 2

---

[112] Exh. JNT000011 at 3; Exh. NRC000028 at 46. Maryland's RPS specifies two different tiers of renewables from which its energy sales must come: Tier 1 renewables—including wind and solar power—and Tier 2 renewables—such as hydroelectric plants and waste-to-energy facilities. Id. at 2–3. However, the Maryland RPS requirements for Tier 2 renewables are scheduled to sunset in 2018. Id. at 3. In addition, a modification to the 2004 Maryland RPS distinguished between Tier 1 renewables, so that a certain percentage of Maryland's energy sales must come exclusively from Tier 1 solar renewables, while a separate percentage must come exclusively from Tier 1 non-solar renewables. Id. at 4, 7.

[113] Tr. at 403–05; Exh. JNT000011 at 3. If a power supplier in Maryland is unable or unwilling to purchase the required amount of renewable energy resources, they must pay an alternative compliance payment, or an ACP, for each MW of renewable energy that they are short of the RPS requirement. Exh. JNT000011 at 3.

[114] Tr. at 443.

[115] Id. at 454.

[116] Id. at 403–05.

[117] Exh. JNT000011 at 1–4.

percent of Maryland's energy sales must come from solar power, all of which must be produced in the State of Maryland.[118]

It is reasonably foreseeable that Maryland utilities will comply with the RPS.[119]

E. Wind Power Potential

Wind power could be a component of a baseload energy source in combination with compressed air energy storage (CAES) facility, a natural gas plant, or both.[120] In the FEIS combination alternative analysis, the Staff estimated a contribution of 100 MW(e) from wind power.[121] According to the FEIS, 100 MW(e) equates to at least 250 to 300 MW of installed capacity, which would be coupled with a 100 MW CAES plant to provide the 100 MW(e) of baseload power.[122] In arriving at these estimates, Mr. Kugler and Ms. Cort testified that they were working under the assumption that the combination alternative would be operational by 2015, and thus they relied on shorter-term projections contained in the Department of Energy's 2011 Annual Energy Outlook and the National Renewable Energy Laboratory's (NREL's) 2010 offshore wind report, and information from the Maryland Public Service Commission (MPSC).[123]

Mr. Kugler explained that, in order to determine potential wind and solar power estimates for Maryland, the Staff analyzed potential wind and solar power sources on a regional level because such estimates are rarely performed on a state-by-state basis.[124] To do this, he

---

[118] Exh. JNT000011 at 3. The Maryland RPS requires that by 2022, 2 percent of Maryland's energy sales must come from in-state solar power, and 18 percent must come from other Tier 1 renewable sources, such as wind, geothermal, and ocean energy. Id. at 1–3. Since the Maryland RPS requirements for energy sales from Tier 2 renewables sunsets in 2018, by 2022 no energy sales are required to come from Tier 2 renewables. Id.

[119] Tr. at 441.

[120] Exh. NRC000004 at 24–25; FEIS at 9-21. CAES facilities are discussed infra pp. 37-39.

[121] FEIS at 9-28.

[122] Id.

[123] Exh. NRC000004 at 25.

[124] Tr. at 400.

explained, the Staff examined potential wind and solar power estimates for the region in which Maryland is located — the Reliability First Corporation, East Region ("RFC/East Region").[125] The RFC/East Region is comprised of four different states—Maryland, Delaware, Pennsylvania, and New Jersey.[126] Using the wind and solar power estimates for the RFC/East Region, the Staff determined Maryland's relative contribution by dividing the overall regional wind and solar power estimates by three, based upon the Staff's calculation that Maryland is responsible for roughly one-third of the regional power output.[127] According to Mr. Kugler, this is a high estimate, given that other sources indicate that Maryland is likely only responsible for roughly one-quarter of the RFC/East Region's regional output.[128] Nonetheless, Mr. Kugler testified that the Staff estimated Maryland to contribute one-third of the power to the RFC/East Region in order to ensure that its FEIS analysis of combination alternative estimate would provide a fair estimate.[129]

Mr. Kugler and Ms. Cort further testified that the DOE Annual Energy Outlook projected a growth of 420 MW of onshore wind capacity and 200 MW of offshore wind capacity between 2010 and 2035 in the RFC/East Region.[130] Because it considered Maryland to be responsible for a third of the RFC/East Region's regional output, the Staff estimated that Maryland would

---

[125] Id. The RFC is one of the eight approved regional entities in North America under the North American Electric Reliability Corporation (NERC). "NERC's mission is to verify the reliability of the bulk power system in North America. NERC develops and enforces reliability standards, monitors the bulk power system, assesses and report on future transmission and generation adequacy, and offers education and certification programs to industry personnel . . . ." FEIS at 8-2. RFC's primaries duties include creating reliability standards, monitoring compliance with those reliability standards, and providing seasonal and long-term assessments of bulk electric system reliability within the RFC geographic area. Id.

[126] Tr. at 400–01.

[127] Id.

[128] Id.

[129] Id. at 401.

[130] Exh. NRC000004 at 29; Exh. NRC000022 (U.S. Department of Energy, Energy Information Administration, Annual Energy Outlook 2011, DOE/EIA-0383 (2011)).

experience a growth of roughly 210 MW in installed onshore and offshore wind between 2010 and 2035.[131] Assuming a 34 percent capacity factor for wind, the Staff calculated that Maryland's 210 MW increase in wind power would equate to about 71 MW(e) of average output. Based on these calculations, along with the limited wind development currently in Maryland, Mr. Kugler and Ms. Cort testified that it "would be unreasonable to expect large-scale development of this resource within the timeframe of the proposed project" and thus that its estimate of a 100 MW(e) wind power contribution to the combination alternative was reasonable.[132]

Applicants, however, consider the Staff's 100 MW(e) contribution estimate from wind power to be "optimistic" and "speculative."[133] Mr. Ratti testified on behalf of Applicants that he anticipated installed wind capacity over the next ten years would likely only produce an additional 21 MW(e) of wind power.[134] Mr. Ratti based this estimate on the Long Term Energy Report for Maryland (Maryland LTER), which shows 190 MW of additional capacity coming on line.[135] Mr. Ratti further testified that 120 MW of that capacity has already come online through the Criterion and Roth Rock projects, thus leaving an addition 70 MW of installed wind capacity over the next ten years, which is equivalent to 21 MW(e) on average.[136] According to Mr. Ratti, the estimates provided by the Maryland LTER are reliable because they are modeled on the current regulatory environment and the RPS, and "an expansion of RPS requirements beyond the current RPS is highly speculative."[137]

---

[131] Exh. NRC000004 at 29.

[132] Id.

[133] Exh. APL000001 at 29.

[134] Id.

[135] Id. at 28–29.

[136] Id. at 29.

[137] Id. at 28. Maryland's RPS was enacted in 2004 under the 2004 Maryland Renewable Energy Portfolio Standard and Credit Trading Act. See supra pp. 20–22. Mr. Ratti stated that "[i]n the

Testifying on behalf of the Joint Intervenors, Mr. Sklar disagreed with the Staff and UniStar estimates, claiming that they were too low. Mr. Sklar stated the DOE study that the Staff relied on in estimating the potential wind contribution was not a market-oriented analysis, and, as such, it merely extrapolated growth rates and cost reductions, thus providing a much more conservative estimate.[138] Instead, Mr. Sklar estimated that by 2020, Maryland would have 1255 MW of installed wind capacity—roughly 1135 MW more installed wind capacity than the State currently has.[139] Mr Sklar added that, based on a study by the Institute for Local Self-Reliance, roughly 40 percent of Maryland's energy needs could be met with renewables, including wind, solar, and biomass.[140]

In considering offshore wind potential specifically, Mr. Kugler and Ms. Cort testified that the Staff relied primarily on NREL's 2010 report concerning large-scale offshore wind in the United States to assess Maryland's offshore wind potential.[141] NREL's report states that the Mid-Atlantic region, which extends from New Jersey to North Carolina, has up to 570 GW of potential offshore wind capacity, of which 54 GW is attributable to Maryland, 15 GW is attributable to Delaware, and 94 GW is attributable to Virginia.[142] Mr. Kugler testified that onshore wind has a capacity factor of around 34 percent, while offshore wind has a capacity factor closer to 40

---

unlikely, but plausible, case that all of the new renewable energy necessary to satisfy the RPS were to come from wind power, wind power would have to provide up to approximately 1.5 million MWh per year. That would approximately represent an additional 570 MW of wind power, or 170 MW(e) on average." Exh. APL000001 at 29.

[138] Tr. at 590.

[139] Id. at 606–08.

[140] Id. at 401; see Exh. JNT000007 ("Energy Self-Reliant State," 2nd ed., John Farrell and David Morris (May 2010)).

[141] Exh. NRC000004 at 27.

[142] Exh. NRC000024 at 60–63 (tbl. 4-3). Another exhibit proffered by the Applicants estimates Maryland's offshore wind potential to be roughly 60 GW. Exh. APL000010 ("Maryland's Offshore Wind Power Potential," University of Delaware's Center for Carbon-free Power Integration, College of Earth, Ocean, and Environment (Feb. 1, 201)) at 19 (tbl. 3).

percent because offshore winds tend to be steadier.[143]

The NREL Report identifies offshore wind development projects in States such as Delaware, New Jersey, and Massachusetts, stating that "[a]lthough many more proposals have been made, the projects listed in the table are more advanced, meeting one or more of the following criteria: they have been approved by their state, received an interim lease from BOEM [Bureau of Ocean Energy Management] (2010), or granted a BOEM lease."[144] For Maryland, Delaware, and Virginia, the NREL Report identified only the NRG Bluewater Wind project off the coast of Delaware in the list of more advanced projects.[145] It had a planned capacity of 450 MW(e) but ultimately failed to secure adequate financing.[146] Although a number of proposals have been made, no offshore wind turbines have actually been installed in the United States.[147] The Staff stated that the NREL report's findings were consistent with other sources the Staff reviewed, including the Wind Technologies Market Report, and a 2008 report from the MPSC. Based on these reports, the Staff concluded that, while the potential for offshore wind was high, it "would not significantly contribute to the combination of energy alternatives in the timeframe of the proposed project."[148]

Currently there are two onshore utility-scale moderate-sized (50 MW and 70 MW,

---

[143] Tr. at 356.

[144] Exh. NRC000024 ("National Renewable Energy Laboratory, Large-Scale Offshore Wind Power in the United States; Assessment of Opportunities and Barriers," Walter Musial & Bonnie Ram (2010)) at 30–31 (tbl. 3-3).

[145] Id.

[146] Exh. NRC000004 at 26; Tr. at 348. That project would have been located 11 miles east off the coast of Dewey Beach, Delaware. Exh. NRC000004 at 26.

[147] Tr. at 345–46; Exh. APL000010 at 1.

