

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

COMMISSIONERS:

Gregory B. Jaczko, Chairman  
Dale E. Klein  
Kristine L. Svinicki

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

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CLI-10-11

**MEMORANDUM AND ORDER**

**I. INTRODUCTION**

This proceeding stems from the application of Entergy Nuclear Generation Company and Entergy Nuclear Operations, Inc. (together, Entergy) to renew the operating license for the Pilgrim Nuclear Power Station for an additional 20 years beyond the current operating license expiration date of June 8, 2012. In a request for hearing and petition to intervene, Pilgrim Watch, a non-profit citizens' organization, submitted five contentions challenging the renewal application.<sup>1</sup> The Atomic Safety and Licensing Board granted Pilgrim Watch's intervention petition, admitting two contentions, Contention 1 (challenging Entergy's aging management program for buried pipes) and Contention 3 (challenging Entergy's analysis of Severe Accident Mitigation Alternatives (SAMA)). A majority of the Board dismissed Contention 3 prior to

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<sup>1</sup> *Request for Hearing and Petition to Intervene By Pilgrim Watch* (May 25, 2006)(Petition).

hearing, granting an Entergy motion for summary disposition.<sup>2</sup> Following an evidentiary hearing on Contention 1, the Board issued Initial Decision LBP-08-22, resolving all outstanding issues pertaining to Contention 1 in favor of Entergy.<sup>3</sup>

Pursuant to 10 C.F.R. § 2.341(b), Intervenor Pilgrim Watch has filed a petition for review of the Board's Initial Decision in LBP-08-22, and numerous earlier Board decisions in this proceeding, including LBP-07-13 (which dismissed Contention 3, the SAMA contention); LBP-06-23 (which ruled on standing and contention admissibility);<sup>4</sup> as well as "the many interlocutory decisions in this proceeding."<sup>5</sup> Both Entergy and the NRC Staff oppose the petition.<sup>6</sup>

On the issue of the dismissed SAMA contention (Contention 3), we requested the parties to provide additional briefing.<sup>7</sup> For the reasons outlined below, we grant review of the Board

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<sup>2</sup> Memorandum and Order (Ruling on Motion to Dismiss Petitioners' Contention 3 Regarding Severe Accident Mitigation Alternatives), LBP-07-13, 66 NRC 131 (2007).

<sup>3</sup> 68 NRC 590 (2008). Judge Ann Marshall Young issued a Concurring Opinion on October 31, 2008.

<sup>4</sup> 64 NRC 257 (2006).

<sup>5</sup> See *Pilgrim Watch's Petition for Review of LBP-06-848* [sic], *LBP-07-13, LBP-06-23 and the Many Interlocutory Decisions in the Pilgrim Nuclear Power Station Proceeding* (Nov. 12, 2008)(Petition for Review) at 1. Additional Board decisions challenged in Pilgrim Watch's petition include LBP-07-12, 66 NRC 113 (2007), Memorandum and Order (Ruling on Entergy's Motion for Summary Disposition of Pilgrim Watch Contention 1, Regarding Adequacy of Aging Management Program for Buried Pipes and Tanks and Potential Need for Monitoring Wells to Supplement Program); Order (Revising Schedule for Evidentiary Hearing and Responding to Pilgrim Watch's December 14 and 15 Motions)(Dec. 19, 2007)(unpublished); Order (Denying Pilgrim Watch's Motion for Reconsideration (Jan. 11, 2008)(unpublished); and Memorandum and Order (Ruling on Pilgrim Watch Motions Regarding Testimony and Proposed Additional Evidence Relating to Pilgrim Watch Contention 1)(June 4, 2008)(unpublished).

<sup>6</sup> See *NRC Staff's Answer in Opposition to Pilgrim Watch's Petition for Review of LBP-08-22, LBP-07-13, LBP-06-23 and Interlocutory Decisions* (Nov. 24, 2008)(Staff Answer to Petition for Review); *Entergy's Answer Opposing Pilgrim Watch's Petition for Review* (Nov. 24, 2008)(Entergy Answer to Petition for Review).

<sup>7</sup> CLI-09-11, 69 NRC \_\_\_\_ (June 4, 2009)(slip op.).

decision dismissing Contention 3 (LBP-07-13), and reverse in part the decision, remanding Contention 3, as limited by today's ruling, to the Board for hearing.<sup>8</sup>

## II. PROCEDURAL BACKGROUND

Contention 3 addresses the Entergy Environmental Report's SAMA analysis for the Pilgrim facility. Mitigation alternatives or "SAMAs" refer to safety enhancements such as a new hardware item or procedure intended to reduce the risk of severe accidents. "The purpose of the SAMA review is to ensure that any plant changes that have a potential for significantly improving severe accident safety performance are identified and assessed."<sup>9</sup> NRC SAMA analysis evaluates a number of potential accident progression sequences (scenarios) and the possible safety enhancements that may reduce the risk of those accident scenarios. The analysis assesses whether and to what extent the probability-weighted consequences of the analyzed severe accident sequences would decrease if a specific SAMA were implemented at a particular facility. SAMA analysis is used for determining whether particular SAMAs would sufficiently reduce risk – e.g., by reducing frequency of core damage or frequency of containment failure – for the SAMA to be cost-effective to implement. The SAMA analysis therefore is a probabilistic risk assessment analysis. If the cost of implementing a particular SAMA is greater than its estimated benefit, the SAMA is not considered cost-beneficial to implement. Certain license renewal applicants, including Entergy, are required to consider SAMAs in the environmental report prepared in connection with the application.<sup>10</sup>

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<sup>8</sup> Today's decision addresses only issues surrounding Contention 3; the balance of the Pilgrim Watch petition for review will be decided in a separate decision. A petition for review may be granted in the Commission's discretion as outlined in 10 C.F.R. § 2.341(b)(4). Based on the reasons discussed in this decision, Pilgrim Watch's petition for review raised sufficient questions of law to warrant review of LBP-07-13.

