

UNITED STATES OF AMERICA
 NUCLEAR REGULATORY COMMISSION
 ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

Ann Marshall Young, Chair
 Dr. Paul B. Abramson
 Dr. Richard F. Cole

In the Matter of:

ENTERGY NUCLEAR GENERATION
 COMPANY AND ENTERGY NUCLEAR
 OPERATIONS, INC.
 (Pilgrim Nuclear Power Station)

Docket No. 50-293-LR

ASLBP No. 06-848-02-LR

July 19, 2011

PARTIAL INITIAL DECISION

(Rejecting, Upon Remand, Pilgrim Watch's Challenge to Meteorological Modeling in SAMA
 Analysis in Entergy's License Renewal Application)

I. INTRODUCTION

Applicant Entergy¹ seeks renewal of its operating license for the Pilgrim Nuclear Power Station (Pilgrim) for an additional twenty-year period beyond its current operating license expiration date of June 8, 2012.² The Commission has remanded to us³ an issue raised by Pilgrim Watch, the Intervenor in this proceeding, regarding certain aspects of the meteorological modeling and data used in Entergy's severe accident mitigation alternatives (SAMA) analysis which Pilgrim Watch argues to be deficient. Having fully considered all record evidence, we find that accounting for the meteorological patterns, atmospheric transport modeling, and data issues raised by Pilgrim Watch cannot credibly alter the Pilgrim SAMA analysis conclusions regarding which SAMAs are potentially cost beneficial to implement. Accordingly, we find in

¹ The Applicant Entergy encompasses two entities, Entergy Nuclear Generation Company and Entergy Nuclear Operations, Inc.

² See 71 Fed. Reg. 15,222, 15,222 (Mar. 27, 2006).

³ CLI-10-11, 71 NRC __, __ (slip op. at 3) (Mar. 26, 2010).

favor of the Applicant, Entergy, with respect to the remanded matters.⁴

II. **BACKGROUND**

A. **The Procedural History of Entergy's License Renewal Application**

On January 25, 2006, Entergy submitted an application to renew its operating license for Pilgrim for a twenty-year period pursuant to 10 C.F.R. Part 54.⁵ Pilgrim Watch filed an intervention petition⁶ in response to the NRC's publication of a notice of opportunity for hearing in the Federal Register.⁷

This Board, in LBP-06-23, granted Pilgrim Watch's hearing request, admitting two contentions: Contention 1, concerning the aging management program for buried pipes and tanks containing radioactively contaminated water, and Contention 3, challenging Entergy's SAMA analysis.⁸ In admitting Contention 3, the Board limited it to the following challenge:

Applicant's SAMA analysis for the Pilgrim plant is deficient in that the input data concerning (1) evacuation times, (2) economic consequences, and (3) meteorological patterns are incorrect, resulting in incorrect conclusions about the cost versus benefits of possible mitigation alternatives, such that further analysis is called for.⁹

The Board also granted the requests from the Towns of Plymouth and Duxbury, Massachusetts to participate in this proceeding pursuant to 10 C.F.R. § 2.315(c),¹⁰ and rejected an intervention

⁴ We further find that reliance by the NRC Staff upon Entergy's SAMA analysis would be reasonable in satisfaction of its obligations under the National Environmental Policy Act (NEPA).

⁵ 71 Fed. Reg. at 15,222.

⁶ Request for Hearing and Petition to Intervene by Pilgrim Watch (May 25, 2006). In its intervention petition, Pilgrim Watch proffered five contentions. Id. at 3.

⁷ 71 Fed. Reg. at 15,222.

⁸ See LBP-06-23, 64 NRC 257, 348-49 (2006).

⁹ Id. at 341.

¹⁰ See Board Order and Notice (Regarding Oral Argument and Limited Appearance Statement Sessions) (June 21, 2006) at 1 (unpublished).

petition filed by the Massachusetts Attorney General.¹¹

On May 18, 2007, Entergy moved for summary disposition of Contention 3.¹² The NRC Staff supported the motion and Pilgrim Watch opposed the motion.¹³ In LBP-07-13, the majority of this Board granted Entergy's motion and dismissed Contention 3.¹⁴

On April 10, 2008, the Board held an evidentiary hearing on the merits of Contention 1¹⁵ and closed the evidentiary record shortly thereafter.¹⁶ In LBP-08-22, we resolved Contention 1 in favor of Entergy and terminated the proceeding.¹⁷ Pilgrim Watch petitioned for review of that initial decision and several other Board decisions, including our order dismissing Contention 3 on summary disposition.¹⁸

On March 26, 2010, the Commission reversed in part the Board majority's decision granting summary disposition of Contention 3 and remanded the matter "as limited by [the

¹¹ LBP-06-23, 64 NRC at 349, aff'd CLI-07-03, 65 NRC 13, 16 (2007).

¹² See Entergy's Motion for Summary Disposition of Pilgrim Watch Contention 3 (May 18, 2007).

¹³ See NRC Staff Response to Entergy's Motion for Summary Disposition of Pilgrim Watch Contention 3 (July 2, 2007) at 1; Pilgrim Watch's Answer Opposing Entergy's Motion for Summary Disposition of Pilgrim Watch Contention 3 (July 2, 2007) at 1.

¹⁴ See LBP-07-13, 66 NRC 131, 137 (2007). Pilgrim Watch sought interlocutory Commission review of LBP-07-13, Pilgrim Watch Brief on Appeal of LBP-07-13 Memorandum and Order (Ruling on Motion to Discuss [sic] Petitioner's Contention 3 Regarding Severe Accident Mitigation Alternatives) (Nov. 13, 2007) at 1, which the Commission denied, holding that Pilgrim Watch's appeal must await the Board's final decision. CLI-08-2, 67 NRC 31, 32 (2008).

¹⁵ Tr. at 557-874.

¹⁶ Board Memorandum and Order (Ruling on Pilgrim Watch Motions Regarding Testimony and Proposed Additional Evidence Relating to Pilgrim Watch Contention 1) (June 4, 2008) at 3-4 (unpublished).

¹⁷ LBP-08-22, 68 NRC 590, 610 (2008). Judge Young concurred with LBP-08-22. Id. at 612 (Young, J., concurring). The Commission denied Pilgrim Watch's petition for review of Contention 1. See CLI-10-14, 71 NRC ___, ___ (slip op. at 29) (June 17, 2010).

¹⁸ See Pilgrim Watch's Petition for Review of LBP-06-848 [sic], LBP-07-13, LBP-06-23 and the Interlocutory Decisions in the Pilgrim Nuclear Power Station Proceeding (Nov. 12, 2008) at 1.

Commission's] ruling, to the Board for hearing."¹⁹ Specifically, the Commission remanded certain meteorological issues imbedded in Contention 3 that challenged the adequacy of the straight-line Gaussian plume model used in the MACCS2 code for performing the SAMA analysis, insofar as they considered the "sea breeze" and the potential for plumes headed out to sea to change direction, remain concentrated, and cause "hot spots" of radioactivity.²⁰

Additionally, if the Board were to conclude that there is a deficiency in the challenged meteorological modeling and data that is material enough that it could cause additional SAMAs to become cost effective, the Commission's remand required consideration of certain economic costs and evacuation timing issues.²¹ The Commission explained this qualified remand:

if the Board on remand were to conclude that there is a material deficiency in the meteorological patterns modeling, the economic cost calculations also could warrant re-examination. We therefore remand the economic cost and evacuation time portions of Contention 3 to the Board, but only to the extent that the Board's merits conclusion on meteorological patterns may materially call into question the relevant economic cost and evacuation timing conclusions in the Pilgrim SAMA analysis.²²

On August 27, 2010, the Commission provided further guidance regarding the scope of Contention 3, explaining that "the issue on remand focuses on the adequacy of the atmospheric dispersion modeling in the Pilgrim SAMA analysis, not the methodology or underlying assumptions used for translating the atmospheric dispersion modeling results into economic

¹⁹ CLI-10-11, 71 NRC at __ (slip op. at 3).

²⁰ Id. at __ (slip op. at 14-16, 23, 25-26).

²¹ Id. at __ (slip op. at 26-27).

²² Id. at 27. Pilgrim Watch requested that the Commission reconsider its decision in CLI-10-11, arguing that the Commission improperly limited the scope of Contention 3 to exclude the economic consequences portion of the contention. See Pilgrim Watch Motion for Reconsideration of CLI-10-11 (Apr. 5, 2010) at 2. The Commission denied the motion, reiterating that the effects of spent fuel accidents, decontamination clean-up costs, and health costs are not within the scope of the remanded contention. CLI-11-15, 71 NRC __, __ (slip op. at 2-7) (June 17, 2010).

costs.”²³

On September 15, 2010, the Board held a prehearing conference with the parties to discuss the scope of Contention 3.²⁴ After receiving briefs on the matter,²⁵ on September 23, 2010, the Board framed the scope of remanded Contention 3 as follows:

the primary and threshold issue [is] whether the meteorological modeling in the Pilgrim SAMA analysis is adequate and reasonable to satisfy NEPA, and whether accounting for the meteorological patterns/issues of concern to Pilgrim Watch

²³ CLI-10-22, 72 NRC __, __ (slip op. at 7-8) (Aug. 27, 2010). Further, the Commission noted that the Board should “consider whether the NRC’s practice [of using the mean consequence values] is reasonable for a SAMA analysis, and whether Pilgrim Watch’s concerns are timely raised.” Id. at __ (slip op. at 8 n.34). In response, the Board called for briefs, and the Board majority requested expert affidavits from the parties regarding the timeliness of the “mean consequence values issues.” See Board Order (Confirming Matters Addressed at September 15, 2010, Telephone Conference) (Sept. 23, 2010) at 2 (unpublished) [hereinafter Sept. 23, 2010 Order]; Board Order (Questions from Board Majority Regarding the Mechanics of Computing “Mean Consequences” in SAMA Analyses) (Oct. 26, 2010) at 3-5 (unpublished). After considering the briefs and affidavits submitted by the parties, a majority of the Board held that the mean consequence values issue was not timely raised and thus the Board would not entertain the issue. See Board Order (Ruling on Timeliness of Mean Consequence Issue) (Nov. 23, 2010) at 1-2 (unpublished); accord Board Memorandum and Order (Ruling on Timeliness of Mean Consequence Values Issue) (Mar. 3, 2011) at 1. Judge Young dissented, concluding that Pilgrim Watch raised the issue in responding to Entergy’s motion for summary disposition of Contention 3. See Separate Statement of Administrative Judge Ann Marshall Young (Mar. 3, 2011) at 1, 4 (unpublished).