[148] Exh. NRC000004 at 28. The Staff thus argues that its decision not to include the NRG Bluewater Wind project off the coast of Maryland is justified because it has not made significant progress in the leasing and permitting process. Id.

respectively) wind energy projects in Maryland.[149] The first operating wind project in Maryland, the 70 MW Criterion onshore wind project, went online in December 2010.[150] The second operating wind project in Maryland, the 50 MW onshore Roth Rock project, went online in July 2011.[151] Because neither the NREL report nor the MPSC "Ten-Year Plan (2009-2018) of Electric Companies in Maryland" identified any other active wind projects in Maryland, the Staff concluded that "significant development of wind generation in Maryland is not likely in the timeframe of the proposed project."[152]

While neither the NREL report nor the MPSC identified any other active wind projects in Maryland, Mr. Ratti testified that "[t]wo onshore projects have gone through a significant number of developmental steps in Maryland"—primarily, the Dan's Mountain 69.6 MW project in Western Maryland.[153] In addition, Mr. Ratti testified that multiple other wind farms exist in neighboring states. Specifically, Mr. Ratti noted that:

a. Pennsylvania has 751 MW of wind capacity currently online and an additional 177 MW under construction;

b. West Virginia has 431 MW of wind capacity currently online and an additional 147 MW under construction;

c. Virginia has no operating projects, but one 38 MW project is currently under construction.[154]

Despite the success of these projects, wind power still faces many hurdles. Mr. Kugler testified that incorporating wind and solar power into the grid presents some serious challenges to

---

[149] Id.

[150] Id.

[151] Id.

[152] Id. at 26-27.

[153] Exh. APL000001 at 26. The other project Mr. Ratti mentions, the Savage Mountain 40 MW project, was cancelled in 2010. Id.

[154] Id. at 25.

the grid operators because the variability of wind and solar is something over which they have no control.[155] In addition, Mr. Kugler noted that often wind power will run into transmission capacity problems, whereby the wind turbines will be running at full capacity and producing more energy than the transmission lines are capable of handling.[156] In these situations, the turbines' output must be reduced to below what they are then capable of generating, simply because of the limited transmission line capability.[157]

To accommodate for the variability of wind, Mr. Kugler testified that a grid operator could employ the use of a CAES facility, or a natural gas plant.[158] The more renewables that are incorporated into the grid, however, Mr. Kugler cautioned, the bigger the CAES facility or natural gas plant that would be required in order to compensate for the variability of the wind.[159] Doing this would be expensive, according to Mr. Kugler, because building two power plants would be necessary—one wind power plant, and another plant of the same size that could compensate for the variable output of the wind power plant.[160]

Mr. Kugler testified that "there is certainly offshore wind potential for Maryland," but did not believe that offshore wind was poised to take off in Maryland.[161] Mr. Kugler went on to explain that currently multiple barriers exist to building offshore wind power facilities.[162] As an example

---

[155] Tr. at 360–61.

[156] Id. at 358.

[157] Id.

[158] Id. at 361–65. Mr. Kugler cautioned, however, that using such systems would work best for small wind or solar projects, since the impact of their variability on the grid would be limited to a small amount. Id. at 361–62.

[159] Id. at 365.

[160] Id.

[161] Tr. at 345.

[162] Id.

of the difficulties that offshore wind power faces generally, Mr. Kugler cited the Cape Wind project, which has been dealing with licensing issues for over ten years.[163] In addition, offshore wind turbines also present special maintenance challenges.[164] The Wind Technologies Report cited by the Staff reiterates some of the difficulties confronting offshore wind, stating that:

> though political support exists for offshore wind energy in some quarters, planning, siting, and permitting can be challenging, as demonstrated in the long history of the Cape Wind project. Competing uses of offshore waters and public concerns can complicate the process and, despite recent progress in clarifying the permitting procedures in federal waters, uncertainties in federal and state permitting processes remain.[165]

According to Mr. Kugler, "the cost of offshore wind is typically viewed as being twice what it would be for onshore wind and in the United States onshore wind is marginally competitive in some places and fairly well competitive in other places."[166] The Wind Technologies Market Report, upon which the Staff relied, echoes this, stating that "the projected near-term costs of offshore wind energy remains high."[167] A 2008 MPSC report, which the Staff also cited, concluded that offshore wind power in Maryland is unlikely without subsidies or other incentives.[168]

The Board finds that the amount of available wind power capacity will for the foreseeable future be determined primarily by regulatory requirements.[169] For Maryland, the determining

---

[163] Id.

[164] Id.

[165] Exh. NRC000029 (U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, 2010 Wind Technologies Market Report (2010)) at 10.

[166] Tr. at 347.

[167] Exh. NRC000029 at 10.

[168] See Exh. NRC000023 (Maryland Public Service Commission, Final Report Under Senate Bill 400: Options for Re-Regulation and New Generation (Dec. 16, 2008)).

[169] See Exh. APL000001 at 28-29.

regulatory requirement will be the State's RPS.[170] Although the RPS only sets minimum requirements, the economic uncertainties are too great to justify a conclusion that those requirements are likely to be significantly exceeded in the foreseeable future.[171]

E. Solar Power Potential

The term solar power refers to the conversion of the energy from the sun into electricity.[172] Currently, there are two main solar technologies available for utility-scale plants: thermal technologies, also referred to as concentrated solar power, and photovoltaics.[173] Thermal technologies rely on mirrors to concentrate the solar power, which in turn heats a fluid that then drives a turbine or an engine.[174] Photovoltaics use cells with semiconductors to convert solar power directly into electricity.[175] The primary photovoltaic technologies are crystalline silicone and various types of thin-film, such as cadmium-telluride or gallium arsenide.[176] In addition to utility-scale solar power plants, solar power is also available at the end-user level, where the energy generated is used directly at the generating site.[177]

Solar power, like wind power, can provide a baseload energy source when combined with a CAES facility or a natural gas plant.[178] In the FEIS combination alternative analysis, the Staff

---

[170] Id.

[171] See id.; Exh. APL000062.

[172] FEIS at 9-23, Exh. APL000001 at 30.

[173] FEIS at 9-23, Exh. APL000001 at 30.

[174] FEIS at 9-23, Exh. APL000001 at 30.

[175] Exh. APL000001 at 30.

[176] Id. at 30–31. In some photovoltaic applications, it is also possible to concentrate the sun's rays before they reach the solar panels. These types of applications are referred to as concentrated photovoltaics.

[177] Exh. NRC000004 at 34.

[178] See FEIS at 9-20 to 9-24, 9-28; Exh. NRC000004 at 37.

estimated a total contribution of 75 MW(e) from solar power.[179] In reaching this estimate, the Staff worked under the assumption that a combination alternative would need to be operational by 2015, and thus relied primarily on shorter-term projections from the DOE's Annual Energy Outlook and the MPSC's Ten-Year Plan to determine the likely contribution of solar power to the combination alternative.[180]

Although the studies that the Staff relied on implied that solar power potential in Maryland is relatively low, the Staff included a solar power contribution estimate in the FEIS combination alternative analysis because "generation from solar is possible and currently available in Maryland."[181] Mr. Kugler and Ms. Cort testified that "[t]he 75 MW(e) level of contribution was based on DOE/EIA's overall prediction of growth in solar as an end-use generation source and the Review Team's technical judgment of this prediction as authoritative and reasonable."[182] According to Mr. Kugler and Ms. Cort, the DOE Annual Energy Outlook predicts no increase in utility-scale solar capacity between 2010 and 2035 in the RFC/East region, and the addition of 810 MW of end-use solar capacity (all photovoltaic) in that region between 2010 and 2035.[183] Based on their assumption that Maryland accounts for roughly one-third of the RFC/East region, the Staff estimated an addition of 270 MW of end-use solar capacity in Maryland by 2035.[184] Using a 25 percent average capacity factor for photovoltaics, the Staff calculated that the 270 MW increase in solar capacity equates to roughly 68 MW(e) in baseload capacity.[185] Accordingly, the

---

[179] FEIS at 9-28.

[180] Exh. NRC000004 at 33.

[181] Id. at 35.

[182] Id.

[183] Id.; Exh. NRC0000022.

[184] Exh. NRC000004 at 35.

[185] Id. Mr. Kugler and Ms. Cort testified that the Staff assumed a 25 percent average capacity for photovoltaics based on a DOE study stating that photovoltaic capacity factors range from 18

Staff concluded the 75 MW(e) solar power contribution estimate in the combination alternative was reasonable.[186]

On behalf of Applicants, Mr. Ratti testified that the raw potential for solar power in Maryland is high.[187] However, he stated that such potential is limited because solar power requires roughly 6 to 7 acres per installed MW and "because the economics of solar are such that building solar power plants makes economic sense only inasmuch as it is mandated through state standards and/or federal incentives are made available."[188] Mr. Ratti believes that the Maryland LTER is correct, and he thus expects 75 MW(e) of new solar baseload equivalent capacity in Maryland by 2020.[189] The Maryland LTER estimates that future increases in installed solar capacity will be closely linked to the RPS solar carve-out requirement (2 percent of Maryland's electrical energy must come from solar power by 2022).[190] Specifically, the Report assumes that new solar power will be installed to meet the growing requirements for solar under the RPS through 2018 and that, up to that point, there will be solar renewable energy certificates (RECs) available at prices below the solar alternative compliance payment (ACP).[191] After 2018, the

---

percent to 25 percent in the U.S. Id.; Exh. NRC000021 (U.S. Department of Energy, Energy Information Administration, Levelized Cost of New Generation Resources in the Annual Energy Outlook 2011 (2010)).

[186] Exh. NRC000004 at 36. Mr. Kugler and Ms. Cort also testified that this estimate need not be larger merely because a DOE report identifies Maryland's solar power potential as "Good." According to the Staff, the DOE report indicating that Maryland has "Good" solar power potential rated a region's solar power potential on a scale of "Moderate," "Good," Very Good," or Excellent," and only Alaska and the northwest corner of Washington are rated less favorably than Maryland. Id. at 34; Exh. NRC000036 (U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, 2008 Solar Technologies Market Report (2010)).

[187] Exh. APL000001 at 33.

[188] Id.

[189] Id. at 39.

[190] Id. at 37.

[191] Id. The Maryland RPS requires suppliers to purchase renewable energy certificates, or RECs, from renewable energy sources. Tr. at 403–05; Exh. JNT000011 ("'Long-Term Electricity

Maryland LTER estimates that additional requirements for solar power under the RPS will not be met with new physical installations, and that utilities will elect instead to pay the solar ACP because the cost will likely be lower than that of purchasing solar RECs.[192] Mr. Ratti admits, however, that it is plausible, though unlikely, that all of the RPS solar carve-out would be met through new solar physical installations in Maryland, in which case 160 MW(e) of new solar power would be available in Maryland over the next 10 years.[193]

Joint Intervenors contend, however, that the 75 MW(e) solar power contribution estimate contained in the FEIS combination alternative severely underestimates the potential for solar power in Maryland. In support of that proposition, Mr. Sklar noted a study by SolarTown which concludes that over 450 million square feet of roof space would be suitable for solar panels in Maryland, amounting to over 5,000 MW of new solar power capacity to the State.[194] In addition, Mr. Sklar testified that it is likely that more large electricity end-users will begin installing solar photovoltaic systems in Maryland, much like Perdue, General Motors, and the Washington Redskins are doing or have already done.[195] Mr. Sklar thus testified that he conservatively expects that there will be at least 2,250 MW of solar power installed in Maryland by 2025.[196]

Currently in Maryland, however, the only utility-scale operating solar power project is the

---

Report for Maryland Renewable Energy Portfolio Standards,' White Paper to Support LTER Assumptions" (Nov. 30, 2010)) at 3. If a power supplier in Maryland is unable or unwilling to purchase the required amount of RECs, they must pay an alternative compliance payment, or an ACP, for each megawatt-hour of renewable energy that they are short. Exh. JNT000011 at 3.