<sup>9</sup> *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).

<sup>10</sup> See 10 C.F.R. § 51.53(c)(3)(ii)(L).

NRC guidance documents conclude that the MACCS2 code (a version of the MELCOR Accident Consequence Code System code) is acceptable for performing SAMA analyses,<sup>11</sup> and NRC licensees commonly use the MACCS2 code for performing SAMA analyses. Entergy's SAMA analysis utilized the MACCS2 code to evaluate the off-site consequences (population dose and economic costs) of a radioactive material release to the environment from severe accidents.

In Contention 3, Pilgrim Watch challenged the Entergy SAMA analysis, claiming that it “ignore[d] the true off-site radiological and economic consequences of a severe accident at Pilgrim.”<sup>12</sup> As originally proffered, much of Contention 3 was a broad-brush challenge to the use of probabilistic risk assessment modeling, in which to determine the overall accident risk the estimated potential consequences of a severe accident are multiplied by the possibility of the accident occurring.<sup>13</sup> Contention 3 stressed that “[b]y multiplying high consequence values with low probability numbers, the consequence figures appear far less startling,” and therefore “the likely impacts of a severe accident have been drastically minimized.”<sup>14</sup> The contention indeed claimed that the “overarching defect” of the analysis is that it considered severe accident “risks” by considering the probability of particular severe accidents.<sup>15</sup>

In addition to generally challenging probabilistic risk assessment, Contention 3 further claimed that Entergy “used incorrect input data” in analyzing severe accident consequences.

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<sup>11</sup> See, e.g., NEI-05-01[Rev A], Severe Accident Mitigation Analysis (SAMA) Analysis, Guidance Document (Nov. 2005)(NEI-05-01[Rev A])(endorsed by Final License Renewal Interim Staff Guidance LR-ISG-2006-03: Staff Guidance for Preparing Severe Accident Mitigation Alternatives Analyses, 72 Fed. Reg. 45,466 (Aug. 14, 2007).

<sup>12</sup> Petition at 26.

<sup>13</sup> See *id.* at 28-31.

<sup>14</sup> *Id.* at 29-30.

<sup>15</sup> *Id.* at 29 (emphasis in original).

The contention argued that incorrect, incomplete, or outdated “inputs to the [MACCS2] code” were used, including inputs related to “meteorologic data, demographics, emergency response, and regional economic data,” and that these incorrect inputs “minimized the likely risks of a severe accident.”<sup>16</sup>

Among these arguments on “input data,” Pilgrim Watch claimed that the MACCS2 code has “limitations inherent in the software” which can result “in an incorrect evaluation of actual plume dispersion and which by design omit the majority of the economic costs.”<sup>17</sup> In challenging the SAMA analysis’s “meteorological data,” for example, Pilgrim Watch criticized the MACCS2 code’s use of the straight-line Gaussian plume model to estimate the atmospheric dispersion of a release of radionuclides. Pilgrim Watch stated that the straight-line Gaussian plume model does not take into effect “terrain effects, which can have highly complex impact on wind field patterns and plume dispersion,” and that the “topography of a coastal environment,” such as that along the coast of Massachusetts, “plays an important role in the sea breeze circulation,” where the “uneven heating of land and water is responsible for . . . coastal winds known as sea and land breezes.”<sup>18</sup>

The Board admitted Contention 3 in part. While the Board did not find admissible all of the challenges, it concluded that “input data” challenges related to three specific subjects – “evacuation times, economic impacts, and meteorologic plume behavior” – had been “sufficiently raised and supported.”<sup>19</sup> The Board found that Contention 3 raised a “reasonable”

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<sup>16</sup> *Id.* at 34.

<sup>17</sup> *Id.*

<sup>18</sup> *See id.* at 34-36.

<sup>19</sup> LBP-06-23, 64 NRC 257, 339 (2006).

claim that “use of more accurate input data in these three areas could materially impact the computed outcome” of the SAMA analysis.<sup>20</sup>

To the degree, however, that the contention could be characterized as claiming that “risk is to be ignored” in SAMA analysis, the Board ruled the contention inadmissible, stating as follows:

[T]o the extent that any part of the contention or basis may be construed as challenging on a generic basis the use of probabilistic techniques that evaluate risk, we find any such portion(s) to be inadmissible. The use of probabilistic risk assessment and modeling is obviously accepted and standard practice in SAMA analyses.

As admitted by the Board, Contention 3 read as follows:

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 costs versus benefits of possible mitigation alternatives, such that further analysis is called for.<sup>21</sup>

Entergy subsequently moved for summary disposition of Contention 3. In support, Entergy claimed that it had “performed a series of sensitivity studies to evaluate the effects of changes in the input parameters challenged by Pilgrim Watch on the results of the SAMA analysis.”<sup>22</sup> From the sensitivity studies, Entergy concluded that the claims made in Contention 3 would prove immaterial to the SAMA analysis conclusions. Specifically, Entergy claimed that the sensitivity studies showed that “the maximum increase in benefit,” in terms of reduced population dose risk and off-site economic cost risk, from implementing additional SAMAs would be less than 4%, while “for any additional SAMAs to become potentially cost effective, the benefits would

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<sup>20</sup> *Id.* at 339.