²⁴ See Board Order (Scheduling Telephone Conference) (Sept. 2, 2010) (unpublished) [hereinafter Conference Scheduling Order]. Pilgrim Watch filed a motion for clarification of the September 2, 2010 order. See Pilgrim Watch Motion for Clarification ASLB Order (Sept. 2, 2010) (Sept. 9, 2010) (ADAMS Accession No. ML201580318). The Board did not rule on that motion, instead advising that Pilgrim Watch may seek further clarification with the Commission. See Sept. 23, 2010 Order at 2-3. In response, Pilgrim Watch requested such clarification from the Commission. See Pilgrim Watch Motion Regarding ASLB Refusal to Respond to Pilgrim Watch’s Motion for Clarification ASLB Order (Sept. 2, 2010) (Sept. 22, 2010). The Commission denied Pilgrim Watch’s request, concluding that Pilgrim Watch’s questions were answered by the Board or were premature. CLI-10-28, 72 NRC __, __ (slip op. at 1-2) (Nov. 5, 2010).

²⁵ NRC Staff’s Initial Response to the Board’s Order (Regarding Deadlines for Submission of Parties) (May 12, 2010); Entergy’s Submission on Scope and Schedule for Remanded Hearing (May 13, 2010); Pilgrim Watch Response to ASLB’s May 5, 2010 Order (May 13, 2010); NRC Staff Reply to Pilgrim Watch Response Board’s [sic] May 5, 2010 Order (May 17, 2010); Pilgrim Watch’s Reply to Entergy’s Submission on Scope and Schedule for Remanded Hearing (May 17, 2010); Pilgrim Watch’s Reply to NRC Staffs [sic] Initial Brief to the Board’s Order (Regarding Deadlines for Submission of Parties) (May 17, 2010); Entergy’s Reply to Pilgrim Watch’s Response to ASLB’s May 5, 2010 Order (May 18, 2010).

could, on its own, credibly alter the Pilgrim SAMA analysis conclusions on which SAMAs are cost[]beneficial to implement.²⁶

The Board stated that if it found meteorological modeling deficiencies in the SAMA analysis significant enough to cause additional SAMAs to become cost effective, then the Board would consider whether the evacuation and economic issues identified in CLI-10-11 might be open for adjudication.²⁷ On the other hand, if the Board determined there are no meteorological modeling deficiencies calling into question the SAMA analysis conclusions, then the Board's action on remand would be complete.²⁸ The Board also directed the parties to address a series of questions regarding the meteorological phenomena at issue, specifically the impact of "sea breeze" and "hot spots" on Pilgrim's SAMA analysis.²⁹

On January 3, 2011, the parties filed initial written presentations on Contention 3, pre-filed expert testimony, and pre-filed exhibits.³⁰ Thereafter, on January 13, 2011, pursuant to 10

²⁶ Sept. 23, 2010 Order at 1.

²⁷ Id. at 3.

²⁸ See Conference Scheduling Order at 2.

²⁹ Sept. 23, 2010 Order, app. A.

³⁰ Entergy submitted the following pre-filed testimony: Exh. ENT000001, Testimony of Dr. Kevin R. O'Kula and Dr. Steven R. Hanna on Meteorological Matters Pertaining to Pilgrim Watch Contention 3 (Jan. 3, 2011) [hereinafter O'Kula/Hanna Testimony]; Exh. ENT000012, Testimony of Dr. Kevin R. O'Kula on Source Term Used in the Pilgrim Nuclear Power Station Severe Accident Mitigation Alternatives (SAMA) Analysis (Jan. 3, 2011); and ten pre-filed exhibits. See Entergy Hearing Exhibit List (Jan. 3, 2011). The NRC Staff submitted the following pre-filed testimony: Exh. NRC000014, NRC Staff Testimony of Nathan E. Bixler and S. Tina Ghosh Concerning the Impact of Alternative Meteorological Models on the Severe Accident Mitigation Alternatives Analysis (Feb. 2, 2011)[hereinafter Bixler/Ghosh Testimony]; Exh. NRC000015, NRC Staff Testimony of James V. Ramsdell, Jr., Concerning the Impact of Specific Meteorological Conditions on the Severe Accident Mitigation Analysis (Feb. 2, 2011) [hereinafter Ramsdell Testimony]; and thirteen exhibits. NRC Staff Exhibit List (Feb. 2, 2011). Additionally, the NRC Staff and Entergy jointly filed one exhibit. Exh. JN000001, C. R. Molenkamp et al., Comparison of Average Transport and Dispersion Among a Gaussian, a Two-Dimensional, and a Three-Dimensional Model (Oct. 2004) [hereinafter Molenkamp Report]. Although entitled "pre-filed testimony," Pilgrim Watch's submission contained no expert testimony. See Pilgrim Watch SAMA Remand Pre-Filed Testimony (Jan. 3, 2011) [hereinafter Pilgrim Watch Statement of Position]. Pilgrim Watch filed twenty-one exhibits. Pilgrim Watch List of Exhibits (Jan. 3, 2011).

C.F.R. § 2.323, Entergy filed a motion in limine contending that Pilgrim Watch's pre-filed testimony and portions of its exhibits were outside the scope of remanded Contention 3 or unsupported by a qualified witness, and thus should be excluded from the evidentiary record.³¹ The NRC Staff supported Entergy's motion,³² and Pilgrim Watch opposed the motion, but conceded that its pre-filed testimony was a statement of position rather than pre-filed testimony.³³

On February 1, 2011, the parties filed rebuttal testimony.³⁴

On February 16, 2011, the parties filed a joint motion requesting that the Board resolve the threshold issue of Contention 3 based on the parties' pre-filed written evidentiary submissions without holding an oral evidentiary hearing.³⁵ The parties also requested that the Board:

accept into the record the pre-filed testimony of the parties on the meteorological modeling issues, including the January 30 declaration of Dr. Bruce Egan submitted by Pilgrim Watch, and the pre-filed exhibits of the parties subject to ruling on Entergy's Motion In Limine.³⁶

On February 18, 2011, the Board convened a teleconference with the parties to discuss

³¹ Entergy's Motion in Limine to Exclude from Evidence Pilgrim Watch's SAMA Remand Pre-Filed Testimony and Exhibits (Jan. 13, 2011) at 1-2.

³² NRC Staff's Response in Support of Entergy's Motion in Limine (Jan. 24, 2011) at 1.

³³ Pilgrim Watch Reply to Entergy's Motion in Limine to Exclude from Evidence Pilgrim Watch's SAMA Remand Pre-Filed Testimony and Exhibits (Jan. 23, 2011) at 1-2.

³⁴ Entergy filed the following rebuttal testimony: Exh. ENT000013, Rebuttal Testimony of Dr. Kevin R. O'Kula and Dr. Steven R. Hanna on Meteorological Matters Pertaining to Pilgrim Watch Contention 3 (Feb. 1, 2011) [hereinafter O'Kula/Hanna Rebuttal Testimony]; and Exh. ENT000014, Rebuttal Testimony of Dr. Kevin R. O'Kula on Source Term Used in the Pilgrim Nuclear Power Station SAMA Analysis (Feb. 1, 2011). The NRC Staff filed the following rebuttal testimony: Exh. NRC000016, NRC Staff Rebuttal Testimony of S. Tina Ghosh Concerning Pilgrim Watch's Application of NUREG-1150 and NUREG-1465 (Feb. 2, 2011). Pilgrim Watch submitted the Statement by Bruce A. Egan, ScD., CCM (Jan. 30, 2011).

³⁵ Joint Motion Requesting Resolution of Contention 3 Meteorological Issues on Written Submissions (Feb. 16, 2011) at 1.

³⁶ Id. at 2.

inter alia the joint motion.³⁷ The Board granted, pursuant to the provisions of 10 C.F.R. § 2.1206, the joint motion for good cause shown and directed the parties to submit proposed findings of fact and conclusions of law.³⁸ The Board also granted Entergy's motion in limine in part, excluding as evidence the January 3, 2011 pre-filed testimony of Pilgrim Watch, explaining that the document would not be considered evidence but rather a statement of position.³⁹ Additionally, the Board admitted all of the exhibits of the parties (including the declaration of Dr. Egan), but stated that it would accord each exhibit weight to the extent it is "relevant, material, and reliable" pursuant to 10 C.F.R. § 2.337(a).⁴⁰

On March 9, 2011, in Plymouth, Massachusetts, the Board heard argument on the threshold issue of Contention 3, examined the parties' counsel regarding proposed findings of fact and conclusions of law, and heard short closing arguments.⁴¹

III. LEGAL STANDARDS

Pilgrim Watch's Contention 3 challenges the adequacy of the SAMA analysis contained in Entergy's environmental report. The NRC's license renewal regulations require that, for a license renewal to be issued, the Commission must determine that the applicable requirements of 10 C.F.R. Part 51, Subpart A have been satisfied.⁴² In an operating license renewal proceeding and as relevant to Contention 3, 10 C.F.R. § 51.53(c)(3)(ii)(L) requires an applicant's environmental report to contain, "[i]f staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or

³⁷ Tr. at 754-83; accord Board Order (Addressing Joint Motion, Motion in Limine, Proposed Findings of Fact and Conclusions of Law/Concluding Statements of Position, and Argument to be held March 9, 2011) (Feb. 22, 2011) at 1-2 (unpublished) [hereinafter Feb. 22, 2011 Order].