[192] Exh. APL000001 at 37.

[193] Id. at 39.

[194] Exh. JNTR00001 at 14; Exh. JNTR00013.

[195] Exh. JNTR00001 at 14; Exh. NRC000037 ("Solar Installation at Perdue to be One of East Coast's Largest," RenewableEnergyWorld.com (Jan. 18, 2011)); Exh. NRC000038 ("Baltimore GM Factory Grows with Solar Power," Tina Casey, TriplePUndit.com (May 23, 2011)); Exh. JNT000020 ("Washington Redskins Go 'Green' with Solar Panels at FedEx," Jeremy Borden (Sept. 15, 2011)).

[196] See Tr. at 581–84.

2.2 MW University of Maryland Eastern Shore plant.[197] In addition, there is also a large 1.8 MW commercial installation at McCormick's Hunt Valley Distribution Center.[198]

The Staff acknowledges, though, that multiple other solar projects are currently in development in Maryland and the surrounding area. These projects include Constellation Energy's proposed 16.1 MW solar facility at Mount St. Mary's University in Emmitsburg, Maryland, a separate 1.3 MW solar array proposed by Constellation Energy to generate power for Mount St. Mary's, and Maryland Solar's proposed 20 MW solar facility in Hagerstown, Maryland.[199] In addition to these projects, Mr. Ratti testified that Southern Maryland Electric Cooperative also has a proposed 5.5 MW project that would be located in Hughesville, Maryland.[200] Mr. Ratti also noted that the states surrounding Maryland currently have solar projects in construction or development, including:

- Pennsylvania: 6 MW in operation, 1 MW in construction, 52 MW in development;
- Delaware: 10 MW in operation (Dover Sun Park).[201]

Joint Intervenors point out that Sun Edison and Standard Solar alone have recently completed solar power projects in Maryland totaling 16.4 MW (43.1 MW if recently completed projects in Delaware, New Jersey, Pennsylvania, and Washington, D.C. are also included).[202] In

---

[197] Exh. APL000001 at 38.

[198] Id.

[199] Exh. NRC000004 at 36; Exh. NRC000039 ("MD's Largest Solar Project Under Construction," Tim Wheeler, Baltimore Green Blog (Sept. 29, 2011)). Constellation Energy announced in September 2011 that it had already begun work on its plant in Emmitsburg, Maryland. Exh. NRC000039.

[200] Exh. APL000001 at 38.

[201] Id. at 39; Exh. APL000043 ("Utility-Scale Solar Projects in the United States Operating, Under Construction, or Under Development," Solar Energy Industries Association (Oct. 14, 2011)).

[202] Exh. JNTR00001 at 14; Exh. JNT000014 ("SunEdison Solar Project Listing: Mid Atlantic Region," SunEdison (Oct. 27, 2011)); Exh. JNT000015 ("PV Projects Developed by Standard Solar," Standard Solar (Oct. 27, 2011)).

addition, Joint Intervenors identified two proposed solar projects that were recently announced in Maryland: a 3.7 MW project that will provide power to two Perdue Farms facilities and a 1.2 MW project that will power a plant in Baltimore.[203]

While solar power faces numerous challenges, including its intermittent nature, corresponding grid issues, and the large amount of land required, the biggest challenge currently facing solar power is its cost.[204] Mr. Sklar claims, however, that "[t]he cost of solar power, particularly photovoltaics, has been dropping sharply over the past few years."[205] In support of this statement Mr. Sklar cites a 2010 report entitled "Solar and Nuclear Costs—The Historic Crossover."[206] In that report, the authors compare the costs of solar photovoltaics to the cost of nuclear power and conclude that, in North Carolina, solar power became cheaper than nuclear power in 2010 and the cost gap will continue to widen.[207] As Mr. Ratti testified, however, this study is misleading.[208] On one hand, it reduces the cost of solar from roughly 35 cents a kilowatt hour to 15.9 cents a kilowatt hour by including federal and state incentives, and assumes that these incentives will persist.[209] For nuclear power, however, the report relies on very high cost estimates—from 20 to 25 cents per kilowatt hour. That is roughly 8 to 13 cents per kilowatt hour

---

[203] Submission of Amended Contention 10C at 10; Exh. NRC000037; Exh. NRC000038. Mr. Kugler and Ms. Cort question whether the estimated capacity for these projects, as stated in the articles cited by Joint Intervenors, is in fact correct. See Exh. NRC000004 at 36.

[204] See, e.g., Exh. APL000004 at 31–32; Tr. at 465–66; Exh. NRC000004 at 35.

[205] Exh. JNTR00001 at 13.

[206] Exh. JNT000012.

[207] Exh. JNTR00001 at 13; Exh. JNT000012 ("Solar and Nuclear Costs: The Historic Crossover; Solar Energy is Now the Better Buy," John O. Blackburn and Sam Cunningham (July 2010))at 3.

[208] Tr. at 696–98.

[209] Exh. JNT000012 at 17–18.

higher than the DOE projections.[210] The assumptions underlying this study are thus, at the very least, questionable.

Other reputable studies acknowledge the high cost of solar power and the impact that cost is playing in the prevalence of solar power. For instance, the MPSC considered the potential for solar power in Maryland in a 2008 report and concluded that the overall economics of solar power remain negative, but could improve if technology progresses faster than contemplated by the report and financial incentives continue.[211] Mr. Ratti testified that the typical cost of a utility-scale photovoltaic plant was down from $8,000 per KW in 2004 to $3,400 per KW in 2010.[212] For smaller installations, however, the costs are higher—roughly $6,000 per KW for a 5 KW rooftop installation in Maryland in the fall of 2011.[213] Without any state or federal incentives, solar power would thus have a levelized cost of more than $200 per MWh for utility-scale power plants and $400 to $500 power MWh for rooftop installations.[214]

Thus, the potential for solar power is largely limited to the demand generated by governmental mandates, along with state and federal incentives, many of which are expiring soon and may not be renewed due to current economic conditions.[215] As with wind power, the Board finds that the amount of available solar power capacity will for the foreseeable future be determined primarily by the RPS.[216] The costs issues and other economic uncertainties are too

---

[210] Tr. at 698; Exh. APL000014 (Department of Energy , Energy Information Administration, DOE/EIA-0383, "Annual Energy Outlook 2011," Table 1 (Dec. 2010)).

[211] Exh. NRC00023 at 10.

[212] Exh. APL000004 at 32; Exh. APL000040 ("The Prospect for $1/Watt Electricity from Solar," Department of Energy Solar Energies Technology Program (Aug. 10, 2010)).

[213] Exh. APL000004 at 32–33.

[214] Id. at 33.

[215] Id. at 34–35.

[216] See Exh. APL000001 at 28-29.

great to justify a conclusion that those requirements are likely to be significantly exceeded in the foreseeable future.[217]

F. Compressed Air Energy Storage (CAES)

When coupled with intermittent power sources such as wind and solar power, a CAES facility can simulate a power generation profile comparable to baseload generation.[218] A CAES facility has the ability to take power provided from a generation source, such as a wind turbine, and use that power to fuel motor driven air compressors that compress air into an underground storage medium, such as an underground salt cavern or aquifer.[219] During high electricity demand periods, the stored energy that was collected during low-peak periods is recovered by releasing the compressed air through a combustion turbine to generate electricity.[220] CAES facilities require a specific geology in order to support an underground storage medium.[221]

In developing the combination alternative, the Staff assumed that 250 to 300 MW of installed wind capacity would be combined with a CAES facility to provide 100MW(e) of baseload power.[222] The FEIS further assumes that the installed solar capacity would be combined with a CAES facility to provide 75MW(e) of baseload power.[223] Thus, the practical effect of including

---

[217] See id.

[218] Exh. NRC000004 at 37; see Exh. APL000001 at 41.

[219] FEIS at 9-21; Exh. NRC000004 at 37; see Exh. APL000001 at 42–3.

[220] FEIS at 9-21; Exh. NRC000004 at 37; see Exh. APL000001 at 40. The two existing commercial CAES systems rely on combustion turbines to generate electricity. In these systems, the efficiency of the turbines is increased because compression of the inlet air is provided by the CAES facility rather than the turbine. Exh. NRC000004 at 37. The Staff is aware of a conceptual design for a CAES system that does not rely on combustion turbines, but this design has not been built, tested, or proven. Exh. NRC000004 at 37; Exh. NRC000041 ("ConocoPhillips Joins $54.5M Series B for General Compression," Houston CityBizList (June 7, 2011)).

[221] FEIS at 9-21; see Exh. NRC000004 at 37.

[222] FEIS at 9-28.

[223] Id.

CAES in the combination alternative is to increase the baseload power contribution from all the renewable energy sources by 175 MW(e), yielding a total of 400 MW(e) from all those sources.[224] Because the goal of the project is to provide 1600 MW(e) of baseload power, the 400 MW(e) baseload power contribution from the renewable energy sources reduces the required size of the natural gas plant in the combination alternative from 1600 MW(e) to 1200 MW(e).[225] Reducing the size of the natural gas plant decreases the air emissions associated with the combination alternative, assuming the gas plant would operate at full capacity.[226]

Currently, the only CAES system existing in the United States is the 110 MW(e) facility located at the McIntosh Power Plant in Alabama that has been operating since 1991.[227] The only other operating CAES facility is a 290 MW(e) plant near Breman, Germany that has been in use since 1978.[228] There is also a proposal to construct a 268 MW(e) CAES facility coupled to a wind farm near Des Moines, Iowa.[229] Other proposals at various stages of development involving CAES have been announced in California, New York, and Texas.[230] There are currently no known proposed CAES projects in Maryland.[231] Nevertheless, the Staff incorporated a CAES facility in its combination alternative analysis in order to reduce the required size of the natural gas

---

[224] See id.

[225] See Tr. at 367-68.

[226] See id. at 367-70.

[227] FEIS at 9-21; Exh. NRC000004 at 37; Exh. NRC000040 ("Compressed Air Energy Storage: Theory, Resources, and Applications for Wind Power," Samir Succar & Robert H. Williams, Princeton University Energy Systems Analysis Group (2008)).

[228] FEIS at 9-21; Exh. NRC000004 at 37; Exh. APL000001 at 44. Both operating facilities in existence use mined caverns to store the compressed air. FEIS at 9-21; Exh. NRC000004 at 37.

[229] FEIS at 9-21; Exh. NRC000004 at 38; Exh. APL000001 at 45.

[230] FEIS at 9-21; Exh. NRC000004 at 38; Exh. APL000001 at 45.

[231] FEIS at 9-21; Exh. NRC000004 at 38; Exh. APL000001 at 45.

plant and thereby reduce the environmental impact of the combination alternative.[232] But the Staff also concluded that a 1600 MW(e) CAES facility in Maryland is unlikely,[233] making it necessary to retain the natural gas plant in the combination alternative to ensure that the combination of sources would provide 1600 MW(e) of baseload power.