<sup>21</sup> *Id.* at 341.

<sup>22</sup> *Entergy’s Motion for Summary Disposition of Pilgrim Watch Contention 3* (May 17, 2007)(Summary Disposition Motion) at 10.

have to increase by more than 100%, far greater than the maximum increase in benefit calculated by any of the sensitivity analyses.”<sup>23</sup> The Staff supported Entergy’s motion, agreeing that “the information Pilgrim Watch sought to have considered . . . has now been considered” and the “additional factors considered do not change the conclusions of the SAMA analysis,” and therefore no genuine material dispute remained.<sup>24</sup>

After considering Entergy’s additional analyses, a majority of the Board agreed that no material fact remained in dispute regarding evacuation, economic impacts, or meteorological patterns, and therefore dismissed Contention 3.<sup>25</sup> The majority reasoned that the additional SAMA<sup>26</sup> that came closest to being cost-effective would produce an estimated benefit of \$2.5 million, but would cost approximately \$5 million to implement. Therefore, the majority concluded that Pilgrim Watch would need to indicate “errors aggregating nearly 100% in the estimated benefit of implementation” for such asserted errors to be material to the SAMA cost-benefit conclusions.<sup>27</sup> The majority stated that Entergy’s “bounding analyses” demonstrated that the maximum change Pilgrim Watch’s claimed oversights or errors could produce on the SAMA analysis “is on the order of [only] 2%,” and that Pilgrim Watch had not offered any evidence contradicting this conclusion.<sup>28</sup>

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<sup>23</sup> *Id.*

<sup>24</sup> See *NRC Staff Response to Entergy’s Motion for Summary Disposition of Pilgrim Watch Contention 3* (June 29, 2007)(Staff Response to Summary Disposition Motion) at 6.

<sup>25</sup> LBP-07-13, 66 NRC at 144-54.

<sup>26</sup> From its SAMA analysis, Entergy identified seven potentially cost-effective SAMAs. See NUREG-1437, Supplement 29, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Regarding Pilgrim Nuclear Power Station, Final Report-Main Report (July 2007)(Pilgrim EIS) at 5-5 to 5-10. Because none of the seven potentially cost-effective SAMAs bear on adequately managing the effects of aging, none need be implemented as part of the license renewal safety review, pursuant to 10 C.F.R. Part 54.

<sup>27</sup> LBP-07-13, 66 NRC at 147.

<sup>28</sup> *Id.*

In reaching its decision, the Board majority rejected Pilgrim Watch's "criticisms of the Gaussian plume model" used in the MACCS2 code for a SAMA analysis, stating that "a challenge to the use of probabilistic methodologies and/or the modeling used was rejected by this Board [when it admitted the contention]," and that at issue were only "challenges to the *input* to the code in these three specific arenas [evacuation, economic impacts, and meteorological patterns], not the modeling itself."<sup>29</sup>

The majority nonetheless went on to conclude that, in any event, Entergy's analyses were applied conservatively to the SAMA analysis to "maximize the effects of the radiation carried by the meteorological pattern in each of the hundreds of particular scenarios computed," and that the analyses "encompass any particular scenario which might incorporate the time-dependent effects of 'sea-breeze' or localized time-dependent wind patterns."<sup>30</sup> The majority therefore stated that the results of Entergy's modeling "subsume[d] all reasonably possible meteorologic patterns," and that Pilgrim Watch's experts had not challenged Entergy's assertions that the new SAMA analyses' computations were "conservative" and "predict worse consequences, and therefore, higher costs of any particular event."<sup>31</sup>

Judge Young issued a dissenting opinion, and would have denied the summary disposition motion, "at least on the meteorological matters at issue, and whatever impact these might have on the evacuation and [economic] cost matters."<sup>32</sup> The dissent concluded that the majority inappropriately had engaged "in the sort of weighing of evidence that is not appropriate

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<sup>29</sup> *Id.* at 151 & n.21 (emphasis in original); see also *id.* at 146, 149-50.

<sup>30</sup> *Id.* at 151-52.

<sup>31</sup> *Id.* at 151.

<sup>32</sup> *Id.* at 167 (dissenting opinion).

at the summary disposition” stage, and that it was “clear that Intervenor *dispute* Entergy’s conclusions” and did so with adequate support.<sup>33</sup>

Notably, the dissent disagreed with the majority’s conclusion that meteorological arguments involving the straight-line Gaussian plume model did not fall within the scope of Contention 3 as admitted. The dissent emphasized that in admitting Contention 3 the Board merely had excluded any aspects of the contention that challenged “*on a generic basis* the use of probabilistic techniques that evaluate risk,” but “did *not* exclude *specific* [modeling methodology] challenges that might bring into question specific aspects of the SAMA analysis regarding the three types of input we admitted.”<sup>34</sup> The dissent stressed that Contention 3’s claims regarding meteorological issues “centrally involved challenges to the ‘straight-line Gaussian plume model,’ and [that the Board] did not exclude this” from the contention.<sup>35</sup>

While acknowledging that the straight-line Gaussian plume model is not an “input *per se* in the technical sense,” the dissent stated that the Gaussian plume model “is implicitly part of what is ‘put in’ to the MACCS2 code to produce results about meteorological patterns,” that Pilgrim Watch challenges “several aspects of what is ‘put in’ to the SAMA analysis on meteorological issues,” and that by excluding challenges to the plume model used in the MACCS2 code, the majority had rendered Contention 3 “meaningless with regard to meteorological issues.”<sup>36</sup>

In its petition for review, Pilgrim Watch contests the majority’s decision in LBP-07-13 to dismiss Contention 3. Pilgrim Watch claims that it disputed all of the material facts Entergy presented in its motion for summary disposition, and set forth facts supported by

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<sup>33</sup> *Id.* at 156, 160, 163 (dissenting opinion)(emphasis in original).