³⁸ Feb. 22, 2011 Order at 2.

³⁹ Id.

⁴⁰ Id. at 2, 5.

⁴¹ Tr. at 784-1018.

⁴² 10 C.F.R. § 54.29(b).

related supplement or in an environmental assessment, a consideration of alternatives to mitigate severe accidents.⁴³ Because the Commission has established this requirement to provide information to be used by the Agency staff in fulfillment of its obligation under the National Environmental Protection Act (NEPA),⁴⁴ the suitability of the Entergy SAMA analysis must be judged by the requirements of NEPA.

SAMA analysis is a site-specific mitigation analysis, for which “NEPA demands no fully developed plan or detailed examination of specific measures which will be employed to mitigate adverse environmental effects.”⁴⁵ The Commission has explained that the SAMA analysis is neither a worst-case⁴⁶ nor a best-case impacts analysis.⁴⁷ And the agency’s NEPA requirements are “tempered by a practical rule of reason.”⁴⁸

Regarding the adjudication of Contention 3, the Commission explained that the relevant

⁴³ Id. § 51.53(c)(3)(ii)(L) (emphasis added).

⁴⁴ See id. § 51.1 (stating that the regulations in Part 51 implement section 102(2) of NEPA, codified at 42 U.S.C. § 4332(2)).

⁴⁵ CLI-10-11, 71 NRC at ___ (slip op. at 38) (quoting Duke Energy Corp. (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-03-17, 58 NRC 419, 431) (internal quotations omitted).

⁴⁶ In this regard, we note that our colleague once again mentions that she would have admitted evidence on the question of whether the NRC should have used a 95th percentile consequence rather than the mean consequence. See Separate Statement of Administrative Judge Ann Marshall Young attached hereto at 2-3. But it is plain that the “mean” is consistent with Commission policy and precedent, whereas the 95th percentile is akin to a worst-case scenario analysis – which is not an approach required by the Commission. In fact, the Commission has stated in this proceeding that “[a]s a policy matter, license renewal applicants are not required to base their SAMA analysis upon consequence values at the 95th percentile consequence level (the level used for the GEIS severe accident environmental impacts analysis).” CLI-10-11, 71 NRC at ___ (slip op. at 39). The Commission has expressed a similar view in another license renewal proceeding. Cf. Amergen Energy Co., LLC (Oyster Creek Nuclear Generating Station), CLI-09-7, 69 NRC 235, 263 (2009) (holding that the “reasonable assurance” standard for aging management programs does not require a 95% confidence level of compliance).

⁴⁷ CLI-10-11, 71 NRC at ___ (slip op. at 38); see also Robertson v. Methow Valley Citizens Counsel, 490 U.S. 332, 354-56 (1989).

⁴⁸ CLI-10-22, 72 NRC at ___ (slip op. at 9) (quoting Communities, Inc. v. Busey, 956 F.2d 619, 626 (6th Cir. 1992)).

issue is “not whether there are ‘plainly better’ atmospheric dispersion models or whether the SAMA analysis can be refined further,”⁴⁹ but whether “it looks genuinely plausible that inclusion of an additional factor or use of other assumptions or models may change the cost-benefit conclusions for the SAMA candidates evaluated.”⁵⁰ The Commission also concluded that “[u]ltimately, NEPA requires the NRC to provide a ‘reasonable’ mitigation alternatives analysis, containing ‘reasonable’ estimates, including, where appropriate, full disclosures of any known shortcomings in available methodology, disclosure of incomplete or unavailable information and significant uncertainties, and a reasoned evaluation of whether and to what extent these or other considerations credibly could or would alter the Pilgrim SAMA analysis conclusions on which SAMAs are cost beneficial to implement.”⁵¹

That said, we note that the question of whether or not Staff has satisfied its obligations under NEPA is not at issue before us; the present challenge (and, therefore, the portion of our previous decision remanded for our further examination) is, as we discussed above, to the SAMA analysis performed by Entergy and submitted in fulfillment of its obligations to the Staff under 10 C.F.R. § 51.53(c)(3)(ii)(L). Thus, we evaluate below the sufficiency of the remanded aspects of the Entergy SAMA analysis by applying, in relevant part, the standards appropriate for a NEPA analysis.

IV. THE PARTIES’ WITNESSES

As to the meteorological matters of Contention 3, Entergy presented, and the Board accepted into evidence as exhibits, the pre-filed written testimony of two witnesses: (1) Dr. Kevin R. O’Kula, Advisory Engineer with URS Safety Management Solutions, LLC., and (2) Dr. Steven R. Hanna, President of Hanna Consultants and an Adjunct Associate Professor at the

⁴⁹ CLI-10-11, 71 NRC at ___ (slip op. at 37).

⁵⁰ Id. at ___ (slip op. at 39).

⁵¹ CLI-10-22, 72 NRC at ___ (slip op. at 9-10) (internal citations omitted).

Harvard School of Public Health.⁵² The professional qualifications of the witnesses are detailed in their pre-filed testimony.⁵³

Regarding the meteorological matters pertaining to Contention 3, the NRC Staff presented, and the Board accepted into evidence as exhibits, the pre-filed written testimony of three witnesses: (1) Dr. Nathan Bixler, Principal Member of the Technical Staff at Sandia National Laboratories, (2) Dr. S. Tina Ghosh, Senior Program Manager for the NRC,⁵⁴ and (3) Mr. James Ramsdell, Jr., Senior Technical Researcher for Pacific Northwest Laboratories.⁵⁵ The professional qualifications of the witnesses were appended to their pre-filed testimony.⁵⁶

Pilgrim Watch presented, and the Board accepted a document entitled “Pre-filed Testimony” which, by agreement of the parties, we accepted as a statement of position. In addition, the declarations of: Dr. Bruce A. Egan, President of Egan Environmental, Inc were accepted into evidence.⁵⁷ The professional qualifications of Dr. Egan were discussed in the pre-filed declaration.⁵⁸

⁵² O’Kula/Hanna Testimony at Q1 to A7.

⁵³ Id. at 1-5 (discussing the professional qualifications of each witness).

⁵⁴ Bixler/Ghosh Testimony at 1.

⁵⁵ Ramsdell Testimony at 1.

⁵⁶ Exh. NRC000011, Dr. Bixler’s Statement of Qualifications (Jan. 3, 2011); Exh. NRC000012, Dr. Ghosh’s Statement of Qualifications (Jan. 3, 2011); Exh. NRC000013, Mr. Ramsdell’s Statement of Qualifications (Jan. 3, 2011).

⁵⁷ Exh. PWA000001-00-BD01, Declaration of Bruce A. Egan, ScD., CCM, in Support of Pilgrim Watch’s Response Opposing Entergy’s Motion for Summary Disposition of Pilgrim Watch Contention 3 (June 20, 2007) [hereinafter Egan Decl.]; Exh. PWA000022-00-BD01, Declaration of Bruce A. Egan, Sc.D., CCM, in Support of Pilgrim Watch’s Response Opposing Entergy’s Initial Statement of Position on Pilgrim Watch Contention 3 (Jan. 30, 2011); Exh. PWA000023-00-BD01, Statement by Bruce A. Egan, Sc.D., CCM (Jan. 30, 2011) [hereinafter Egan Statement].

⁵⁸ Egan Decl. at 2.

V. FINDINGS OF FACT

A. Statement of the Issue

The threshold issue before the Board is “whether the meteorological modeling in the Pilgrim SAMA analysis is adequate and reasonable to [enable the Staff to] satisfy [its obligations under] NEPA, and whether accounting for the meteorological patterns/issues of concern to Pilgrim Watch could credibly alter the Pilgrim SAMA analysis conclusions on which SAMAs are cost beneficial to implement.”⁵⁹ The resolution of this issue implicates two particular weather patterns—the “sea breeze” effect (and the effects of coastal topography thereupon) and the “hot spot” effect—which Pilgrim Watch claims, if properly accounted for, could cause the SAMA cost-benefit-analyses conclusions to be altered.

B. SAMA Analyses in General

The goal of a SAMA analysis is to identify potential changes to a nuclear power plant, or its operations, that might reduce the risk (the likelihood or the impact, or both) of a severe reactor accident for which the benefit of implementing the change outweighs the cost of implementation.⁶⁰ To that end, a SAMA analysis evaluates the extent to which “probability-weighted consequences of the analyzed severe-accident sequences would decrease if a specific SAMA were implemented at a particular facility,” and whether the decrease in consequences would sufficiently reduce risk for the SAMA to be cost beneficial to implement.⁶¹ A SAMA analysis is a probabilistic analysis focused on long-term and spatially-averaged

⁵⁹ Conference Scheduling Order at 1.

⁶⁰ Duke Energy Corp. (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-02-17, 56 NRC 1, 5 (2002) (“The purpose of the SAMA review is to ensure than any plant changes – in hardware, procedures, or training – that have a potential for significantly improving severe accident safety performance are identified and assessed. If the cost of implementing a particular SAMA is greater than its associated benefit, the SAMA would not be considered cost-beneficial.”); accord O’Kula/Hanna Testimony at A15 (O’Kula); Bixler/Ghosh Testimony at A7 (Ghost and Bixler).

⁶¹ CLI-10-11, 71 NRC at ___ (slip op at 3).

impacts from severe accident events for the purpose of making cost-benefit evaluations.⁶² The effects are averaged both over the area within 50 miles of the site and over the expected variations in meteorological patterns.

C. Additional Cost-Effective SAMA at Pilgrim

Uncontroverted evidence establishes that the lowest-cost not-implemented SAMA for the Pilgrim plant has a cost approximately twice the benefit derived from its implementation.⁶³ Thus, for the asserted flaws in the meteorological modeling to cause that next SAMA to be cost effective to implement, the benefit or cost averted must increase by approximately a factor of two by correction of those errors asserted by Pilgrim Watch and remanded here. And this advises that the sum of the offsite economic cost risk (OECR) and population dose risk (PDR), which together comprise approximately eighty-six percent (86%) of the averted-cost benefit, would need to increase by somewhat more than a factor of two before another SAMA would be considered potentially cost beneficial.⁶⁴ Indeed, the Staff's expert witness, Mr. Ramsdell, testified that this averted-cost benefit would need to increase "by a factor of about 2.5 [in order] to make the next lowest cost SAMA appear cost[]beneficial."⁶⁵ Thus we find that the effects of the two meteorological patterns at issue must cause the expected average offsite damages to increase by at least a factor of two for the next most costly SAMA to be cost effective, i.e., to credibly alter the Pilgrim SAMA analysis conclusions on which SAMAs are cost beneficial to implement.