H. Constraints that Limited the Potential Wind and Solar Power Contributions to the Combination Alternative

1. The Timeframe of the Proposed Action

Because wind and solar power technologies are still evolving, their potential energy contributions are rapidly changing.[234] As a result, potential wind and solar contribution estimates in the Calvert Cliffs Unit 3 FEIS combination alternative analysis are heavily dependent upon the relevant timeframe—that is, the estimated completion date for Calvert Cliffs Unit 3.[235] The more distant the completion date, the more time would be available for the development of wind and solar power that could be included in the combination alternative. Thus, in order to properly estimate the wind and solar power contributions in the Calvert Cliffs Unit 3 FEIS combination alternative analysis, it is necessary to first determine the relevant timeframe.[236]

In preparing the FEIS, the Staff relied on the year 2015 as the estimated date by which construction of Calvert Cliffs Unit 3 would be complete.[237] When Mr. Kugler and Ms. Cort began

---

[232] See Tr. at 466, 471–72.

[233] FEIS at 9-21; Exh. NRC000004 at 38–9.

[234] See, e.g., Exh. APL000010 at 1 ("Although only a small fraction of total U.S. electricity is generated from renewable energy sources, in recent years wind power has comprised the second largest fraction of newly installed power, behind natural gas."); Tr. at 419–20 ("[W]e know that solar is being built. And we expect that to continue. And, although there may be no announcements of projects that add up to the amount of power we're talking about, we expect that trend to continue."); id. at 574, 577–78, 581–85, 605–08, 633–34.

[235] See id. at 428 ("It's a forward-looking analysis.").

[236] See id. at 727–28.

[237] Id. at 373–74, 387–88. Mr. Kugler testified that the projected date for completion of construction is essentially also the projected date for the start of commercial operations. This is

preparing their testimony for the evidentiary hearing on Contention 10C, however, that date had been revised to 2017, in accordance with Applicants' updated revision to the application.[238] Mr. Kugler and Ms. Cort thus adjusted their testimony to properly reflect any potential change in analysis brought about by this revised date.[239]

Joint Intervenors, however, contend that the dates upon which the Staff based the FEIS and its testimony—that is, 2015 and 2017, respectively—are fundamentally impractical.[240] Joint Intervenors noted that in addition to lacking a license for Calvert Cliffs Unit 3, the reactor design—the U.S. Evolutionary Power Reactor—is also not yet certified.[241] Moreover, they pointed out that the prototype for this reactor, which is currently being constructed in Finland, was originally to be built in four years, but is now estimated to take nine years to complete.[242] Based on these facts, Joint Intervenors argued that 2022 is a more reasonable timeframe to rely on when considering a combination alternative to Calvert Cliffs Unit 3.[243] However, Joint Intervenors also stated that a range from 2020 to 2025 might actually be more reasonable, because

> historically speaking new design nuclear reactors . . . typically operate at much lower capacity factors for the first two to three years of their existence because they've got to work out the bugs. So, instead of looking at 90 percent capacity factors, when a new reactor comes on line, particularly a new design reactor, we're usually looking closer [to] 50 to 60 percent capacity factors. And that might push out . . . when you would need to have a comparable amount of power in place.[244]

---

because, according to Mr. Kugler, Applicants will be testing the systems as they build them, and thus a separate testing phase at the end of construction is unnecessary. Id. at 408–09.

[238] Id. at 373–74, 388.

[239] Id. According to Mr. Kugler, analyzing combination alternative for a timeframe beyond 2017 would not conform to its guidance, and it would be difficult to determine what alternative timeframe should be used. Id. at 388.

[240] Id. at 713.

[241] Id. at 325.

[242] Id. at 325.

[243] Id. at 324–25, 711–12.

[244] Id. at 712–13.

According to the Staff, in preparing the combination alternative analysis, it refrained from evaluating whether Calvert Cliffs Unit 3 was commercially viable, and consequently, when Calvert Cliffs Unit 3 would likely become operational.[245] Rather, because Calvert Cliffs Unit 3 was the proposed action, the Staff simply assumed that Calvert Cliffs Unit 3 was commercially viable.[246] The Staff never made an independent determination as to when it believed commercial operations were likely to begin at Calvert Cliffs Unit 3, nor did it take into consideration the fact that the Staff had separately determined that a license cannot be issued to Calvert Cliffs Unit 3 due to the current foreign ownership situation.[247]

Nonetheless, the ability to secure financing poses a significant obstacle for nuclear power projects, including Calvert Cliffs Unit 3, and current low prices of natural gas make it an attractive option for power companies, thus posing a threat to new nuclear projects.[248] In addition, Mr. Kugler and Ms. Cort acknowledged that construction of a plant is not always completed expeditiously once the license is issued, as is the case with Watts Bar 2, which was licensed in the 1970's but is still under construction.[249]

Applicants' witness, Mr. Lutchenkov, estimated that it would take roughly seven to eight years to construct Calvert Cliffs Unit 3 and begin commercial operations.[250] Mr. Lutchenkov stated that safety-related construction, that is, construction which is only permitted once the NRC

---

[245] See id. at 387–88 ("MR. KUGLER: I'll be honest. I don't really get into whether [Calvert Cliffs Unit 3 is] commercially viable in my evaluation.").

[246] Id. at 387–88, 411.

[247] Id. at 409–11.

[248] Id. at 348, 415. Mr. Kugler did, however, note that while current low natural gas prices make natural gas an attractive option for power companies, most power companies will continue to want a range of energy sources, including nuclear, so that they are not completely reliant on one energy source. Id. at 415.

[249] Id. at 411–12.

[250] Id. at 519–23.

issues a COL, would take approximately 60 to 68 months to complete.[251] Prior to the safety-related construction, however, a preconstruction phase lasting roughly 18 to 24 months would have to occur, during which the site is cleared and prepared for the initial development.[252] Mr. Lutchenkov testified that while NRC permission is not required to begin the preconstruction phase for Calvert Cliffs Unit 3, Applicants are required to obtain certain state and federal permits before the preconstruction phase may begin.[253] Applicants have obtained some of these required permits, including the Maryland Certificate of Public Convenience and Necessity (CPCN), but were still in the process of obtaining others at the time of the evidentiary hearing.[254] Regardless, Mr. Lutchenkov reiterated that Applicants would refrain from beginning even preconstruction until certain key factors are in place.[255] Mr. Lutchenkov testified that those key factors included a U.S. partner, a Department of Energy (DOE) loan guarantee, and a favorable economic and regulatory structure within the State of Maryland. Those issues remain unresolved.[256]

The Board concludes, taking into account both the time necessary to complete licensing and the time needed to complete construction, that Calvert Cliffs Unit 3 could realistically be completed between 2020 and 2025 if the foreign ownership problem can be resolved in the near future. Economic issues could further delay completion or prevent it entirely, but there is no point in conducting an alternatives analysis on the assumption that the proposed action will never be

---

[251] Id. at 520.

[252] Id.

[253] Id. at 521.

[254] Id.

[255] Id. at 522. This is a position that Applicants have stated on numerous separate occasions as well. Id. at 521.

[256] Id. at 521–22. Mr. Lutchenkov further explained that a favorable economic and regulatory structure within the State would be one which would allow for "a profitable entity and a profitable generation of power." Id.

built. Joint Intervenors argued for 2022 as the estimated completion date.[257] As that year falls near the middle of our 2020-2025 estimate, we will use 2022 as the timeframe of the proposed action.

It would be possible to complete construction of an otherwise unannounced solar or onshore wind power facility, including all necessary permitting, prior to the completion of Calvert Cliffs Unit 3.[258] Mr. Ratti estimated that an onshore wind project could be online and generating electricity within 3 to 5 years from conception.[259] The Board accepts this as a reasonable estimate. The Board therefore finds that extending the timeframe of the proposed action to 2022 would permit additional solar power and onshore wind power to be developed in Maryland and nearby states within the timeframe of the proposed action.

Mr. Ratti testified that he would expect "overall development times in the 10-15 year range" for offshore wind farms.[260] His estimate was influenced by the approximately ten year period required for the Cape Wind Project, located off the Coast of Massachusetts, to complete the federal approval process.[261] However, he also added that the federal government's "Smart from the Start" initiative, which began in 2010, is aimed at accelerating renewable wind energy development on the Atlantic, in part by expediting the approval process.[262]

Mr. Sklar testified that he expects the approval time for an offshore wind farm in Maryland and neighboring states to be approximately five years.[263] He stated that the Cape Wind Project

---

[257] Tr. at 324.

[258] Id. at 492.

[259] Exh. APL000001 at 19.

[260] Id.

[261] Id. at 18.

[262] Id. at 18–20.

[263] Id. at 609-610.

encountered intense local opposition from residents of Nantucket. Offshore wind farms in Maryland will not encounter that level of opposition, he predicted.[264]

The Board finds, taking into account the prospect that "Smart from the Start" initiative will shorten the time required to complete the federal approval process, that the 2022 timeframe would likely permit the development of offshore wind farms that may be proposed for development in the next several years.

As we have previously concluded, the Maryland RPS will be the primary factor determining the development of additional wind and solar power that is likely to be available in Maryland by 2022. A study prepared by the University of Delaware's Center for Carbon-free Power Integration, College of Earth, Ocean, and Environment (the Delaware study), estimates the installed onshore and offshore wind capacity that will be needed for Maryland utilities to satisfy the RPS obligation in 2022, based on four different assumptions about the percentage of the total obligation that will be met with wind power.[265] The four assumptions were that onshore and offshore wind would provide 25, 50, 75, and 100 percent of the 2022 REC obligation for Tier 1 non-solar renewable sources.[266] In order to translate RECs into installed capacity, the Delaware Study assumed a 35 percent capacity factor for onshore wind and a 40 percent capacity factor for offshore wind.[267] The results are summarized below:[268]

---

[264] Tr. at 609.

[265] Exh. APL000010 at 21–23; see also Tr. at 441–46.

[266] Exh. APL000010 at 23 (tbl. 6).

[267] Id.

[268] Id. The Delaware Study estimates for onshore wind assume that 1000-4500 MW of capacity could be installed on land in Maryland. The Delaware study acknowledged, however, that "[a]n analysis of the extent of Maryland land-based wind resources is beyond the scope of this report," and "land-based wind turbine calculations are provided for comparison purposes only." Id. at 23. Thus, the Delaware Study estimates do not necessarily project new installed onshore wind capacity in Maryland. Rather, they estimate the new installed wind capacity, either onshore or offshore, that will be needed to satisfy the RPS in 2022, assuming the specified percentages of the 2022 REC obligation will in fact be met with wind power.

Percentage of 2022 REC Obligation Met with Wind Power	Onshore Installed Capacity Needed (MW)	Offshore Installed Capacity Needed (MW)
25 percent; or 3,416,244 RECs	1,114	975
50 percent; or 6,832,488 RECs	2,228	1,950
75 percent; or 10,248,731 RECs	3,343	2,925
100 percent; or 13,664,975 RECs	4,457	3,900

The Staff did not base the combination alternative upon the estimates in the Delaware Study. Instead, the Staff relied on the LTER and the DOE Report discussed previously to estimate future wind power generation in the State of Maryland.[269] The LTER predicts that wind power will make up about 20 percent of the renewables used to satisfy the non-solar Tier 1 RPS requirement, which is slightly below the lowest estimate in the Delaware study (25 percent).[270] Substituting the LTER figure for the 25 percent used in the Delaware study, about 800 MW of installed offshore wind capacity will be needed to satisfy the RPS in 2022.[271]

The LTER, however, estimates that under 200MW of installed wind power capacity located in Maryland will be used to satisfy the RPS in 2022.[272] The difference reflects the LTER's prediction that a very large percentage (more than 75 percent) of the RPS for non-solar Tier 1 resources will be met by generation located outside Maryland.[273] As previously explained, the

---

[269] See supra pp. 24-25.