<sup>34</sup> *Id.* at 161 (emphasis in original).

<sup>35</sup> *Id.*

<sup>36</sup> *Id.* at 161-62.

experts disputing Entergy's conclusions.<sup>37</sup> Citing repeatedly to the dissenting opinion, Pilgrim Watch claims that the majority inappropriately weighed the evidence presented, failed to view the record in the light most favorable to Pilgrim Watch, and improperly excluded "areas of inquiry" that the Board in LBP-06-23 had admitted, such as the specific challenges regarding the straight-line Gaussian plume model.<sup>38</sup>

Pilgrim Watch's arguments on meteorological patterns largely focus on its claim that because Entergy's sensitivity analyses used a standard straight-line Gaussian plume model to estimate the atmospheric dispersion of a release of radionuclides, the additional Entergy sensitivity analyses repeated "the same mistakes"<sup>39</sup> of Entergy's earlier analysis, and therefore the additional sensitivity studies did not "add useful information" because the "primary model is flawed."<sup>40</sup> Pilgrim Watch argues that it "demonstrated that Entergy's use of the straight-line steady state Gaussian plume model leads to a non-conservative geographical distribution of dose within the 50-mile radius of Pilgrim," and that "this could materially affect the costs of mitigation alternatives."<sup>41</sup> Pilgrim Watch states that it showed that "a variable trajectory plume model – not a straight-line Gaussian plume model – is appropriate for Pilgrim's coastal location and would bring more SAMAs into play."<sup>42</sup> On the issue of economic costs, Pilgrim Watch argues that it showed how the MACCS2 code is "not the proper diagnostic tool to assess economic consequences," and that the majority "ignored Petitioner's demonstration showing how

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<sup>37</sup> See Petition for Review at 13.

<sup>38</sup> *Id.* at 11-12, 14-15.

<sup>39</sup> *Id.* at 14.

<sup>40</sup> *Id.* at 16 (quoting Pilgrim Watch expert's affidavit); see also *id.* at 14-17.

<sup>41</sup> *Id.* at 15.

<sup>42</sup> *Id.*

Energy both underestimated the costs they considered and totally ignored other costs that belong in a proper SAMA analysis.”<sup>43</sup> For evacuation times inputs, Pilgrim Watch claims that the majority “accepted the Applicant’s unrealistically low” estimates for how long an evacuation would take, and that “projected health related costs in the evacuee population would be greater if an appropriate variable trajectory plume model” were used.<sup>44</sup>

In CLI-09-11,<sup>45</sup> we requested additional briefing on Contention 3, directing the parties to address the following two questions, with appropriate specific references to the existing adjudicatory record:

- (1) In granting summary disposition, was it appropriate for the Board majority to exclude challenges to the use of particular methodologies, such as the use of the straight-line Gaussian plume model to predict the atmospheric dispersion of radionuclides, or the use of the MACCS2 code for determining economic costs?
- (2) Did Pilgrim Watch present a supported, genuine dispute that could materially affect the ultimate conclusions of the SAMA cost-benefit analysis? For example, discuss evidence or testimony presented on (1) whether use of a variable trajectory model could materially affect whether any additional SAMA may be cost-beneficial; (2) the conservatism of the Gaussian plume model and the MACCS2 code (including the economic model) as applied in the cost-benefit analysis; and (3) whether the cost-benefit analysis “subsumes all reasonably possible meteorologic patterns.”

#### Summary Disposition Standards

Applicable NRC standards governing summary disposition are set forth in 10 C.F.R.

§ 2.710. The standards are based upon those the federal courts apply to motions for summary

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<sup>43</sup> *Id.* at 18.

<sup>44</sup> *Id.* at 17.

<sup>45</sup> CLI-09-11, 69 NRC \_\_\_\_ (June 4, 2009)(slip op.).

judgment under Rule 56 of the Federal Rules of Civil Procedure.<sup>46</sup> Summary disposition is appropriate where relevant documents and affidavits “show that there is no genuine issue as to any material fact and that the moving party is entitled to a decision as a matter of law.”<sup>47</sup> When a motion for summary disposition is made and supported as described in our regulations, “a party opposing the motion may not rest upon [] mere allegations or denials,” but must state “specific facts showing that there is a genuine issue of fact” for hearing.<sup>48</sup> It is not sufficient, however, for there merely to be the existence of “*some* alleged factual dispute between the parties, for “the requirement is that there be no *genuine* issue of *material* fact.”<sup>49</sup> “Only disputes over facts that might affect the outcome” of a proceeding would preclude summary disposition.<sup>50</sup> “Factual disputes that are . . . unnecessary will not be counted.”<sup>51</sup>

The correct inquiry is whether there are material factual issues that “properly can be resolved only by a finder of fact because they may reasonably be resolved in favor of either party.”<sup>52</sup> At issue is not whether evidence “unmistakably favors one side or the other,” but whether “there is sufficient evidence favoring the non-moving party” for a reasonable trier of fact

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<sup>46</sup> See *Advanced Medical Systems, Inc.* (One Factory Row, Geneva, Ohio 44041), CLI-93-22, 38 NRC 98, 102 (1993).