⁶² O'Kula/Hanna Testimony at A16 (O'Kula).

⁶³ The results of the SAMA analysis for the Pilgrim plant indicate that for the next potentially cost-beneficial SAMA, SAMA 8, the approximate cost of implementing the SAMA (>\$5,000,000) is more than twice the benefit (\$2,410,000) derived from the cost averted by implementing the SAMA. Id. at A47 (O'Kula).

⁶⁴ Id. (O'Kula).

⁶⁵ Ramsdell Testimony at A36.

D. As to the Sea Breeze

Pilgrim Watch contends that the Pilgrim SAMA analysis significantly underestimates offsite consequences of a severe accident because (1) the MACCS2 computer code used by Entergy in its SAMA analysis ignores sea breeze circulations and (2) the single meteorological data collection site used to provide the data for the computations cannot adequately capture the complex wind trajectories caused by the sea breeze effect.⁶⁶ Pilgrim Watch argues that “the topography of a coastal environment plays an important role in the sea breeze circulation[] and can alter the typical flow pattern expected from a typical sea breeze along a flat coastline.”⁶⁷ Pilgrim Watch also argues that “Pilgrim’s coastal location increases doses on communities inland to an approximate distance of 15 km (9.3 miles).”⁶⁸

1. Pilgrim’s wind data included the appropriate portion and information for the sea breeze.

Contrary to Pilgrim Watch’s claim, the computations with MACCS2 do not ignore sea breezes. Entergy’s SAMA analysis covers an entire year and thus includes data reflecting both types of coastal breeze, land and sea breezes.⁶⁹ Pilgrim’s on-site meteorological tower captured both seaward and inland coastal breezes during 2001, and Entergy used this meteorological data in the MACCS2 calculation of the SAMA analysis.⁷⁰ Both the primary and backup data collection towers are located less than ¼ mile from the coastline.⁷¹ If there is a coastal breeze on-site, it is recorded by the on-site meteorological towers and has been

⁶⁶ Pilgrim Watch Statement of Position at 4-5.

⁶⁷ Id. at 6-7 (citing Exh. PWA000011-00-BD01, J. D. Spengler & G. J. Keeler, Final Project Report, Feasibility of Exposure Assessment For The Pilgrim Nuclear Power Plant at 40 (May 12, 1988)) [hereinafter Spengler Report].

⁶⁸ Id. at 6 (citing Spengler Report).

⁶⁹ O’Kula/Hanna Testimony at A74 (Hanna); Ramsdell Testimony at A10.

⁷⁰ O’Kula/Hanna Testimony at A77 (O’Kula) .

⁷¹ Id. at A73 (O’Kula and Hanna).

included as part of the MACCS2 calculation. As concluded by Entergy's experts, "the 2001 Pilgrim hourly meteorological data used in the SAMA analysis captures the coastal breeze effect, including any sea breeze blowing inland during the day and any land breeze blowing offshore during the night."⁷²

Pilgrim Watch's and Dr. Egan's claims that one meteorological data collection site cannot adequately capture the complex wind trajectories caused by the sea breeze effect were shown to be incorrect by Dr. O'Kula and Dr. Hanna. By comparing annual wind roses (which show the frequency that the wind is blowing in each of 16 directional sectors)⁷³ for other coastal sites in the SAMA domain, Dr. O'Kula and Dr. Hanna concluded that the Pilgrim site's observed wind directions for 2001 are representative of the other coastal sites.⁷⁴ Dr. O'Kula and Dr. Hanna also testified that they compared the Pilgrim 2001 annual wind rose to wind roses from inland sites within the SAMA domain beyond typical sea breeze range, such as Taunton, and found "little net change" between them.⁷⁵ Dr. O'Kula and Dr. Hanna concluded that the 2001 annual wind roses "show no dramatic differences that would affect the long term and broad area impacts produced by a SAMA analysis."⁷⁶ They explained that local temporal and spatial dependencies of individual sea breezes do not affect the SAMA analysis because they average out over the year.⁷⁷ Dr. O'Kula and Dr. Hanna confirmed this result by CALMET Trajectory

⁷² Id. (O'Kula and Hanna) (emphasis added).

⁷³ Id. at A14 (O'Kula and Hanna).

⁷⁴ Id. at A79 (O'Kula and Hanna).

⁷⁵ Id. (O'Kula and Hanna) (citing Exh. ENT000004-00-BD01, Steven Hanna & Elizabeth Hendrick, Analysis of Annual Wind Roses and Precipitation within about 50 Miles of the Pilgrim Nuclear Power Station, and Use of CALMET to Calculate the Annual Distribution of Trajectories from the Pilgrim Station at B-11 (Dec. 2010) [hereinafter Hanna Report]).

⁷⁶ Id. (O'Kula and Hanna).

⁷⁷ Id. (O'Kula and Hanna).

Analysis,⁷⁸ which was used to calculate the annual distribution of trajectories from the Pilgrim Station.

Entergy also presented uncontroverted evidence demonstrating that the single year's worth of meteorological data collected at the site during 2001 is both temporally and spatially representative of other years' data. Dr. Hanna explained that comparing the annual wind rose at Pilgrim for 2001 to the annual wind roses at Pilgrim for 1996-2000 shows that the 2001 wind rose is reasonably representative of other years.⁷⁹ Indeed, quantitatively comparing the percentages of each year that the wind is blowing in each of the 16 directional sectors establishes that the maximum variation from year to year was an increase in the NNE direction by 3.1% (i.e., from 14% to 17.1%), while more than half of the yearly variations in any directional sector are less than 1%.⁸⁰ This comparison led Dr. Hanna to conclude that, as to wind direction used in the SAMA analysis, "the annual wind rose from 2001 at the Pilgrim Station is representative of other years."⁸¹ Entergy also presented an evaluation demonstrating that the Plymouth Municipal Airport 2001 precipitation data used in the Pilgrim SAMA analysis is representative of the 2001 precipitation levels at eight other sites in the SAMA domain⁸² and representative of the precipitation levels for the years 1995 to 2009.⁸³

Dr. Egan suggests that the Molenkamp model comparison study (Molenkamp Report) does not validate use of the Gaussian Plume for Pilgrim's SAMA analysis because "a comparison of model predictions made in the relatively flat area of the 'Southern Great Plains

⁷⁸ Id. (O'Kula and Hanna).

⁷⁹ Id. at Q65-A65 (Hanna).

⁸⁰ Hanna Report at 26 tbl. 3; see also O'Kula/Hanna Testimony at A65 (Hanna).

⁸¹ Hanna Report at 24-25.

⁸² Id. at 34.

⁸³ O'Kula/Hanna Testimony at A72 (Hanna).

(SGP) site in Oklahoma and Kansas' cannot be used to state how model comparisons would fare at a coastal area like Plymouth, MA."⁸⁴ Entergy's experts agree that "topography and other surface property variability . . . could affect local wind speed and direction,"⁸⁵ but note that the Molenkamp Report concluded that the selected site had "sufficient variability for the purpose of this study,"⁸⁶ which was to evaluate whether it was necessary to use more sophisticated models than MACCS2 for performing SAMA analyses.

Dr. Hanna provided specific uncontroverted evidence indicating adequate similarity between the Southern Great Plains and the Pilgrim coastal domain, in terms of wind variations and topography.⁸⁷ He testified that the wind roses the Molenkamp Report provided for six sites showed approximately the same variability as the wind roses for weather sites in the Pilgrim analysis.⁸⁸

Thus we conclude, based on our review of the evidence, that the Pilgrim SAMA analysis incorporates the proper fraction (percentage) of contribution from times when the sea breeze is blowing and that the data used by Entergy to represent the sea breeze and other meteorological phenomena as well as topographical effects are sufficiently representative of the conditions at Pilgrim for SAMA analyses use. Further, we find the Entergy Pilgrim data and analysis includes an appropriate contribution from the sea breeze effect.

⁸⁴ Egan Statement at 7.

⁸⁵ O'Kula/Hanna Rebuttal Testimony at A6 (O'Kula and Hanna).

⁸⁶ Id. (O'Kula and Hanna) (quoting Molenkamp Report at 3).

⁸⁷ Id. at A7, A8 (Hanna).

⁸⁸ Id. at A7 (Hanna).

2. Sea Breezes are localized phenomena; they do not materially impact the large inland areas that make up the dominant portions of the SAMA impacts.

Entergy's expert testimony indicates that sea breeze conditions are (1) most often localized within 10 miles of the coast⁸⁹ and (2) generally beneficial in dispersing the plume and decreasing doses.⁹⁰ The sea breeze is generally a highly beneficial phenomenon that disperses and dilutes the plume concentration and thereby lowers projected doses downwind from the release point.⁹¹ Furthermore, Entergy's expert testimony concludes that a sea breeze influence at Pilgrim would generally penetrate only five to ten miles inland⁹² and will not be a factor towards the more heavily populated inland areas that are present in the 50 mile radius over which the SAMA analysis is conducted.