[270] Tr. at 450–51.

[271] Id. at 451.

[272] Id. at 452.

[273] Id. at 453–54.

Staff excluded wind power generated outside Maryland from the combination alternative. We turn to that issue next.

2. The Exclusion of Generating Capacity Located Outside Maryland

A second factor that limited the potential wind and solar power contributions to the combination alternative was the Staff's requirement that such sources must be located within Maryland. There was only one exception: the Staff agreed that potential wind power sources directly offshore of Maryland could be included in the combination alternative, even if they fall outside the State's territorial limit (3-miles offshore).[274] The Staff, however, excluded all other wind power sources that were not located within Maryland's borders.[275]

"NRC's site selection process guidance calls for identification of a [region of interest], the geographic area considered by an applicant in searching for candidate areas and potential sites for possible siting of a new nuclear power plant."[276] In the FEIS, the Staff determined that the region of interest (ROI) for the proposed Calvert Cliffs Unit 3 was the State of Maryland.[277] Applicants originally proposed the State of Maryland as the ROI for the Calvert Cliffs Unit 3 project in Revision 6 of its Environmental Report (ER), and in the FEIS the Staff accepted the Applicant's proposal, stating that "UniStar's designated ROI is consistent with expectations for an ROI" and that "UniStar's" basis for defining its ROI did not arbitrarily exclude desirable candidate locations."[278] Based on the ROI, as defined in the FEIS, the Staff looked only at potential wind

---

[274] Id. at 405-06.

[275] Tr. at 406, 457-58.

[276] FEIS at 9-33.

[277] FEIS at 9-34; Tr. at 400.

[278] FEIS at 9-34.

and solar power sources within the State of Maryland in determining potential wind and solar power contribution estimates to the Calvert Cliffs Unit 3 combination alternative.[279]

In support of its decision, the Staff emphasized that, much like many of the other states in its region, "Maryland already imports a very large portion of its power from other states."[280] Mr. Kugler testified that "the transmission system is already pretty loaded down in terms of importing power during periods of peak demand."[281] According to Mr. Kugler, Maryland's dependence on out-of-state power was a key factor in the MPSC's decision to approve the Certificate of Public Convenience and Necessity for Calvert Cliffs Unit 3. He stated that "one of the factors [the MPSC] considered was [that] they want[ed] to get power sources built in Maryland to support the grid in Maryland. They don't want Maryland to become even more dependent on outside sources because they're competing with other states around them and their grid is already pretty strained."[282]

The MPSC's decision to grant a Certificate of Public Convenience and Necessity for Calvert Cliffs Unit 3 was based on the recommendation contained in the Proposed Order of the Hearing Examiner.[283] In his recommendation, [284] pursuant to Section 7-207(e) of the Public

---

[279] Tr. at 400; Exh. NRC000004 at 5 ("The approach used to develop a combination of energy alternatives included the maximum contribution from renewable sources that could be reasonably expected within the region of interest and within the timeframe of the proposed project."); Exh. NRC000043 (Prefiled Rebuttal Testimony of Andrew J. Kugler and Katherine A. Cort Regarding Contention 10C" and "Affidavit of Andrew J. Kugler Concerning Prefiled Rebuttal Testimony of Andrew J. Kugler and Katherine A. Cort Regarding Environmental Contention 10C" and "Affidavit of Katherine A. Cort Concerning Prefiled Rebuttal Testimony of Andrew J. Kugler and Katherine A. Cort Regarding Contention 10C" (Nov. 18, 2011)) at 9–10.

[280] Tr. at 402.

[281] Id.

[282] Id. at 403.

[283] Exh. NRC000014 (Maryland Public Service Commission, In the Matter of the Application of UniStar Nuclear Energy, LLC and UniStar Nuclear Operating Services, LLC for a Certificate of Public Convenience and Necessity to Construct a Nuclear Power Plant at Calvert Cliffs in Calvert County, Maryland, Case Number 9127, Order Number 82741 (June 26, 2009)) at 5.

Utilities Company Article, the Hearing Examiner considered, among other things, the effect of the generating station on "the stability and reliability of the electric system."[285] In addressing this issue, he cited a MPSC Staff witness who stated that Calvert Cliffs Unit 3 will reduce the State of Maryland's dependence on imported electricity and will reduce congestion on transmission lines within the State of Maryland during peak periods by providing a continuous in-state baseload power source.[286] Based on this testimony, the Hearing Examiner concluded that Calvert Cliffs Unit 3 would have a beneficial effect on the stability and reliability of the electric system in the State of Maryland, and recommended that the MPSC grant the Certificate of Convenience and Necessity for Calvert Cliffs Unit 3.[287] The MPSC affirmed the Proposed Order of the Hearing Examiner.[288]

Mr. Kugler testified that the Staff excluded technologically feasible, commercially viable energy sources solely because they were not located within the State of Maryland.[289] He acknowledged, however, that wind power generated offshore of Delaware could supply power to

---

[284] Exh. NRC000015 (Maryland Public Service Commission, In the Matter of the Application of UniStar Nuclear Energy, LLC and UniStar Nuclear Operating Services, LLC for a Certificate of Public Convenience and Necessity to Construct a Nuclear Power Plant at Calvert Cliffs in Calvert County, Maryland, Case Number 9127, Proposed Order of Hearing Examiner (Apr. 28, 2009)) at 97.

[285] Md. Code Ann., Pub. Util. Cos., § 7-207(e) (West 2012); Exh. NRC000015 at 42–43; see also Exh. NRC000015 at 97 (stating that Calvert Cliffs Unit 3 is "strongly supported by the local government and community" and that it "will constitute a new large source of power that would be of benefit to the citizens and State of Maryland.").

[286] Exh. NRC000015 at 52–53.

[287] Id. at 52–53, 99–100.

[288] Exh. NRC000014 at 5.

[289] Tr. at 406–07 ("CHAIRMAN SPRITZER: All right. What about if [a wind source is] offshore in Delaware? Would that have been excluded? MR. KUGLER: We would not have included that because it was not within Maryland, because, again, we were looking at that as our region of interest.").

Maryland.[290] He explained that the most congested transmission lines in Maryland are typically to the North and the West, and thus wind power generated in Delaware could likely be transmitted into Maryland, given that the power would be entering the state through the East, where the transmission lines are less congested.[291] However, Mr. Kugler stated that such a power source would have been excluded from the FEIS combination alternative analysis based solely on its out-of-state location, despite the fact that it would enter Maryland's grid on uncongested transmission lines.[292]

I. The Staff's Evaluation of the Environmental Impacts of the Combination Alternative

The FEIS includes a Table entitled "Summary of Environmental Impacts of a Combination of Power Sources."[293] For each impact category, such as land use, air quality, and water use and quality, the Table includes an impact categorization (small, moderate, or large); a comment providing a description of the impact; and, for air quality, quantitative estimates of emissions.[294] Thus, the Table provides information permitting a reader of the FEIS to contrast the environmental impacts of the combination alternative with those of the proposed action. The Staff also discussed in somewhat greater detail the differences among the viable energy alternatives regarding carbon dioxide emissions. The Staff estimated that the combination alternative would produce 153,000,000 metric tons of carbon dioxide emissions during a 40-year period. This was less than the Staff's estimates of the carbon dioxide emissions from the alternatives consisting solely of coal-fired and natural-gas fired generation, but greater than the Staff's 32,000,000 metric ton estimate for the nuclear plant (taking into account transportation

---

[290] Id. at 407.

[291] Id.

[292] Id.

[293] FEIS at 9-29 (Table 9-3).

[294] Id.

emissions for the nuclear plant workforce and fuel cycle emissions).[295] The Staff concluded that "from an environmental perspective, none of the viable energy alternatives [including the combination alternative] are clearly preferable to construction of a new baseload nuclear power generating plant located within Unistar's ROI."[296]

In the FEIS combination alternative analysis, the Staff also considered the result if the wind contribution was quadrupled to 400 MW(e) of baseload power (the equivalent of 1000 to 1200 MW of installed capacity with a 400 MW(e) CAES facility).[297] The Staff did not consider this a realistic scenario, but included it in the FEIS in response to comments received on the DEIS.[298] Under that scenario, the combination alternative would require a 900 MW(e) natural gas plant rather than a 1200 MW(e) plant.[299] This change would reduce by about 25 percent the air emissions associated with the natural gas plant component of the combination alternative.[300] At the same time, land use impacts would increase if onshore wind is used, and a wider ocean area would be required if offshore wind is used. The Staff concluded that all of the environmental impact categorizations would be the same as the original combination alternative, except that if onshore wind is used to meet the increased wind estimate then the impacts to land use and ecology might become large, and if offshore wind is used increased impacts to aquatic ecology are likely.[301] The Staff further concluded that, under this modified scenario, the environmental impacts of the combination alternative would be greater than those of the proposed action, and

---

[295] Id. at 9-31.

[296] Id.

[297] Id. at 9-28.

[298] Tr. at 368-69.

[299] FEIS at 9-28.

[300] Tr. at 370.

[301] FEIS at 9-30.

thus the modified scenario would not be environmentally preferable.[302]

At the evidentiary hearing, the Staff elaborated on this point. Mr. Kugler explained that in general, as wind and solar power contributions are increased, impacts to air quality and waste management will decrease, but impacts to land use will increase significantly.[303] Solar and wind power have very low capacity factors, he stated, and thus large installations requiring significant amounts of land are needed to provide these kinds of power outputs.[304] Mr. Kugler testified that, no matter how much the solar and wind contributions were increased, there would never be a point at which the Staff would consider the combination alternative to be environmentally preferable to Calvert Cliffs Unit 3.[305]

V. CONCLUSIONS OF LAW

A. Legal Standards Governing the Board's Review of the Combination Alternative

The Staff is required to issue an FEIS that thoroughly and objectively evaluates reasonable alternatives to the proposed action.[306] To this end, the FEIS need not discuss remote and speculative alternatives, but must consider only alternatives that bring about the ends of the proposed project.[307] But if an alternative is feasible, commercially and capable of bringing about the ends of the proposed project, then the Staff may not dismiss it merely because it is

---

[302] Id.

[303] Tr. at 473.

[304] Id. at 472. Mr. Kugler further stated that the land use impacts that occur as a result of solar installations can be reduced by locating the installations on rooftops, but that the larger installations that are being built in Maryland and elsewhere typically located on the ground. Id.

[305] Tr. at 470–73.

[306] See National Environmental Policy Act of 1969 § 102(2)(C)(i)–(iii), 42 U.S.C. § 4332(2)(C)(i)–(iii) (2012); FirstEnergy Nuclear Operating Co. (Davis-Besse Nuclear Power Station, Unit 1), CLI-12-08, 75 NRC __, __ (Mar. 8, 2012) (slip op. at 5) (citing NRDC v. Martin, 458 F.2d 827, 834, 837 (D.C. Cir. 1972)); see also 10 C.F.R. § 51.53(c)(2).