<sup>47</sup> 10 C.F.R. § 2.710(d)(2).

<sup>48</sup> 10 C.F.R. § 2.710(b).

<sup>49</sup> *Anderson v. Liberty Lobby*, 477 U.S. 242, 247-48 (1986)(emphasis in original).

<sup>50</sup> *Id.* at 248.

<sup>51</sup> *Id.*

<sup>52</sup> *Id.* at 250.

to find in favor of that party.<sup>53</sup> If the evidence in favor of the non-moving party is “merely colorable” or “not significantly probative,” summary disposition may be granted.<sup>54</sup>

In ruling on a motion for summary disposition a licensing board (or presiding officer) should not, however, conduct a “trial on affidavits.”<sup>55</sup> At this stage, “the judge’s function is not himself to weigh the evidence and determine the truth of the matter but to determine whether there is a genuine issue for [hearing].”<sup>56</sup> “The evidence of the non-movant is to be believed, and all justifiable inferences are to be drawn in his favor.”<sup>57</sup> If “reasonable minds could differ as to the import of the evidence,” summary disposition is not appropriate.<sup>58</sup> Caution should be exercised in granting summary disposition, which may be denied if “there is reason to believe that the better course would be to proceed to a full [hearing].”<sup>59</sup>

Below we address in turn arguments on (1) the scope of Contention 3 as admitted, and (2) the conservatism of the straight-line Gaussian plume model and Entergy SAMA analyses. We additionally highlight other key SAMA-related arguments made in the record that the majority did not specifically address, but that may be relevant to resolution of Contention 3.

### III. ANALYSIS

#### A. Scope of Contention 3

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<sup>53</sup> *Id.* at 249-52.

<sup>54</sup> *Id.* at 249-50.

<sup>55</sup> *See id.* at 242, 255.

<sup>56</sup> *Id.* at 249.

<sup>57</sup> *Id.* at 255.

<sup>58</sup> *Id.* at 250-51.

<sup>59</sup> *Id.* at 255.

The parties – and even the Board judges among themselves – do not agree on the scope of Contention 3 as admitted. Like the Board majority, Entergy and the NRC Staff claim that Contention 3 included only challenges to specific input data applied in the SAMA analysis and not challenges to any model embedded in the MACCS2 code, such as the straight-line Gaussian plume atmospheric dispersion model and the code’s economic model.<sup>60</sup> Entergy and the Staff therefore conclude that the Board majority properly rejected Pilgrim Watch’s arguments concerning the adequacy of the Gaussian plume model because the model is not an “input” to the MACCS2 code. Pilgrim Watch argues that the majority misinterpreted the decision admitting Contention 3 (LBP-06-23) and therefore improperly “excluded areas of inquiry” that had been admitted as part of the contention, including the adequacy of the straight-line Gaussian plume model.

We agree with Pilgrim Watch and the dissent that the majority improperly excluded the issue of the adequacy of the straight-line Gaussian plume model. While the Board decision admitting the contention declared the contention’s scope limited to particular types of “input data” that is entered into the MACCS2 code, the Board did not make a distinction between specific *input* data entered into the MACCS2 code and specific *models* embedded in the code (such as the atmospheric dispersion model), resulting in confusion over the contention’s scope. Pilgrim Watch’s arguments on the adequacy of the straight-line Gaussian plume model and the sea breeze phenomenon appeared under the headings of “incorrect input data” and “Meteorological Data”<sup>61</sup> and, as the dissent notes, “centrally involved” arguments asserting the “limitations” of the straight-line Gaussian plume model.<sup>62</sup> Moreover, different models require different amounts and

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<sup>60</sup> See *NRC Staff’s Initial Brief in Response to CLI-09-11* (Memorandum and Order (Request for Additional Briefing))(June 25, 2009)(NRC Initial Brief) at 9-10; *Entergy’s Brief in Response to CLI-09-11* (June 25, 2009)(Entergy Initial Brief) at 14-17.

<sup>61</sup> See Petition at 34-38.

<sup>62</sup> See, e.g., *id.* at 34-35; LBP-07-13, 66 NRC at 161 (dissenting opinion).

kinds of data, with more detailed variable trajectory models requiring significantly more data than that used in the straight-line Gaussian dispersion model. Therefore, there easily may be an overlap between arguments challenging the sufficiency of “input data” used and challenging the model used, if the model does not require, allow for, or otherwise take into account particular types of data.

In admitting the contention, the Board indicated that Contention 3 included issues relating to plume behavior, including whether Entergy had “adequately taken into account relevant and realistic data with respect to . . . meteorological patterns that would carry the plume,” and the “use of more accurate data relating to . . . meteorologic plume behavior.”<sup>63</sup> Unless expressly narrowed otherwise, these issues logically may encompass arguments that a model is deficient because it does not take into account and reflect sufficient types of meteorological information or “data.”

While in admitting Contention 3, the Board explicitly rejected challenges “on a *generic* basis” to the use of probabilistic techniques, it is not clear from the decision what the Board meant by the term “generic.”<sup>64</sup> Pilgrim Watch’s meteorological arguments involving plume dispersion were specific to the Pilgrim location, and were separate from its more generalized argument against any consideration of probability-weighted risk assessment.<sup>65</sup> In short, given

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<sup>63</sup> LBP-06-23, 64 NRC at 339-40.

<sup>64</sup> *Id.* at 340 (emphasis added).