The Staff presented evidence that sea breezes occur in Boston, Massachusetts only 31 days per year (8.5%) and that sea breeze circulation near Pilgrim is weaker and has less inland penetration than near Boston. Staff's expert testimony on this point is:

A recent Master's degree thesis analyzed sea breeze events at General Edward Lawrence Logan International Airport ("Logan") in Boston, Massachusetts over a recent ten (10) year period using criteria developed by Miller and Keim. Thorp determined from the Logan data that meteorological conditions conducive to sea breeze events occurred an average of about 88 days per year (24%), but actual sea breeze events only occurred an average of about 31 days per year (8.5%). The average time of onset of the sea breeze was about 10:00 am and the average duration was about 8 hours. About 25% of the sea breeze events were marginal events that lasted less than 2 hours, were interrupted by periods of calm, or light and variable winds, or had no clear start or stop. Typical inland penetration of the sea breeze varied from about 10 to 25 miles depending on the underlying synoptic situation. Sea breeze flow patterns presented by Thorp

⁸⁹ Id. at A77 (O'Kula).

⁹⁰ Id. at A76 (Hanna).

⁹¹ Exh. NRC000006-00-BD01, Washington Safety Management Solutions LLC, Washington Group International, Radiological Dispersion and Consequence Analysis Supporting Pilgrim Nuclear Power Station Severe Accident Mitigation Alternative Analysis at 20-21 (May 2007).

⁹² O'Kula/Hanna Testimony at A74 (Hanna).

suggest that the sea breeze circulation in the vicinity of Pilgrim is weaker than in the vicinity of Logan and has more limited inland penetration.⁹³

3. Entergy's SAMA analysis conservatively accounts for Sea Breezes.

Entergy's experts explained that the SAMA analysis conservatively accounts for "the deposition that would occur from an individual sea breeze occurrence."⁹⁴ They explained that "any deposition impacts from a typical single sea breeze would generally be limited to 10 miles inland" because "sea breezes are localized phenomena that generally occur within 10 miles of the coast."⁹⁵ However, the present Pilgrim SAMA analysis "model[s] any plume initiated during a sea breeze event as continuing to travel in the same direction out to 50 miles, and thus would model these plumes as reaching the more heavily populated inland areas."⁹⁶ Pilgrim Watch does not controvert Entergy's testimony that approximately 95% of the PDR occurs (outside the reach of the sea breeze effects) in the 10-to-50 mile range,⁹⁷ and 83% of the SAMA off-site population dose consequences occur in the 20 to 50 mile range from the Pilgrim plant.⁹⁸ Dr. O'Kula explained that, as a result, "the Pilgrim SAMA analysis conservatively accounts for the sea breezes by assuming that they had impacts throughout the 50-mile range, and not just the 10-mile range near the coast where such breezes might be localized."⁹⁹ Thus we conclude,

⁹³ Ramsdell Testimony at A8 (emphasis added) (citing Exh. NRC000010, Jennifer E. Thorp, The Eastern Massachusetts Sea Breeze Study (May 2009) (unpublished)). According to Dr. Hanna, a "synoptic wind" is caused by prevailing pressure gradients that are often too strong to be overcome by the local pressure difference causing coastal breezes. O'Kula/Hanna Testimony at A74 (Hanna).

⁹⁴ Id. at A80 (O'Kula and Hanna).

⁹⁵ Id. (O'Kula and Hanna).

⁹⁶ Id. at A77 (O'Kula).

⁹⁷ Id. at A43 (O'Kula).

⁹⁸ Id. at A77 (O'Kula).

⁹⁹ Id. (O'Kula); accord Ramsdell Testimony at A14. Entergy's testimony also addresses the suggestion that sea breezes may increase concentrations for coastal locations by drawing

based upon our review of the evidence, that using data from only the Pilgrim site (which is in substantial agreement with wind data from nearby measuring stations) and coupling that with the Gaussian Plume model of MACCS2, which computes consequences outside the reach of the actual meteorological patterns associated with sea breezes, causes the Pilgrim SAMA analysis to conservatively compute the effects of the sea breeze phenomenon.

4. Sea Breezes generally decrease doses in the region that contributes most to overall consequences.

Dr. O’Kula testified that “population dose and economic cost results are relatively insensitive to individual plume transport behavior.”¹⁰⁰ He explained that “hourly variations in plume behavior and individual plume travel trajectories are of secondary importance to . . . long-term, longer-distance (out to 50 miles) land contamination impacts” because “the land contamination result is the principal contributor to the long-term population dose and economic costs.”¹⁰¹

contaminants inland that would otherwise be directed offshore or be carried aloft, thereby subjecting inhabitants of coastal communities to larger doses. In this regard, Dr Hanna testified that:

Pilgrim Watch hypothesizes specific short-term scenarios for which the ability to track an individual plume and determine concentrations and depositions at specific locations are important, as would be the case for emergency response or for EPA air permit applications. However, the Pilgrim SAMA analysis is focused on expected annual consequences integrated over an area with radius 50 miles, based on use of one year of hourly meteorological data. While over the course of a year it is possible that a hypothetically simulated plume during one or two hours could be redirected onshore by an individual sea breeze, thereby increasing impacts, it is also true that a hypothetically simulated plume during another hour could be redirected offshore by an individual land breeze yielding no impacts. Because the SAMA analysis simulates postulated plume travel based on weather scenarios experienced over the course of a year, which includes both sea breezes and land breezes, there is little net change on an expected annual basis over a broad area.

O’Kula/Hanna Testimony at A78 (Hanna).

¹⁰⁰ Id. at A44 (O’Kula).

¹⁰¹ Id. (O’Kula)

Dr. Hanna testified that, for SAMA purposes, “the sea breeze phenomenon generally has the beneficial effect of decreasing doses at specific locations where maximum concentrations would occur and for specific time periods rather than increasing them.”¹⁰² The reason sea breezes are more likely to decrease, rather than increase, consequences stems from the fact that “coastal breezes are dispersive over a several-hour period.”¹⁰³ Dr. Hanna explained

Coastal land and sea breezes are a type of mesoscale or medium range phenomena that lead to relatively slow (over an hour or two) fluctuations in wind speeds and directions over 90° to 180°. Therefore, they would be likely to increase lateral dispersion and reduce concentrations and dosages at specific locations near the centerline of the plume over a given time period ranging from one to several hours. Accordingly, for a period of time up to about a day, because of the broad (as much as 180 °) variations in wind direction during a coastal breeze episode, sea and land breezes are not a concentrating phenomenon (increasing the maximum plume centerline concentration). Rather they are a dispersive one (lowering the maximum plume centerline concentration and thereby lowering projected dose at that location and for that time period).¹⁰⁴

Entergy’s experts testified that “on an annual basis, sea breezes during the day are generally offset by land breezes at night.”¹⁰⁵ Similarly, Staff’s expert testified that the effects of overestimating and underestimating the impacts more or less cancel each other:

Recalling that sea breeze events occur about 8.5% of the days, we can then estimate that the MACCS2 wind model would underestimate offsite consequences about 3.5% of the time . . . during the year because it didn’t represent the sea breeze circulation explicitly. We can also estimate that MACCS2 would overestimate offsite consequences about 2.8% of the time¹⁰⁶

¹⁰² Id. at A76 (Hanna).

¹⁰³ Id. at A81 (O’Kula and Hanna).

¹⁰⁴ Id. at A76 (Hanna).

¹⁰⁵ Id. at A81 (O’Kula and Hanna).

¹⁰⁶ Ramsdell Testimony at A14 (internal cross reference omitted).

Thus we find that the present Pilgrim SAMA analysis does not underestimate the consequences of scenarios that occur during the presence of the sea breeze, and therefore does not underestimate, as a result of inaccuracies in modeling the sea breeze meteorology, the benefit of implementation of any SAMA.

5. More accurate modeling of the meteorology would not result in the identification of additional cost-effective SAMAs.

Uncontroverted expert testimony establishes that more accurate modeling of the meteorology would not result in differences of more than a factor of two for any particular meteorologic condition, and therefore could not cause the computed resultant deposition of radioactive products released during any particular severe accident scenario to be in error by more than a factor of two. We note that the only dispute before us regards the predicted deposition during the occurrence of the “sea breeze” effect and the “hot spot” effect; i.e. the possibility that the entire meteorologic computation might be in error is not at issue, just whether or not more accurate modeling of the meteorology during occurrence of the “sea breeze” and the “hot spot” conditions can credibly alter the Pilgrim SAMA analysis conclusions on which SAMAs are cost beneficial to implement:

Based upon our review of the evidence (discussed below), we conclude that results of computations with MACCS2’s meteorological models agree, within a factor of two, with those of more sophisticated models (such as full three dimensional time dependent modeling). The Gaussian plume model used in the MACCS2 code was compared to models like those suggested by Pilgrim Watch (AERMOD and CALPUFF)¹⁰⁷ in a 2004 NRC Office of Nuclear Regulatory Research funded atmospheric transport model comparison study involving three classes of atmospheric models, the Molenkamp Report.¹⁰⁸ The computations by MACCS2’s atmospheric model were compared to those of the NRC’s RASCAL code (a two-dimensional

¹⁰⁷ Egan Decl. ¶ 7.

¹⁰⁸ Ramsdell Testimony at A29 (citing Molenkamp Report).

Lagrangian puff dispersion model) and Lawrence Livermore National Laboratory's ADPIC/LODI models (fully three-dimensional time dependent models).¹⁰⁹ The Staff's expert explained that

The models predicted the mean air concentrations for both non-depositing and depositing material and surface concentration for depositing material to distances beyond 50 mi for 610 randomly selected release times. The mean concentration and deposition estimates which are directly related to SAMA analysis input were generally within a factor of 2 for the three models. The estimates of the MACCS2 dispersion model were generally within the bounds of the other two models.¹¹⁰

Entergy and the Staff presented uncontroverted evidence that the model-to-model comparison between MACCS2 and more complex atmospheric transport and dispersion models showed that results calculated by the various models are generally within a factor of two and that MACCS2 is within plus or minus 10% of a state-of-the art three dimensional model when averaged over a series of radial arcs out to fifty miles.¹¹¹ The Staff's experts concurred that the estimates of the MACCS2 dispersion model were generally within the bounds of the other models¹¹² and that MACCS2 performed as well as either of the more advanced Lagrangian puff model codes (similar to CALPUFF in capability) evaluated in the study.¹¹³

Therefore, based upon our review of the evidence, we conclude that, even if the sea breeze effect were erroneously computed by the present SAMA analysis, the errors could not have caused the portion of the meteorological computations involving the sea breeze effect to be in error by more than a factor of two. And, because the sea breeze effect is localized, the effects upon the computed consequences of a release from the plant during the occurrence of

¹⁰⁹ Id.