[307] Vermont Yankee, 435 U.S. at 551; NextEra Energy Seabrook, LLC (Seabrook Station, Unit 1) CLI-12-05, 75 NRC __, __ (slip op. at 49) (Mar. 8, 2012).

inconsistent with the preferences of interested parties, or for other reasons inconsistent with NEPA's rule of reason.[308]

The project's goals determine the alternatives that are considered reasonable.[309] In considering alternatives under NEPA, an agency should take into account the needs and goals of the parties involved in the application.[310] "However, agencies are not permitted 'to define the objectives [of a proposed action] so narrowly as to preclude a reasonable consideration of alternatives.'"[311] Although the agency's alternative analysis should reflect the applicant's goals, the underlying goal should not be purposefully narrowed to predetermine the outcome.[312] Blindly adopting the applicant's statement of the purpose of the action is a "losing position" because it does not allow for the full consideration of alternatives required by NEPA.[313] NEPA requires an agency to "'exercise 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 preferred by the applicant.[314]

B. The Staff's Limitations on the Timeframe and Geographic Scope of the Combination Alternative Were Unreasonably Restrictive

The Combination Alternative included in the FEIS would supply 1600 MW(e) of baseload power for distribution in Maryland. It is therefore capable of satisfying that purpose of the project.

---

[308] See Wetlands Water District v. Dept. of the Interior, 376 F.3d 853, 868 (9th Cir. 2004).

[309] City of New York v. U.S. Dep't of Transp., 715 F.2d 732, 742 (2d Cir. 1983).

[310] Private Fuel Storage, LLC (Independent Spent Fuel Storage Installation), CLI-04-22, 60 NRC 125, 146 (2004).

[311] Wyoming v. U.S. Dept. of Agriculture, 661 F.3d at 1244 (quoting Citizens' Committee to Save Our Canyons v. U.S. Forest Service, 297 F.3d 1012, 1030 (10th Cir. 2002)).

[312] City of Grapevine v. Dep't of Transp., 17 F.3d 1502, 1506 (D.C. Cir. 1994).

[313] Simmons v. U.S. Army Corps of Eng'rs, 120 F.3d 664, 669 (7th Cir., 1997).

[314] Id. (quoting Citizens Against Burlington, Inc. v. Busey, 938 F.2d 190, 209 (D.C.Cir.1991) (Buckley, J., dissenting)).

The record also establishes that solar power, onshore wind, and offshore wind are technologically feasible means of generating electrical energy.[315] Both solar power and onshore wind power facilities are already generating electricity in Maryland and elsewhere.[316] While there is no offshore wind currently operating along the Atlantic Coast, offshore wind farms are operating in Europe, and no witness disputed the technological feasibility of offshore wind.[317] It is also clear that Maryland has ample potential for the development of offshore wind.[318]

Thus, the major issue concerning the Combination Alternative is the extent to which solar and wind power will be commercially viable within the timeframe of the proposed action. In analyzing this issue, the Staff looked to not just the theoretical potential for the development of wind and solar power, but to their likely availability within the timeframe of the proposed action. In general, we believe that was a reasonable approach. But, as we explain below, the Staff adopted an unrealistic timeframe for the proposed action, and it also inappropriately eliminated all potential wind and solar power contributions from outside Maryland. These restrictions unduly limited the potential wind and solar power contributions to the Combination Alternative, thereby making it overly dependent upon the natural gas plant.

1. The Staff Unreasonably Limited Wind and Solar Power Contributions to Only Those that Would be Available by 2015 or 2017

As stated in Carolina Environmental Study Group v. United States, NEPA requires that alternatives be considered "as they exist and are likely to exist," not merely as they exist at the present time.[319] Although "remote and speculative" alternatives need not be addressed in a

---

[315] See FEIS at 9-20 to 9-24.

[316] Exh. APL000001 at 38–39; Exh. NRC000004 at 26.

[317] See Tr. at 345–47; Exh. APL000010 at 1.

[318] Exh. NRC000024 at 60–63 (tbl. 4-3); Exh. APL000010 at 19 (tbl. 3).

[319] 510 F.2d 796, 801 (D.C. Cir. 1975); see also NextEra Energy Seabrook, L.L.C. (Seabrook Station, Unit 1), LBP-11-02, 73 NRC __, __ (slip op. at 24–25) (Feb. 15, 2011).

FEIS, NEPA requires the Staff to consider reasonable alternatives that are likely to be available within the timeframe of the proposed action.[320]

The Staff failed to comply with this requirement because its estimated dates for the completion of the proposed action—2015 and 2017—are unrealistic. No license has been issued for Calvert Cliffs Unit 3, the reactor design is still uncertified, and the Staff has yet to complete its SER with open items for this proposed facility. It might take roughly eight years, if not more, once the required COL is obtained to complete construction of Calvert Cliff Unit 3. Moreover, Applicants have reiterated that they have no intention of beginning preconstruction, even if they were to obtain a COL, until multiple key factors are in place. Given these factors, it is likely that Calvert Cliffs Unit 3 will not be built until sometime between 2020 and 2025, and it may never be built. The completion date proposed by Intervenors, 2022, is far more realistic than the dates used by the Staff.

Because wind and solar power technologies are constantly evolving, their respective potential power contributions to the combination alternative are highly dependent upon the relevant timeframe. Also, the RPS requirements increase up to 2022. Maryland utilities must comply with those requirements. And there will be more time for new wind and solar projects to complete the necessary approval processes, negotiate power purchase agreements, and complete construction if the timeframe is extended to 2022. Thus, the potential wind and solar power contributions to the combination alternative will likely be greater in 2022 than in 2015 or 2017.

Thus, by relying on the impractical dates of 2015 and 2017, the Staff's analysis of wind and solar power contributions to the combination alternative is flawed.

---

[320] See Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 551 (1978) (quoting NRDC v. Morton, 458 F.2d 827, 837–38 (1972)).

2. The Staff Unreasonably Limited the Combination Alternative to Only Generating Capacity Located in Maryland

The Staff chose not to consider potential contributions to the combination alternative from out-of-state sources of renewable energy, including wind power.[321] The record reflects that, while power is routinely wheeled between states, transmitting electricity over long distances can result in transmission line losses.[322] In addition, during peak periods Maryland experiences transmission line congestion, primarily in areas to the North and West of the State.[323] It would be consistent with NEPA to apply a geographic restriction appropriately tailored to those legitimate concerns. But the Staff instead applied a blanket exclusion of all out-of-state wind power. The Staff has not shown that such a total exclusion of all out-of-state generating capacity was necessary to achieve the purpose of supplying 1600 MW(e) of baseload power in Maryland. The Board concludes that the combination alternative should have included wind power likely to be available from nearby states where transmission line congestion problems are not a significant concern.[324]

The Staff's review of alternative energy sources is guided by the Environmental Standard Review Plan ("ESRP"), Chapter 9, Sections 9.2.1 through 9.2.3, as modified by an April 26, 2010 memorandum, not merely the preferences of the Applicant or the State of Maryland.[325] ESRP 9.2.2 states that:

> [t]he reviewer should review the alternative energy sources and combinations of sources available to the applicant, and categorize them as either competitive or

---

[321] See Tr. at 406–07.

[322] Tr. at 480-81, 660-61.

[323] Tr. at 407.

[324] As we discussed previously, the FEIS does not in fact consistently require that all sources of new electrical power be located in Maryland. See supra pp. 12-13. Our discussion here focuses on the reasons why such a blanket exclusion is unreasonable, even had it been stated consistently in the FEIS.

[325] Exh. NRC000004 at 11.

> noncompetitive with the proposed project. A competitive alternative is one that is feasible and compares favorably with the proposed project in terms of environmental and health impacts. If the proposed project is intended to supply baseload power, a competitive alternative would also need to be capable of supplying baseload power. A competitive alternative could be composed of combinations of individual alternatives.[326]

In addition, ESRP 9.2.2 lists specific criteria that an alternative must meet, the first of which is that "[t]he energy conversion technology should be developed, proven, and available in the relevant region."[327] Mr. Kugler acknowledged these requirements when he testified that as part of a combination alternative review, "the Review Team assesses the environmental impacts of technically feasible and commercially viable energy alternatives available in the region of interest that would be able to meet the purpose and need of the project . . ."[328] Thus, as the ESRP makes clear, and the Staff acknowledges, in order to be included in the FEIS combination alternative analysis, a power source need only be "available in the region of interest," that is, in Maryland; it need not necessarily be located in Maryland if transmission lines will permit importing the power into Maryland. Thus, a technologically feasible and commercially viable out-of-state power source should have been included in the combination alternative to the extent transmission lines will permit importing the power into Maryland.

The Staff's justification for its blanket exclusion of all out-of-state wind power is based upon the the Proposed Order of the Hearing Examiner, subsequently affirmed by the MPSC.[329] The Proposed Order did indicate a preference that a new 1600MW(e) baseload power plant be located in Maryland. But the Staff's reliance on this preference when analyzing the distributed wind power contribution to the combination alternative is misplaced. The Hearing Examiner's

---

[326] Exh. NRC000008 ("Environmental Standard Review Plan—Standard Review Plans for Environmental Reviews for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, NUREG-1555, Rev. 1 (2007)) at 9.2.2-3 to 9.2.2-4.

[327] Id. at 9.2.2-4 (emphasis added); see also Exh. NRC000004 at 11.

[328] Exh. NRC000004 at 11.

[329] Id. at 14.

preference for an in-state source reflects the concern that reliance on a large out-of-state source of baseload power may exacerbate existing transmission line congestion problems.[330] But the Staff witnesses testified that transmission line congestion in Maryland is primarily to the North and West, and that it is possible to avoid transmission line congestion concerns by importing power from the South and East.[331] The Staff acknowledged the possibility that offshore wind in Delaware could provide power to Maryland utilities, but that possible power source was excluded from the Staff's analysis of the combination alternative because it was located outside Maryland.[332]

Thus, in analyzing wind and solar power contribution estimates to the combination alternative, the Staff should have included estimates of wind and solar power sources that could be imported into Maryland through areas where the transmission lines are less-congested, i.e. through the South and East. Nearby states such as Delaware have significant wind power potential,[333] and Maryland utilities could use wind power purchased from those states to satisfy their RPS requirements. But the Staff limited its analysis of potential wind power contributions to the combination alternative to sources within Maryland, regardless of whether such sources were located in an area where a significant congestion problem has been identified.

The Hearing Examiner's Proposed Order also referred to Maryland's interest in limiting its dependence on imported electricity. [334] Mr. Kugler cited this concern as supporting the NRC's refusal to consider out-of-state generating capacity.[335] But the Staff's reliance on this aspect of

---

[330] Exh. NRC000015 at 52; Tr. at 402–03.

[331] See id. at 406–07.

[332] Id.

[333] See JNTR00001 at 6-9; JNT000003 at 3-4 (Table 1).

[334] Exh. NRC000015 at 52.