<sup>65</sup> In rejecting challenges on a generic basis to probabilistic risk assessments, LBP-06-23 appeared to be addressing Pilgrim Watch’s numerous broad arguments against considering the probability-weighted “risk” of accidents by multiplying the consequences of an accident by its probability. See 64 NRC at 340. Before the Board, Pilgrim Watch had stated that its opposition to risk analysis was not “central” to its contention. See *Pilgrim Watch Reply to Entergy Answer to Request for Hearing and Petition to Intervene By Pilgrim Watch* (July 3, 2006) at 14. But while Pilgrim Watch stressed that the “bulk” of its contention highlighted incorrect, incomplete, or inadequate input data, we do not read its arguments before the Board as abandoning the specific plume modeling-related claims that are interwoven with “input data” claims. See *id.* at 16, 20-22, 24; Transcript (July 7, 2006) at 371-72, 418-419 (“Meteorological data is very, very important. That’s why we spent a lot of time indicating why the straight-line Gaussian plume (Continued....)”).

that concerns relating to the input used and the model used may overlap, the Board did not adequately specify that Pilgrim Watch's claims involving the atmospheric dispersion model were beyond the scope of the contention.

Moreover, Entergy's motion for summary disposition did not confine its discussion to data inputs, but also focused on affirming the adequacy of the straight-line Gaussian plume model for SAMA analysis in general and for this analysis.<sup>66</sup> To address Contention 3, Entergy sought the assistance of Washington Safety Management Solutions LLC (WSMS), whose report Entergy relied upon for its summary disposition motion. WSMS's report describes the issues "admitted" to the proceeding as including "[t]he validity of the MACCS2 meteorological *model* and data used in the economic SAMA analysis, including the *ability of the model* to treat terrain effects and sea breeze phenomena. . . ."<sup>67</sup> The report specifically identifies as a part of Contention 3 the claim that "the Gaussian model underpinning MACCS2 is inappropriate to the Pilgrim plant physical environment, and that the meteorological model cannot adequately treat dispersion and the subsequent consequences of postulated severe accidents."<sup>68</sup> In short, Entergy's motion for summary disposition and attached documents addressed several Pilgrim Watch arguments challenging the adequacy of the Gaussian plume model, nowhere suggesting that challenges related to the model should be considered beyond the scope of the admitted contention. Similarly, the Staff's Supplemental Environmental Impact Statement (issued prior to the Board's decision on summary disposition) also describes the admitted model is inappropriate for our coastal community")(Pilgrim Watch representative Ms. Mary Lampert).

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<sup>66</sup> See Summary Disposition Motion at 12-17, and attached Declaration of Kevin R. O'Kula (O'Kula Declaration) at 6-12 (addressing "Gaussian Plume Modeling Issues").

<sup>67</sup> WSMS-TR-07-0005, Revision 1, "Radiological Dispersion and Consequence Analysis Supporting Pilgrim Nuclear Station Severe Accident Mitigation Alternative Analysis" (May 2007)(WSMS Report) at ix, 1 (emphasis added), Exhibit 2 to Summary Disposition Motion; see also WSMS Report at 2-3, 13-20.

<sup>68</sup> *Id.* at 13.

contention as “present[ing] a number of issues concerning the MACCS2 Gaussian plume model and the *appropriateness of using this model* to assess dispersion of radionuclide releases and related consequences.”<sup>69</sup>

And even if the decision admitting Contention 3 in fact had specified that the contention did not encompass the adequacy of any dispersion model claims, the majority provided insufficient legal grounds for categorically rejecting the plume modeling methodology claims. The Staff suggests that the Board in admitting Contention 3 rejected the plume model issue for lack of sufficient basis. But the majority’s decision simply states that in admitting the contention (in LBP-06-23) the Board rejected all challenges to “probabilistic methodologies and/or the modeling used.”<sup>70</sup> The majority also stated that Pilgrim Watch’s plume model arguments impermissibly challenge an “approach mandated by [NRC] regulations,” but did not specify any regulation requiring use of a particular atmospheric dispersion model or code for use in SAMA analysis.<sup>71</sup>

The majority is correct that the Staff used a “customarily” used code, “widely used and accepted as an appropriate tool” for conducting SAMA analyses,<sup>72</sup> and that the Gaussian plume model is a “fundamental part” of the MACCS2 code.<sup>73</sup> But those reasons are not a sufficient ground to exclude the code’s integral dispersion model from all challenge, if adequate support is presented for a contention. Here, neither the decision admitting Contention 3, nor the majority

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<sup>69</sup> See Pilgrim EIS, Final Report – Volume 2, Appendices at G-19 to G-21 (emphasis added).

<sup>70</sup> LBP-07-13, 66 NRC at 151; see also *id.* at 142-43, 150. Entergy argues that as originally pled, Contention 3 never challenged use of the Gaussian plume model, but the contention clearly claimed that the “modeling tool . . . fail[ed] to properly characterize weather conditions.” See Petition at 34-36.

<sup>71</sup> 66 NRC at 150.

<sup>72</sup> *Id.* at 142.

<sup>73</sup> *Id.* at 151.

decision dismissing the contention, anywhere specifies that Pilgrim Watch presented inadequate support for its straight-line Gaussian plume model claims. And while we have not conducted a *de novo* review of the admissibility of Contention 3, it is not obvious to us that the Pilgrim Watch Gaussian plume arguments, raised in support of the meteorological patterns issue, were insufficient to meet threshold contention admissibility requirements.