¹¹⁰ Id. at A30.

¹¹¹ O'Kula/Hanna Testimony at A58 (O'Kula and Hanna); Bixler/Ghosh Testimony at A38-A41 (Bixler); Molenkamp Report.

¹¹² Ramsdell Testimony at A30.

¹¹³ Bixler/Ghosh Testimony at A38 (Bixler).

the sea breeze effect cannot be in error by a factor of two; rather any such error must be considerably less.

6. The sea breeze occurs only during a small fraction of the year, and its effects are countercompensating, rather than unidirectional.

There are a limited number of days per year when noticeable coastal breezes that are not offset by synoptic winds might occur. The parties' expert testimony is consistent that, in the Pilgrim coastal area, there are

about 45 days per year during the summer months where the thermal gradient is sufficient and the synoptic winds are weak enough for a noticeable sea breeze. The durations of sea breezes are typically a few hours

Usually days with a noticeable sea breeze (blowing inland) are days with light synoptic winds, and therefore there is also an opposing land breeze (blowing offshore) at night, which is often stronger.¹¹⁴

Dr. Hanna testified that

[t]he standard sea and land breeze cycle occurs in the late spring and summer along the New England coast, when daytime land temperatures are usually warmer than the ocean temperatures. But, for the other half of the year, from late fall to winter, when daytime land temperatures are usually cooler than ocean temperatures, there is more likely a land (offshore) breeze generated.¹¹⁵

Further, Dr. Hanna explained that "for every day when there is a sea breeze blowing on shore, during the same day there is typically a nighttime land breeze blowing offshore," such that the two effects cancel out when performing an annual consequence evaluation over a broad area, as done in a SAMA analysis.¹¹⁶ The Staff's expert, Mr. Ramsdell, fully concurs with Dr. Hanna that onshore winds during the day are effectively offset, for purposes of a SAMA analysis, by offshore winds during the night or early morning hours.¹¹⁷

¹¹⁴ O'Kula/Hanna Testimony at A75 (Hanna).

¹¹⁵ Id. at A74 (Hanna).

¹¹⁶ Id. at A80 (Hanna).

¹¹⁷ Ramsdell Testimony at A7.

None of the parties dispute that the sea breeze phenomenon occurs only 30 to 50 days per year, has a typical inland penetration of 10 miles, and has a duration of only a few hours.¹¹⁸

Thus, from our examination of the evidence, we conclude that the sea breeze effect does not occur more than fifty days per year and such occurrences last no more than half a day.¹¹⁹ Thus we conclude that, at a maximum, the sea breeze effect occurs less than 25/365 of the year – or less than approximately 7% of the time. We therefore further conclude that the sea breeze effect cannot be weighted, from a probability of occurrence viewpoint, by more than 7%.

Because: (a) the next most costly SAMA is twice as expensive as the consequences estimated by the present Pilgrim SAMA analysis to be associated with the scenario it would address; and (b) the sea breeze effect occurs less than 7% of the year; and (c) the maximum error which could have been found to be present by inaccurate modeling of the meteorology is a factor of two, we find, from examination of the evidence, that any errors in computation of the meteorology associated with the sea breeze effect cannot be greater than 14% and therefore cannot have been large enough (i.e. cannot approach the 100% necessary) to bring the next most costly SAMA into economic play. In other words, asserted inadequacies in the modeling of meteorology and the use of meteorological data in the Pilgrim SAMA analysis at issue upon remand cannot be so large as to credibly alter the Pilgrim SAMA analysis conclusions regarding which SAMAs are cost beneficial to implement.

¹¹⁸ O’Kula/Hanna Testimony at A80 (O’Kula and Hanna); Ramsdell Testimony at A8; Pilgrim Watch Statement of Position at 6, 24 (citing Spengler Report at 1).

¹¹⁹ We conservatively use “half day” here to make the point, but expert testimony indicates plainly that the duration is generally eight hours or less. O’Kula/Hanna Testimony at A80 (Hanna); Ramsdell Testimony at A8; Pilgrim Watch Statement of Position at 24 (citing Spengler Report at 1).

Viewed in its totality, the evidence presented by Entergy and the NRC Staff demonstrates that the Pilgrim SAMA analysis adequately accounts for sea breezes. Pilgrim Watch's evidence does not dispute any of that evidence. Therefore, we reject Pilgrim Watch's unsupported claims and conclude that: (a) Entergy's Pilgrim SAMA analysis adequately takes coastal (sea) breezes into account; and (b) further refinement of the modeling or data accounting for sea breezes will not materially or significantly alter the overall impacts estimated by MACCS2 and the conclusions by Entergy regarding those SAMAs that are potentially cost beneficial.

7. An additional view of the evidence:

The evidence also demonstrates, in another manner, that it is not possible for modeling improvements regarding the sea breeze to alter the outcome of the Pilgrim SAMA cost-benefit analysis. The sea breeze occurs between 40 and 50 days a year¹²⁰ for a period of about 6 hours.¹²¹ This would be (at 50 days) $[50 \times 0.25] / 365$ of the yearly time; i.e., less than 4 percent of the time.¹²²

This would mean that for the contribution to consequences during the existence of the sea breeze to double the cost (which is the level required to make the next most costly SAMA cost effective to implement), the consequences during that period would have to contribute as much as the consequences during the entire balance of the year (i.e. the other 96%) – or that

¹²⁰ See supra Section V(D)(6).

¹²¹ See, e.g., O’Kula/Hanna Testimony at A80 (Hanna); supra note 119 and accompanying text. We conservatively used a “half day” in our discussion above simply to demonstrate the principle, but expert testimony indicates plainly that the duration is generally 6 hours or less.

¹²² We expressed supra that 7% would be a conservative estimate of the fraction of time a sea breeze might be present, but a realistic estimate should be based upon no more than 6 hrs/day and 50 days/year.

the consequences during the sea breeze occurrence would have to be approximately 26 times those during the mean meteorological conditions.¹²³

Therefore, for the SAMA cost-benefit analysis to have been sufficiently in error from not accurately modeling the sea breeze to cause the next SAMA candidate to be cost effective to implement, the consequences from the sea breeze would have to be in the range of somewhat more than 25 times the mean consequences computed by the SAMA analysis.

But, as is discussed and found above, the damages from a release during a sea breeze are likely to be less than those for median meteorologic patterns simply because the sea breeze not only tends to be a dispersive phenomenon, but does not carry the radioactive products into the large inland regions where the dominant portion of the SAMA damages are computed to occur.¹²⁴ And, as is discussed and found above, the effects of a sea breeze tend to be counter-cancelling, and will, at most, cause only minor additive effects in the interior 10 mile range which they affect.

1. Further, as we discussed and found above, the maximum differential in computed

¹²³ For the effect of the sea breeze to cause the next SAMA to be cost effective, it would need to contribute an amount determined by the following approximate formula:

$$.04 \times A + 0.96 \times B = 2.0 \times B$$

Where:

A is the mean of the consequences computed to occur when the sea breeze is active

B is the mean of the consequences computed to occur during all other meteorological conditions

Solving this equation for A, we find that $.04xA = 1.04xB$, Or $A = 26B$

For the purposes of this simple approximate linear analysis, we assume that the current mean of the consequences is not materially affected by the contribution from the sea breeze contributions. This linear approximation is borne out by the expert testimony described above.

¹²⁴ The evidence demonstrates that the sea breeze will not carry the radioactive products more than 10 miles inland, whereas 95% of the damages occur between 10 and 50 miles away from the plant.

resultant consequences that could be caused by more sophisticated modeling is a factor of two, and the evidence leads us to conclude that the differences may be considerably smaller, so that it is not possible for improved modeling to cause the computed damages during the occurrence of the sea breeze to be larger than those of the median by more than a factor of 2.¹²⁵

2. Therefore, the evidence also demonstrates that it is simply not possible that errors in the modeling of meteorology during the occurrence of a sea breeze could alter the cost-benefit analysis by any amount approaching the factor of approximately 26 which would be necessary to alter the Pilgrim SAMA analysis conclusions on which SAMAs are cost beneficial to implement.

E. “Hot Spot” Effect

Pilgrim Watch asserted it “showed that a plume over water, rather than being rapidly dispersed, will remain tightly concentrated due to the lack of turbulence, and will remain concentrated until winds blow it onto land.”¹²⁶ Quoting an article concerning pollutant transport, Pilgrim Watch suggests that the following “basic principles” apply to the radionuclide transport:

major pollution episodes along the northern New England coast are caused by efficient transport of pollutants from distant sources. The transport is efficient because the stable marine boundary layer allows the polluted air masses or plumes to travel long distances with little dilution or chemical modification. The sea-breeze or diurnal modulation of the wind, and thermally driven convergence along the coast, modify the transport trajectories.¹²⁷

¹²⁵ We discussed this view with the parties who generally agreed, Tr. at 892-98, although Pilgrim Watch’s representative noted that there are other “meteorological variables” that should be considered, Tr. at 895.

¹²⁶ Pilgrim Watch Statement of Position at 30 (citing Exh. PWA000006-00-BD01, Wayne M. Angevine et al., Modeling of the Coastal Boundary Layer and Pollutant Transport in New England, J. of Appl. Meteorol. & Clim. (Jan. 2006) [hereinafter Angevine]). Pilgrim Watch also cites a second document by its author’s last name, “Zager et al.,” but does not seem to have submitted any such document for the record as an exhibit. The Board will not acknowledge citations to technical articles that have not been submitted as exhibits.

¹²⁷ Id. (quoting Angevine at 153).