[335] Tr. at 402-03.

the Proposed Order ignores the fact that the Maryland RPS permits Maryland utilities to purchase wind power, as well as other sources of renewable electrical energy, from outside the State. Although the RPS does require that 2 percent of Maryland's power supply come from in-state solar power by 2022, it simultaneously allows for the remaining 18 percent of Maryland's power required to come from renewables by 2022–including wind power–to be produced out-of-state.[336] Thus, Maryland expressly permits utilities to use wind power sources located outside Maryland to satisfy their RPS requirements.

The issue before the Hearing Examiner was whether it would be in the State's interest that a new large baseload power plant be located within the State. Under the combination alternative, the large baseload power source, the 1200 MW(e) natural gas combined-cycle generating units, would be located in Maryland, at the Calvert Cliffs site.[337] The Hearing Examiner did not address the question whether, if the State chose to pursue an approach equivalent to the combination alternative, it would insist that all wind power sources contributing to such an alternative be located in Maryland. Had he considered that issue, it seems far more likely that he would have followed an approach consistent with the State's policy as expressed in the RPS legislation, under which RPS requirements may be satisfied through wind power sources located outside the State.

Consequently, the FEIS analysis of the combination alternative is inadequate because the Staff chose not to consider technologically feasible, commercially viable power sources merely because they were not located in Maryland.[338]

---

[336] See Exh. JNT000011 at 3.

[337] FEIS at 9-28.

[338] See Tr. at 407.

C. The Deficiencies in the Staff's Analysis Are Not Harmless Error

Applicant argues that "[a]ny dispute over the specific, relative mix of wind or solar used in the combination alternative is not one that would affect the outcome of the NEPA analysis and therefore is not a material issue in this proceeding."[339] Applicant bases this argument on the Staff's testimony that increases in the contributions of wind and solar power would not alter its conclusion that the combination alternative is not environmentally preferable to the proposed action. Applicant assumes that, because the Staff's conclusion on this issue would not change, any errors in the Staff's analysis of the combination alternative would not constitute a material violation of NEPA and therefore need not be corrected.[340] In substance, this argument relies on the administrative law doctrine of harmless error.[341] We reject its application here – as we have twice before in this proceeding – because the Staff may not avoid NEPA's requirement to provide the public and the decision-maker with a realistic evaluation of viable alternatives merely by asserting that compliance would not alter its own conclusions.[342]

We first rejected an equivalent argument in our ruling admitting Contention 10C. The Staff argued that we should not admit Contention 10C because Intervenors failed to show that the combination alternative with an increased wind and solar contribution would be environmentally

---

[339] Applicants' Proposed Findings of Fact at 67.

[340] Id. at 65-67.

[341] See California Wilderness Coalition v. U.S. Dept. of Energy, 631 F.3d 1072, 1105–06 (9th Cir. 2011) (finding agency error not harmless).

[342] The Staff's witness, Mr. Kugler, appeared to disagree with the argument that a reasonable assessment of the contributions of wind and solar power was unnecessary to compliance with NEPA. In response to the question whether "all of the exercise in determining what's reasonable [was] really essential to this environmental determination," he responded:

> Well, I think it's important that we develop a combination of energy alternatives that we think could be done to compare it to what's been proposed. Because until we do the comparison, we don't know for sure how it's going to come out.

Tr. at 473.

preferable to the proposed action.[343] Intervenors responded that, once they identified flaws in the DEIS's analysis of alternatives, it was the Staff's responsibility to "produce a new analysis that takes the realities we have presented into account."[344] We agreed with Intervenors because "[f]ederal courts have held that inaccurate, incomplete, or misleading information in an EIS concerning the comparison of alternatives is itself sufficient to render the EIS unlawful and to

[343] Staff Answer to Joint Intervenors' New Contention 10 (July 20, 2010) at 19-20.

[344] Joint Intervenor's Reply to Staff's and Applicant's Responses to Submission of Contention 10 (July 27, 2010) at 13.

compel its revision."[345] We therefore ruled that

> Intervenors need not prove, in order to establish a NEPA violation, that revising the DEIS to comply with NEPA will change the Staff's recommendation or the agency's decision whether to issue the license. It is sufficient that the information which Intervenors maintain should have been included in the DEIS would be relevant to the ability of the agency decisionmakers and the public to assess the environmental consequences of the project, including the environmental consequences of reasonable alternatives. If Intervenors establish that much, they will have shown that the agency failed to comply with NEPA's procedural requirements.[346]

We revisited this issue when the Applicants moved for summary judgment on Contention 10C. Applicants maintained then, as they do now,[347] that even if the FEIS's evaluation of the combination alternative understates the potential contribution of wind and solar power, the issue is immaterial because the Staff performed a "sensitivity analysis" showing that increasing the wind power contribution to the combination alternative would not alter the Staff's conclusion concerning the environmentally preferable alternative.[348] We noted that the doctrine of harmless error has only limited application in NEPA cases, and none where the agency has failed to take the required hard look at environmental consequences and alternatives.[349] For example, in Wilderness Watch v. Mainella,[350] the Eleventh Circuit rejected an argument much like that here, where the agency maintained that it should not be required to remedy a NEPA violation because doing so would not change its conclusions. As the Court of Appeals explained, "[p]ermitting an agency to avoid a NEPA violation through a subsequent, conclusory statement that it would not have

---

[345] LBP-10-24, 72 NRC at __ (slip op. at 50) (citing Animal Defense Council v. Hodel, 840 F.2d 1432, 1439 (9th Cir. 1988); Natural Res. Def. Council v. U.S. Forest Serv., 421 F.3d 797, 810–12 (9th Cir. 2005)).

[346] Id. at __ (slip op. at 52).

[347] Applicants' Proposed Findings of Fact at 68.

[348] Applicants' Motion for Summary Disposition of Contention 10C (June 20, 2011) at 12-13,15.

[349] Contention 10C Summary Disposition Order at 17.

[350] 375 F.3d 1085, 1096 (11th Cir. 2004).

reached a different result even with the proper analysis would significantly undermine the statutory scheme."[351]

That concern applies with equal force in this case. The issue whether the United States should pursue conventional energy sources, renewable sources, or some combination of the two is a matter of intense public interest. One of NEPA's primary goals is fostering informed public participation in the decision making process.[352] Providing the public with accurate and complete information concerning the environmental consequences of the proposed action and alternatives is essential to fulfilling that goal. NEPA requires federal agencies to "[r]igorously explore and objectively evaluate all reasonable alternatives."[353] Even if the rigorous exploration of alternatives NEPA requires would not change the Staff's views, members of the public may use such information to support their own conclusions, which may well be quite different from those of the Staff. This would further NEPA's goal of informed public participation, while the Applicant's harmless error theory would frustrate it.

Although the Staff has provided a reasonable basis for its conclusion that the combination alternative is not environmentally preferable to the proposed action, others have a reasonable basis to argue that the decision-maker should reach the opposite conclusion. The Staff's position is that, as wind and solar power contributions are increased, the impact of the combination alternative on air quality and waste management will decrease, but the combination alternative will still not be environmentally preferable to the proposed action primarily because impacts to land use will increase significantly.[354] But Mr. Sklar disagreed with the claim that the

---

[351] Id.

[352] See Robertson, 490 U.S. at 349–350; see also La. Energy Services, L.P. (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 87 (1998) (citing Robertson, 490 U.S. at 349–50; Hughes River Watershed Conservancy v. Glickman, 81 F.3d 437, 443 (4th Cir.1996)).

[353] 40 C.F.R. § 1502.14(a).

[354] Tr. at 473.

land use impacts of solar and wind power are significant, pointing out that both solar and wind power installations, unlike nuclear and other traditional sources of electrical energy, are readily compatible with other land uses. Solar panels, for example, can be placed on rooftops, and wind turbines can be placed on land used for agriculture.[355] Thus, the alleged impact on other land uses, in Mr. Sklar's view, is overstated. In addition, Mr. Sklar testified that renewable sources of energy would use less water than a nuclear power plant, and that "the risk analysis of what happens when something does not work will probably be a little more gentle with . . . a blend of renewable and conventional technologies" than with a nuclear power plant.[356] The FEIS also states that the combination alternative's impacts to water use and quality would be "somewhat less than the impacts for a new nuclear power plant located at the Calvert Cliffs site."[357]

Given the potential for alternative viewpoints concerning a matter of significant public interest, NEPA's requirement that the agency thoroughly and objectively analyze reasonable alternatives may not be avoided by after-the-fact statements that compliance would not change the Staff's conclusion concerning the environmentally preferable alternative. "Without substantive, comparative environmental impact information regarding other possible courses of action, the ability of an EIS to inform agency deliberation and facilitate public involvement would be greatly degraded."[358] Thus, as the Tenth Circuit observed, "[a] public comment period is beneficial only to the extent the public has meaningful information on which to comment . . . . Thus, we cannot agree that the failure to thoroughly analyze the environmental impacts of Alternative A-modified in a public NEPA document was harmless."[359]

---

[355] Tr. at 680-83.

[356] Tr. at 683-84.

[357] FEIS at 9-29 (tbl. 9-3).

[358] New Mexico ex rel. Richardson v. Bureau of Land Management, 565 F.3d 683, 708 (10th Cir. 2009).

[359] Id.

Accordingly, the NRC must provide a rigorous and objectively reasonable evaluation of the combination alternative in order to comply with NEPA. Applicants' harmless error theory fails (again).

D. Although the Staff Imposed Unreasonable Restrictions on the Combination Alternative, the Staff Need Not Revise the FEIS

Although the Staff unreasonably restricted the analysis of the combination alternative, this does not necessarily require that the FEIS be revised. Below we review the extensive record to determine whether we can arrive at reasonable estimates of the wind and solar power contributions to the combination alternative in 2022 and determine how this would affect the environmental impacts of the revised combination alternative, thereby making revision of the FEIS unnecessary.

We have already determined that the amount of available wind and solar power will for the foreseeable future be determined primarily by regulatory requirements and that, for Maryland, the determining requirement will be the RPS. The Delaware Study indicates, assuming Maryland utilities use wind power to satisfy 25 percent of their REC requirements for non-solar Tier 1 resources, that either 1,114 MW of onshore installed capacity or 975 MW of offshore installed capacity will be needed in 2022. The Maryland LTER estimated that Maryland utilities will use wind power to satisfy only 20 percent of their REC requirements for non-solar Tier 1 resources. Using that percentage, the corresponding estimates for wind power capacity would be reduced to approximately 900 MW of onshore installed capacity or 800 MW of offshore installed capacity in 2022. (We refer to both sets of estimates below as the "Delaware Study estimates"). Either set of figures is substantially above the 250 to 300 MW of installed wind capacity that the Staff included in the combination alternative. Although Mr. Sklar believes Maryland utilities will use wind power to satisfy more than 25 percent of their REC requirements for non-solar Tier 1

resources,[360] we conclude that a percentage in the 20-25 percent range should be used because it is more consistent with the LTER estimate.

Of course, saying that such capacity will be needed in 2022 is not the same as saying that it will be built. Maryland utilities have the option of making alternative compliance payments instead of purchasing RECs. But Maryland expects that, for Tier 1 resources other than solar, utilities will purchase the required RECs each year rather make the alternative compliance payments permitted under the program.[361] RECs represent MW hours of electricity actually produced, which means that, if Maryland utilities are purchasing a given number of RECs, the electricity represented by the RECs must actually be generated. Furthermore, the LTER predicts that sufficient non-solar Tier 1 generating capacity will be available in the PJM region to enable utilities to meet the requirements of the RPS and similar requirements imposed by other States in the region.[362] Thus, for Tier 1 resources other than solar, Maryland utilities will likely meet their obligations by the purchase of RECs rather than making alternative compliance payments.