For the reasons outlined above, we conclude that the majority provided insufficient legal grounds for categorically rejecting meteorological arguments involving adequacy of the straight-line Gaussian plume model. This does not by itself suggest that Pilgrim Watch raised sufficient evidence to withstand summary disposition. But the majority's outright rejection of plume modeling-related claims raises the concern that it may have overlooked or at least inadequately addressed arguments (by Pilgrim Watch as well as by Entergy and the Staff) on the adequacy of the straight-line plume dispersion model for the purpose of the Pilgrim SAMA analysis.

B. *Conservatism of Straight-line Gaussian Plume Model and its Application*

Our inquiry does not end here, however, because in dismissing Contention 3 the majority provided an additional ground for rejecting Pilgrim Watch's plume model arguments. The majority concluded that Pilgrim Watch, in any event, had neither controverted Entergy's claims that the straight-line Gaussian plume model generally results in more *conservative* analyses (indicating *greater* accident consequences), nor controverted claims that the SAMA analysis with the new sensitivity studies included conservative computations that would account for *any* potential meteorological patterns. The majority therefore concluded that any asserted errors in modeling would not render any additional SAMA cost-effective because the effects of "variations in wind speed and direction, meteorological patterns, and plume shape are fully encompassed by the stochastic/statistical methods used in the SAMA analysis."<sup>74</sup> Before the Commission,

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<sup>74</sup> *Id.* at 146; see also *id.* at 150-52.

Entergy similarly stresses that the “absence of any challenge by [Pilgrim Watch’s] declarants to the *conservatism* of the Gaussian plume model renders meaningless [Pilgrim Watch’s] repeated claims that Entergy’s sensitivity analyses were irrelevant because Entergy had used the wrong model.”<sup>75</sup>

We cannot agree with the majority that Pilgrim Watch failed altogether to address whether the MACCS2 code “is technically sound or produces, as Entergy and Staff aver, conservative results,”<sup>76</sup> and failed to dispute evidence “indicating that the Applicant’s analyses maximize the effects of the radiation carried by the meteorological pattern in each of the hundreds of particular scenarios computed.”<sup>77</sup>

We focus on a declaration by Pilgrim Watch expert Mr. Bruce A. Egan. Mr. Egan’s declaration states that he is familiar with Contention 3. Mr. Egan directly responds to several itemized assertions made in the declaration of Entergy expert Mr. Kevin R. O’Kula, who supported Entergy’s motion for summary disposition. Mr. Egan contested Mr. O’Kula’s conclusion that the SAMA analysis accounts for time-dependent weather conditions by analyzing multiple plumes under different weather conditions, calling it an “erroneous concept” that “randomly chosen meteorological conditions would give the same results as inputting meteorological conditions as a function of time.”<sup>78</sup> He declared “incorrect” and a “misconception” the claim that the sea breeze is “generally a highly beneficial phenomena that disperses and dilutes the plume concentration and thereby lowers the projected doses downwind from the release point,” and instead claimed that at a coastal site “the sea breeze

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<sup>75</sup> Entergy Initial Brief at 23.

<sup>76</sup> LBP-07-13, 66 NRC at 151 and n.21.

<sup>77</sup> *Id.* at 151.

<sup>78</sup> *Pilgrim Watch’s Answer Opposing Entergy’s Motion for Summary Disposition of Pilgrim Watch Contention 3* (June 29, 2007)(Opposition to Summary Disposition), attached Declaration of Bruce E. Egan (Egan Declaration) at 5, Number 13 (addressing Item 16 of O’Kula declaration).

would draw contaminants across the land and inland subjecting the population to potentially *larger doses*.”<sup>79</sup>

The majority is correct that a key focus of Mr. Egan’s declaration is the issue of emergency planning – the need to provide accurate, “real time” projections of the location and duration of potential public exposures to determine whether, when, and where particular population groups may need to be evacuated. These are issues beyond the scope of SAMA analysis. But we are not convinced that *all* of Mr. Egan’s statements should be dismissed as irrelevant or inapplicable to the SAMA cost-benefit issue. Mr. Egan describes his declaration on Contention 3 as bearing on the issues of “developing credible evacuation plans, estimating realistic evacuation times, *and* in assessing the cost versus benefits of possible mitigating efforts,”<sup>80</sup> and he reviewed, addressed and, as noted, disagreed with some of Mr. O’Kula’s assertions on whether the SAMA analysis fully accounts for the sea breeze effect and whether the sea breeze effect could lead to greater projected population doses.<sup>81</sup>

Admittedly, some of Mr. Egan’s statements are ambiguous. For example, in addressing three of Mr. O’Kula’s assertions on the conservatism of the straight-line Gaussian plume model and the Entergy SAMA analyses Mr. Egan states that:

The fact that a model may seem to be conservative in particular applications or in limited data comparisons does not mean that the model is better or should be recommended for an application. Models can be conservative but have incorrect simulations of the underlying physics. Similarly, sensitivity studies do not add useful information if the primary model is flawed.<sup>82</sup>

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<sup>79</sup> *Id.* (emphasis added).

<sup>80</sup> *Id.* at 3, Number 6.

<sup>81</sup> *See generally id.* at 3-6.

<sup>82</sup> *Id.* at 5, Number 13 (addressing Items 17, 18, 19 of O’Kula Declaration).