Pilgrim Watch goes on to assert that “[t]his effect can lead to hot spots of radioactivity in places along the coast, certainly to Boston”¹²⁸ and to “Cape Cod, directly across the Bay from Pilgrim and heavily populated in summer.”¹²⁹ Pilgrim Watch designates this effect as the “behavior of plumes over water (the so-called hot spot effect).”¹³⁰

This “Hot Spot” effect, which the Commission has directed us to consider,¹³¹ is referred to by Pilgrim Watch only through a discussion in a report prepared by Dr. Jan Beyea briefly mentioning the potential specter of “Hot Spots” without any explanation or technical support.¹³²

Dr. Beyea provides no scientific rationale or discussion of his concern, nor does Pilgrim Watch provide that itself or through any other evidence. Dr. Beyea is not a meteorologist,¹³³ and therefore his bare concern is not entitled to be given expert evidentiary status. Thus we have before us no evidence based on technical data explaining or supporting the hypothesis offered by Pilgrim Watch that this phenomenon could affect the SAMA cost-benefit balance determination.

On the other side of the evidentiary balance, uncontroverted expert testimony plainly establishes that the effects of any phenomenon causing concentration of the nature that concerns Pilgrim Watch will be minimized because the concentration of a release that is

¹²⁸ Id. (citing Exh. PWA000002-00-BD01, Jan Beyea, excerpt from Report To The Massachusetts Attorney General On The Potential Consequences Of A Spent-Fuel-Pool Fire At The Pilgrim Or Vermont Yankee Nuclear Plant (May 25, 2006) at 11 [hereinafter Excerpt from Beyea Report]).

¹²⁹ Id.

¹³⁰ Id. at 31.

¹³¹ See CLI-10-11,71 NRC at ____ (slip op. at 23-26).

¹³² Excerpt from Beyea Report at 11.

¹³³ See Pilgrim Watch’s Answer Opposing Entergy’s Motion for Summary Disposition of Pilgrim Watch Contention 3 (June 29, 2007) at 97; Id., Attachment, Report To The Massachusetts Attorney General On The Potential Consequences Of A Spent-Fuel-Pool Fire At The Pilgrim Or Vermont Yankee Nuclear Plant (May 25, 2006) at 2.

transported out to sea is then, if it returns to land, extremely diluted. More succinctly, Dr. Hanna testified

“hot spots,” as claimed by Pilgrim Watch, simply do not exist. Therefore, one cannot estimate their occurrence or spatial and time-dependent pattern.

Pilgrim Watch’s speculative claim of hot spots requires the confluence of impossible circumstances. First, the postulated release must remain “tightly concentrated” as it travels out to sea. As explained, even under very stable conditions plumes disperse significantly as they travel (e.g., concentrations decrease by at least a factor of 30 in the near field and a factor of ten or more at larger distances for each factor of ten increase in downwind distance). Next, the postulated release must travel out to sea and back, being carried by a variable wind field which does not cause the “tightly concentrated” release to disperse. Again, even under very stable conditions plumes disperse significantly as they travel.

Therefore, the facts show that by the time such a postulated release reached land after first traveling out to sea, the plume would be significantly dispersed and maximum plume centerline concentrations greatly reduced having generally traveled a much further distance than if the plume had traveled directly over land.

When we talk about concentrations, we are also implicitly talking about deposition and therefore the above statements about concentration also apply to deposition. Dry deposition is always proportional to concentration, with the dry deposition velocity providing the proportionality constant. Wet deposition is proportional to concentration, too, but with a need to know rain rate and wet removal rate.”¹³⁴

Dr. Hanna further testifies that the CALMET analysis discussed in his testimony shows

there is no consistent, frequently occurring pattern of wind blowing out to sea and then reversing direction and heading for the coast that might conceivably affect the time and space integrated results of the SAMA analysis. The comparison of the CALMET and Pilgrim roses shows slightly more CALMET trajectories towards the north-northwest, but this difference and other differences between the CALMET and Pilgrim roses are minor and have negligible impact on the SAMA analysis

In short, “hot spots,” as hypothesized by Pilgrim Watch, do not exist and therefore do not impact deposition or cost differentials, and ultimately have no impact on Pilgrim’s SAMA

analysis.¹³⁵ On the other hand, Staff’s expert, James V. Ramsdell, Jr., took a quite different

¹³⁴ O’Kula/Hanna Testimony at A89 (Hanna) (emphasis added).

¹³⁵ Id. (Hanna) (emphasis added).

view of the meaning of a “hot spot” – interpreting it in terms of localized deposition, although, in the end, he reached a conclusion regarding a localized concentration resulting from a plume that is transported out to sea and back onto land. He testified:

The term “hot spot” is not particularly well defined. In the MACCS2 lexicon, the term refers to an area in which the dose rate from surface contamination exceeds a user specified value. When I hear or see the term, I generally think of an area in which the surface contamination is greater than the contamination in surrounding areas. I don’t know of any criterion for how much greater the contamination has to be for an area to be considered a “hot spot[.]”¹³⁶

Mr. Ramsdell went on to testify:

In my opinion, the most likely meteorological conditions that might lead to a “hot spot” in the vicinity of Pilgrim would be related to precipitation starting after the release was underway. Similarly, most of the large release pathways for severe accidents are ground-level releases, so “hot spot” mechanisms associated with elevated releases would come into play.¹³⁷

Mr. Ramsdell also expressed the opinion that “the modeling of ‘hot spots’ is not essential to the evaluation of SAMAs and is unlikely to affect the identification of potentially cost[-]beneficial SAMAs.”¹³⁸ He concluded his testimony with the observation that

[i]n many respects, the rationale for concluding that the MACCS2 treatment of hot spots is reasonable is similar to the rationale for concluding that explicit treatment of sea breeze events is not essential for SAMA analyses. A “hot spot” is a relatively small area compared to the model domain and the magnitude of “hot spots” would be small. Consequently the [e]ffect of the hot spot on the two spatially and temporally integrated parameters (population dose and economic cost) used in the SAMA analysis is small when a hot spot exists. Further, considering the frequency of conditions that might lead to a hot spot, the [e]ffect of hot spots on the climatological mean parameter values is even smaller. Finally, in the case of Pilgrim, the population dose and economic cost parameter values would have to increase by more than a factor of 2 before the next least costly SAMA would be identified in the screening process as being potentially cost beneficial. Therefore I can conclude that even if MACCS2 included effects from hot spots related to onshore arrival of plumes it would not lead to identification of another cost[-]beneficial SAMA at Pilgrim.¹³⁹

¹³⁶ Ramsdell Testimony at A38.

¹³⁷ Id. at A41.

¹³⁸ Id. at A47.

¹³⁹ Id. at A48.

By an overwhelming preponderance of the evidence, we find that more accurate meteorological modeling of the so-called “hot spot” phenomenon cannot alter the SAMA cost-benefit analysis because (1) Pilgrim Watch has not provided any scientific or technical support for its generalized assertions about “hot spots,” (2) Dr. Beyea’s unsubstantiated assertion of the phenomenon’s importance was made without his being qualified as an expert in meteorology, and (3) experts testified that the phenomenon is unsubstantiated and would not affect the SAMA cost-benefit conclusions if it did exist.

Finally, based upon our review of the record and in consideration of the foregoing, we find that the modeling of the hot spot and sea breeze phenomena and the data used in the SAMA computations by Entergy is reasonable and adequate for the Staff’s use in developing a reasonable analysis of their effects in satisfaction of its obligations under NEPA.

VI. CONCLUSIONS

For the foregoing reasons and based upon a review of the entire hearing record of this proceeding and the proposed findings of facts and conclusions of law submitted by the parties, we resolve all matters in controversy regarding Contention 3, as limited and remanded by the Commission’s March 26, 2010 order, in favor of the Applicant and, to the extent relevant here regarding the Staff’s obligations under NEPA, the NRC Staff is justified in relying upon those Entergy data, modeling and SAMA analyses.

In particular, with respect to the challenge to meteorological modeling and data by Pilgrim Watch as it has been remanded to us, we find that the overwhelming preponderance of the evidence demonstrates:

(a) the Pilgrim SAMA analysis cost-benefit conclusions cannot credibly be altered by the use of more sophisticated modeling or use of additional or different sources of meteorological data respecting the sea breeze or the hot spot effect. We conclude that: (1) the Pilgrim SAMA analysis incorporated data adequately representing the “sea breeze” effect and the “hot spot” effect asserted by Pilgrim Watch to have been inadequately modeled; and (2) representation of

those meteorological patterns underlying the challenges to the SAMA cost-benefit conclusions was conservative and the resultant computations cannot be altered sufficiently to credibly challenge the cost-benefit analysis results (either independently or cumulatively) by: (i) the use of alternative more sophisticated atmospheric transport models, such as AERMOD and CALPUFF; (ii) further refinement in its consideration of the “sea breeze” effect; and (iii) refined treatment of “hot spots” as defined by Pilgrim Watch.

(b) Regarding the NRC Staff’s obligations under NEPA, we conclude that: (1) the meteorological modeling and the transport dispersion modeling performed by Entergy, and the data it employed in the Pilgrim SAMA analysis, were reasonable and adequate to determine the off-site risk for use in the SAMA cost-benefit analysis; (2) the Entergy Pilgrim SAMA analysis adequately accounts for uncertainties in the two meteorological patterns at issue to enable the development, for NEPA purposes, of reasonable estimates supporting the Pilgrim SAMA analysis conclusions on which SAMAs are cost beneficial to implement.

We therefore find that the Pilgrim SAMA analysis meteorological data and straight line Gaussian plume dispersion model are sufficient, and that further refinements to those inputs would not change the cost-benefit conclusions for the SAMA candidates evaluated. Therefore, no consideration need be given to “the economic cost and evacuation time portions of Contention 3.”¹⁴⁰ Accordingly, we conclude that the modeling and data used in the Pilgrim SAMA analysis by Entergy are reasonable and adequate for use by the NRC in satisfaction of its obligations under NEPA.¹⁴¹

¹⁴⁰ See CLI-10-11, 71 NRC at ___ (slip op. at 27).