The question, however, is where the new generating capacity will be located, and whether it will be possible to transmit the new power to Maryland. As noted above, Maryland utilities can purchase the required RECs for Tier 1 non-solar renewable sources such as wind power from out-of-state sources. In addition, utilities are not required to purchase power generated by the renewable energy sources from which they purchase RECs.[363] Accordingly, a Maryland utility can satisfy its REC requirement by purchasing the necessary credits from out-of-state wind power

---

[360] Tr. at 602-09.

[361] Id. at 445-46.

[362] Exh. APL000005 ("Long-Term Electricity Report for Maryland," Exeter Associates, Inc., Prepared for the Maryland Department of Natural Resources (Sept. 23, 2011)) at 3-12 to 3-22 ("Development of Tier 1 non-solar renewable resources is assumed to keep pace with demand so that the region's RPS requirements are fully met throughout the study period.").

[363] Tr. at 454.

sources, even though it would be impractical for the utility to purchase power from those sources due to their distance from Maryland or the lack of uncongested transmission facilities. Therefore, because RECs may be purchased from renewable energy generators that are not likely to actually supply power to Maryland utilities, there are significant uncertainties associated with using the Delaware study's estimates to determine the wind power capacity that could realistically contribute to a commercially viable combination alternative for Maryland.

The most we can say, given that we expect regulatory requirements to strongly influence the construction of new wind power capacity, is that the Delaware Study estimates provide an upper bound for the installed wind power capacity that could be included in the combination alternative in 2022. For those estimates to be relevant to the combination alternative, all of the wind power generating capacity necessary to satisfy the RPS in 2022 would have to be capable of being imported into Maryland, even if it is generated out-of-state. But we have no way of knowing whether that will be true. Some of the generating capacity might be located too far from Maryland to be a realistic supply alternative, although Maryland utilities could still purchase RECs from such out-of-state sources.

The corresponding lower bound would assume only a marginal contribution to the combination alternative from sources located outside Maryland. The LTER's reference case assumes that Maryland will add slightly less than 200 MW of wind generation capacity between now and 2022.[364] If we assume that Maryland utilities will purchase RECs from out-of state sources but import only a limited amount of power due to transmission problems or other technical issues, a conservative estimate would be that 250-300 MW of installed wind capacity would be available for the combination alternative in 2022, equivalent to the figure used in the FEIS.

Realistically, the best estimate will likely be somewhere between the conservative lower bound and the optimistic upper bound. We would therefore expect, using the 2022 timeframe, a

---

[364] Exh. APL000005 at 9-3 (fig. 9.1); Tr. at 455.

modest increase in the potential wind power contribution to the combination alternative beyond that assumed in the FEIS, on the order of an additional 200-300 MW of installed capacity. We think increases above that figure, while possible, are too uncertain to justify inclusion in the analysis.

For solar power, the RPS mandates that RECs used to satisfy the RPS solar carve-out must be obtained from in-state sources. Consequently, we do not have to deal with the uncertainties created by the use of out-of-state sources to satisfy the RPS. Under the RPS solar carve-out requirement, two percent of Maryland's electrical energy must come from in-state solar power by 2022. This is equivalent to approximately 800 MW of installed capacity by 2022.[365] But the LTER anticipates that by 2022 only about half of the RPS requirement will be met through the purchase of RECs; utilities will meet the balance of their requirements through alternative compliance payments.[366] Thus, we arrive at an estimate of 400 MW of installed solar capacity in Maryland by 2022.[367] This is moderately higher than the estimate of approximately 300 MW of installed capacity in the FEIS.

We therefore conclude, on the basis of the extensive record developed in this proceeding, that we are able to provide imperfect but reasonable estimates of the potential contribution of wind and solar power to the combination alternative within the realistic timeframe of the proposed action. We further note that, while the revised estimates are somewhat higher than those in the FEIS, the Staff has explained how increasing the solar and wind power contributions would affect the analysis of the environmental consequences of the combination alternative, including both the impacts that would be reduced and those that would be increased. Moreover, the Staff has made clear that it would not change its conclusion that the combination alternative is not

---

[365] Tr. at 461.

[366] Id. at 461-62; Exh. APL000005 at 3-21.

[367] Tr. at 462-63.

environmentally preferable, making it unnecessary for the Staff to revisit that issue. Thus, the FEIS, as supplemented by the evidence at the hearing and our findings of fact and conclusions of law, is sufficient to satisfy NEPA's twin goals of (1) ensuring that agency decision-makers will have detailed information concerning significant environmental impacts of proposed projects when they make their decisions, and (2) guaranteeing that such information will be available to the larger audience that may also play a role in the decision making process.[368]

Accordingly, we deny Joint Intervenors' request that we require a revision of the FEIS.

VI. CONCLUSION

The Board finds that, while the FEIS analysis of the combination alternative was deficient for the two reasons we have identified, the FEIS, as supplemented, satisfies the requirements of NEPA and 10 C.F.R. Part 51.

In accordance with 10 C.F.R. § 2.1210, this partial initial decision will constitute a final decision of the Commission forty (40) days after its issuance (i.e., on October 9, 2012), unless: (1) a party files a petition for Commission review within fifteen (15) days after service of this initial

---

[368] Robertson, 490 U.S. at 349.

decision; or (2) the Commission directs otherwise.[369] Within ten (10) days after service of a petition for Commission review, parties to the proceeding may file an answer supporting or opposing Commission review.[370] A party who seeks judicial review of this decision must first seek Commission review, unless otherwise authorized by law.[371]

It is so ORDERED.

THE ATOMIC SAFETY
AND LICENSING BOARD

/RA/

Ronald M. Spritzer, Chairman
ADMINISTRATIVE JUDGE

/RA/

Dr. Gary S. Arnold
ADMINISTRATIVE JUDGE

/RA/

Dr. William W. Sager
ADMINISTRATIVE JUDGE

Rockville, Maryland
August 30, 2012

[369] 10 C.F.R. §§ 2.341(b), 2.1210(a), 2.1212.

[370] Any petition for Commission review and any answer shall conform to the requirements of 10 C.F.R. § 2.341(b)(2)-(3).

[371] 10 C.F.R. § 2.1212.

/RA/

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
CALVERT CLIFFS 3 NUCLEAR PROJECT, LLC.	)	
AND UNISTAR NUCLEAR OPERATING	)	
SERVICES, LLC	)	Docket No. 52-016-COL
	)	
(Calvert Cliffs 3 Nuclear Project, LLC)	)	
(Combined License)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing **BOARD ORDER (PARTIAL INITIAL DECISION) (LBP-12-17)** have been served upon the following persons by Electronic Information Exchange.

U.S. Nuclear Regulatory Commission
Atomic Safety and Licensing Board Panel
Mail Stop - T-3 F23
Washington, DC 20555-0001

Administrative Judge
Ronald M. Spritzer, Chair
E-mail: Ronald.spritzer@nrc.gov.

Administrative Judge
Gary S. Arnold
E-mail: gary.arnold@nrc.gov

Administrative Judge
William W. Sager
E-mail: wws1@nrc.gov

Kirsten A. Stoddard, Law Clerk
kirsten.stoddard@nrc.gov

Jonathan C. Eser, Law Clerk
Jonathan.eser@nrc.gov

U.S. Nuclear Regulatory Commission
Office of the General Counsel
Mail Stop - O-15 D21
Washington, DC 20555-0001

Sara Kirkwood, Esq.
Susan Vrahoretis, Esq.
Marcia J. Simon, Esq.
Anthony Wilson, Esq.
Marcia Carpentier, Esq.
Jeremy Wachutka, Esq.
Emily Monteith, Esq.
Michael Spencer, Esq.
Jessica Bielecki, Esq.
Patrick Moulding, Esq.
E-mail: sara.kirkwood@nrc.gov
susan.Vrahoretis@nrc.gov
marcia.Simon@nrc.gov
anthony Wilson@nrc.gov
marcia.carpentier@nrc.gov
jeremy.wachutka@nrc.gov
emily.monteith@nrc.gov
michael.spencer@nrc.gov
jab2@nrc.gov
patrick.moulding@nrc.gov

OGG Mail Center: ogcmailcenter@nrc.gov

Docket No. 52-016-COL

BOARD ORDER (PARTIAL INITIAL DECISION) (LBP-12-17)

U.S. Nuclear Regulatory Commission
Office of Commission Appellate Adjudication
Mail Stop O-16C1
Washington, DC 20555-0001
E-mail: ocaamail@nrc.gov

U.S. Nuclear Regulatory Commission
Office of the Secretary of the Commission
Mail Stop O-16C1
Washington, DC 20555-0001
Hearing Docket
E-mail: hearingdocket@nrc.gov

UniStar Nuclear Energy, LLC
100 Constellation Way
Suite 200C
Baltimore, MD 21202
Carey W. Fleming, Esq.
Senior Counsel
E-mail: carey.fleming@cengllc.com

Winston & Strawn, LLP
1700 K Street, N.W.
Washington, DC 20006-3817
David A. Repka, Esq.
Tyson R. Smith, Esq.
William A. Horin, Esq.
Rachel Miras-Wilson, Esq.
Carlos Sisco
E-mail: DRepka@winston.com
trsmith@winston.com
whorin@winston.com
rwilson@winston.com
csisco@winston.com

State of Maryland
Office of the Attorney General
Maryland Energy Administration and
Power Plant Research Program of the
Department of Natural Resources
1623 Forest Drive, Suite 300
Annapolis, Maryland 21403
Brent A. Bolea, Assistant Attorney General
Michael Hare, Assistant Attorney General
E-mail: BBolea@energy.state.md.us
bhare@oag.state.md.us

Morgan, Lewis & Bockius, LLP
1111 Pennsylvania Avenue, NW
Washington, DC 20004
Jonathan M. Rund, Esq.
E-mail: jrund@morganlewis.com

Nuclear Information Resource Service
6390 Carroll Avenue, #340
Takoma Park, MD 20912
Michael Mariotte, Executive Director
Diane D'Arrigo
E-mail: nirsnet@nirs.org
dianed@nirs.org

Beyond Nuclear
6930 Carroll Avenue Suite 400
Takoma Park, MD 20912
Paul Gunter, Director
E-mail: paul@beyondnuclear.org

Docket Nos. 52-016-COL

BOARD ORDER (PARTIAL INITIAL DECISION) (LBP-12-17)

Public Citizen
215 Pennsylvania Ave, SE
Washington, DC 20003
Allison Fisher, Organizer- Energy Program
E-mail: afisher@citizen.org

Southern MD CARES
P.O. Box 354
Solomons, MD 20688
June Sevilla, Spokesperson
E-mail: qmakeda@chesapeake.net

Hogan & Hartson LLP
Columbia Square
555 Thirteenth Street, NW
Washington, D.C. 20004
Amy Roma, Esq.
E-mail: acroma@hhlaw.com

Dated at Rockville, Maryland
this 30th day of August 2012

[Original signed by Christine M. Pierpoint]
Office of the Secretary of the Commission