¹⁴¹ The Board hereby adopts and incorporates by reference in this order all of the findings of fact proposed by Entergy and the NRC Staff not otherwise addressed herein. All other issues, motions, arguments, or proposed findings presented by the parties concerning Contention 3 and not addressed herein have been found without merit or otherwise unnecessary for the decision.

VII. ORDER

Based on the foregoing discussion, and the entirety of the record, it is, this 19th day of July, 2011, ORDERED that Pilgrim Watch's Contention 3, as remanded, is resolved in favor of the Applicant, and against the Intervenor. Pursuant to 10 C.F.R. § 2.1210(a), this Partial Initial Decision shall constitute the final decision of the Commission forty (40) days from the date of its issuance, unless, within fifteen (15) days of its service, a petition for review is filed in accordance with 10 C.F.R. § 2.341(b), or the Commission, in its discretion, takes review on its own motion.¹⁴² Unless otherwise authorized by law, a party who wishes to seek judicial review of this Initial Decision must first seek Commission review.¹⁴³

It is so ORDERED.

FOR THE ATOMIC SAFETY
AND LICENSING BOARD¹⁴⁴

/RA/

Dr. Paul B. Abramson
ADMINISTRATIVE JUDGE

/RA/

Dr. Richard F. Cole
ADMINISTRATIVE JUDGE

Rockville, Maryland
July 19, 2011

¹⁴² 10 C.F.R. § 2.1210(a)(3).

¹⁴³ 10 C.F.R. § 2.1212.

¹⁴⁴ Judge Young does not fully subscribe to the above opinion. Her views are set forth on the following pages.

Separate Statement of Administrative Judge Ann Marshall Young

I agree with the majority decision to the extent that I find that the preponderance of the evidence presented on that part of Contention 3 currently at issue is to the effect that accounting for Pilgrim Watch's meteorological concerns would not on its own affect the severe accident mitigation alternatives (SAMA) analysis for the Pilgrim plant sufficiently to alter the conclusions on which SAMAs would be cost-beneficial to implement. Pilgrim Watch conceded this in its Pre-Filed Testimony, considered herein as its Initial Statement of Position, in which it stated that "[i]t is not possible for either Pilgrim Watch, or anyone else, to show that meteorology, *in and of itself*, would result in a significantly different SAMA analysis."¹ Although Pilgrim Watch's expert, Dr. Bruce Egan, raised significant questions regarding meteorological modeling for purposes of emergency planning² – a not insignificant issue – this is not part of what is at issue in Contention 3 at this time.³

With respect to what *is* at issue in Contention 3 at this time, as the majority notes, the Commission directed in CLI-10-11 that "[t]he question is not whether there are 'plainly better' atmospheric dispersion models or whether the SAMA analysis can be refined further";⁴ this is not required by NEPA,⁵ and to the contrary:

Unless it looks genuinely plausible that inclusion of an additional factor or use of other assumptions or models may change the cost-benefit conclusions for the SAMA candidates evaluated, no purpose would be served to further refine the SAMA analysis,

¹ Pilgrim Watch SAMA Remand Pre-Filed Testimony (Jan. 3, 2011) at 2 (emphasis in original); *see also id.* at 3, 4.

² *See, e.g.*, Pilgrim Watch Exhibit 23, Statement by Bruce A. Egan, Sc.D, CCM (Jan. 30, 2011) [hereinafter PW Ex. 23].

³ For one example of an explanation of the different analyses involved in emergency response planning and a SAMA analysis, *see* the testimony quoted in the Majority Decision at 20 n.99.

⁴ CLI-10-11, 71 NRC __, __ (slip op. at 37) (Mar. 26, 2010).

⁵ *Id.*

whose goal is only to determine what safety enhancements are cost-effective to implement.⁶

Thus, as my colleagues point out and we have earlier stated, the (two-part) issue that is actually before us is the following:

Whether the meteorological modeling in the Pilgrim SAMA analysis is adequate and reasonable to satisfy NEPA, and whether accounting for the meteorological patterns and issues of concern to Pilgrim Watch could, on its own, credibly alter the Pilgrim SAMA analysis conclusions on which SAMAs are cost-beneficial to implement.⁷

Dr. Egan does not dispute the statements of Entergy's experts to the effect that accounting for Pilgrim Watch's concerns regarding the meteorological analysis would not change the ultimate conclusions on which SAMAs, or safety enhancements, would be cost-beneficial.⁸ Although one can appreciate Pilgrim Watch's arguments that Entergy should use the most up-to-date and accurate meteorological modeling available and more than one year's weather data,⁹ this does not appear to be required for purposes of the SAMA analysis. Nor does it or other Pilgrim Watch evidence overcome the preponderance of the evidence presented by the NRC Staff and Entergy on the meteorological issue now before us.

I would, however, for reasons I have previously stated,¹⁰ have allowed the issue, whether substituting the 95th percentile for the mean in the consequence values analysis would

⁶ *Id.* at __ (slip op. at 39); see also NRC Staff's Proposed Findings of Fact and Conclusions of Law, and Order in the Form of an Initial Decision (Mar. 4, 2011) at 11.

⁷ See, e.g., Majority Decision at 5-6, 12; Notice and Order (Regarding Hearing and Oral Argument) (Feb. 9, 2011).

⁸ See PW Ex. 23 at 3, 8.

⁹ See, e.g., Pilgrim Watch's Reply to Entergy's and NRC Staff's Initial Statement of Position on Pilgrim Watch Contention (Feb. 1, 2011), and material cited therein.

¹⁰ See Order (Questions from Board Majority Regarding the Mechanics of Computing "Mean Consequences" in SAMA Analyses), Separate Statement of Administrative Judge Ann Marshall Young (Oct. 26, 2010) (unpublished); Memorandum and Order (Ruling on Timeliness of Mean Consequence Values Issue), Separate Statement of Administrative Judge Ann Marshall Young (Mar. 3, 2011) (unpublished).

make a significant difference in and should be used in the SAMA analysis, to have been litigated in conjunction with Contention 3¹¹ (which might indeed have led to a different result on the contention¹²).

Additionally, there have been matters raised, relating to how new information arising out of the Fukushima accident in Japan (which occurred only days after the March oral argument in this proceeding) should affect the environmental analysis (including the SAMA analysis) on the application under NEPA, as well as matters relating to the sought license renewal in certain other particulars. And it has been argued in various post-Fukushima filings that any final licensing decision on the renewal application should be postponed until significant further analysis is done concerning the ability of the Pilgrim plant to perform safely in the renewal period, taking into account information arising out of the Fukushima situation and the fact that

¹¹ As my colleagues note, see Majority Decision at 9 n.46, and as stated in CLI-10-11, “[a]s a policy matter, license renewal applicants are not required to base their SAMA analysis upon consequence values at the 95th percentile consequence level (the level used for the GEIS severe accident environmental impacts analysis).” CLI-10-11, 71 NRC at ___ (slip op. at 39). There is, however, no binding rule or other authority excluding use of the 95th percentile consequence level or rendering the use of mean consequence values beyond question, and indeed the Commission in CLI-10-22, 72 NRC ___ (Aug. 22, 2010), specifically referenced the NRC “*practice* for SAMA analysis to utilize mean consequence values, which results in an averaging of potential consequences,” and stated that, because Pilgrim Watch apparently questioned this *practice*, “it would be appropriate for the Board on remand to consider whether the NRC’s *practice* is reasonable for a SAMA analysis, and whether Pilgrim Watch’s concerns are timely raised.” *Id.* at ___ (slip op. at 8 n.34) (emphasis added). Because I found Pilgrim Watch timely addressed the matter, see *supra* note 10, I would have permitted litigation of the reasonableness of the NRC’s policy/practice regarding mean consequence values as opposed to 95th percentile values. In this regard, although I note that Pilgrim Watch makes certain arguments that touch on this reasonableness issue, see, e.g., Pilgrim Watch Findings of Fact Conclusions of Law SAMA Remand (Mar. 4, 2011); Pilgrim Watch Exhibit PWA00012, Dr. Edwin S. Lyman, “A Critique of the Radiological Consequence Assessment Conducted in Support of the Indian Point Severe Accident Mitigation Alternatives Analysis” (Nov. 2007), the issue has clearly not been fully litigated, and, in the absence of full litigation of this issue with specific regard to the Pilgrim plant, I do not draw any ultimate conclusions on it at this time, or on any other substantive issues outside the specific, relatively narrow issue now before us.

¹² See, e.g., Tr. at 974-77; cf. Entergy’s Proposed Findings of Fact and Conclusions of Law on Meteorological Matters Raised in Pilgrim Watch Contention 3 (Mar. 4, 2011) at 40 ¶¶ 22.

the Pilgrim plant is of the same type as the Fukushima reactors. Preliminarily, I would tend to find that some of these arguments do warrant greater scrutiny of the plant and application in light of Fukushima-related information prior to any decision whether to renew the license for another 20 years. However, because the Board Majority's Initial Decision does not terminate this proceeding or constitute a final licensing decision, I will address the preceding matters in greater detail, as appropriate, in the context of later Board rulings on several pending new contentions and other filings submitted by Pilgrim Watch and the Commonwealth of Massachusetts.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)
)
ENTERGY NUCLEAR GENERATION CO.)
AND)
ENTERGY NUCLEAR OPERATIONS, INC.) Docket No. 50-293-LR
)
(Pilgrim Nuclear Power Station))

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing PARTIAL INITIAL DECISION (Rejecting Upon Remand, Pilgrim Watch's Challenge to Meteorological Modeling in SAMA Analysis in Entergy's License Renewal Application) (LBP-11-18) have been served upon the following persons by Electronic Information Exchange (EIE) and by electronic mail as indicated by an asterisk*.

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3

PARTIAL INITIAL DECISION (Rejecting Upon Remand, Pilgrim Watch's Challenge to Meteorological Modeling in SAMA Analysis in Entergy's License Renewal Application) (LBP-11-18)

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[Original signed by Nancy Greathead]

Office of the Secretary of the Commission

Dated at Rockville, Maryland
this 19th day of July 2011