This could mean that Mr. Egan does not contest that the straight-line Gaussian plume model yields more conservative results compared to more detailed varied trajectory models (as the majority concluded), or that he merely does not contest that in the two comparative studies Mr. O’Kula referenced the straight-line Gaussian plume model produced generally more conservative or comparable results. Pilgrim Watch argues that the latter interpretation is correct.<sup>83</sup>

While the majority’s interpretation of Mr. Egan’s declaration is reasonable, at the summary disposition stage “all ambiguities and . . . all permissible inferences” must be resolved “in favor of the party against whom summary [disposition] is sought.”<sup>84</sup> Taken as a whole, we find that Mr. Egan’s declaration can also be read to challenge the claim that the Entergy analyses subsumed all potential meteorological patterns, and to argue that there could be “potentially larger doses” due to the sea breeze effect that may not be taken into account by the current analysis. We therefore disagree with the majority’s conclusion that there was uncontroverted evidence on the conservatism of the straight-line Gaussian plume model and uncontroverted evidence showing that the SAMA analysis “maximize[d] the effects of the radiation carried by the meteorological pattern in each of the hundreds of particular scenarios computed.”<sup>85</sup>

Significantly, however, even if the SAMA analysis may not fully account for all potential plume patterns or all dose impacts relating to the sea breeze effect, that would not necessarily mean that the cost-benefit conclusions are in error, given the nature of SAMA analysis. Entergy and the Staff presented evidence on other, potentially significant considerations for evaluating Entergy’s SAMA cost-benefit conclusions, but the Board did not address those factors.

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<sup>83</sup> See *Pilgrim Watch Brief in Response to Entergy’s Response to CLI-09-11 (Requesting Additional Briefing)*(July 6, 2009)(Pilgrim Watch Reply to Entergy Initial Brief) at 8-9.

<sup>84</sup> See *Patterson v. Oneida, New York*, 375 F.3d 206, 219 (2d Cir. 2004).

<sup>85</sup> See LBP-07-13, 66 NRC at 151.

For example, Entergy expert Mr. O’Kula concluded that sea breeze effects generally are most often localized within 10 miles of the coast and therefore would not be “a factor towards the heavily populated areas in the Pilgrim 50-mile region,” *and* that “it is the impact in the populated zones that dominates population dose and off-site economic cost consequences.”<sup>86</sup> Consequently, even assuming that the SAMA analysis does not entirely account for the sea breeze effect and that the effect could result in “potentially larger doses” as Mr. Egan claims, if the sea breeze effect essentially is limited to lower population areas within 10 miles of the plant and occurs only on a limited number of days per year,<sup>87</sup> its overall impact on the SAMA cost-benefit conclusions may be insignificant.<sup>88</sup> The majority’s decision does not, however, address

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<sup>86</sup> See O’Kula Declaration at 9-10 (referencing Exhibit 2, WSMS Report at 19-21), attached to Summary Disposition Motion. See *also* WSMS Report at 20 (concluding that the “close-in effects within five to ten miles of the point of release will have little bearing on the SAMA PDR [population dose risk] and OECR [offsite economic cost risk] results”); *id.* at 8 (describing spatial dependence of the population dose).

<sup>87</sup> Mr. O’Kula was the principal author of and repeatedly references the WSMS Report submitted as Exhibit 2 in support of Entergy’s motion for summary disposition. The report notes that for the SAMA cost-benefit analysis sea breeze effect conditions “should be weighted by frequency of occurrence based on site conditions, time of day, effective release elevation, and other factors.” See WSMS Report at 20. The affidavit of Staff experts Joseph A. Jones and Dr. Nathan Bixler similarly stresses that sea breeze occurrences “occur a small percentage of the total weather time assessed,” and the “effects are averaged out in the MACCS2 analysis for the annual period assessed.” See Affidavit of Joseph A. Jones and Dr. Nathan Bixler Concerning Entergy’s Motion for Summary Disposition of Pilgrim Watch Contention 3 (June 25, 2007)(Jones and Bixler Affidavit) at 5, attached to Staff Response to Summary Disposition Motion.

Pilgrim Watch itself repeatedly has stated that “a sea breeze front can penetrate inland from 1 km (.5 miles) to 15 km (9 miles),” and that while a sea breeze can occur throughout the year, on average the Pilgrim site “experiences about 45 sea breeze days” a year. See, e.g., Opposition to Summary Disposition at 18, 52 (citing to study by J.D. Spengler and G.J. Keeler, “Feasibility of Exposure Assessment for the Pilgrim Nuclear Power Plant” (May 12, 1988)).

<sup>88</sup> Population dose is predicted in terms of “person-rem.” A “rem” is a unit of radiation dose and “person” refers to the number of people exposed to the particular amount of rem. These two factors are multiplied to obtain the population dose in person-rem. Therefore, for example, a population dose of 10 person-rem may arise from 10 people exposed to 1 rem each, one person exposed to 10 rem, or 100 people exposed to 0.1. Under NRC practice, for a particular weather sequence, SAMA analysis calculates the *total* population dose, the sum of the estimated dose commitments to populations located in all the sectors on a spatial grid-map out to a defined distance (usually 50 miles) from the plant). The mean value of the predicted total population (Continued....)

these specific considerations (and related evidence) bearing on the significance of the sea breeze effect for the Pilgrim SAMA analysis. In our view, these are complex, fact-intensive issues best left for the Board's consideration in the first instance, therefore warranting further development of the record.

Moreover, Pilgrim Watch also argued that while exposures within the 20-50 mile zone "would not be adversely impacted by localized sea breeze conditions" near the Pilgrim facility, in the months when sea breeze conditions are uncommon, another meteorological phenomenon "would likely" carry concentrated plumes "into the 20+ mile region."<sup>89</sup> Specifically, Pilgrim Watch argued that "releases from Pilgrim initially headed out to sea will remain tightly concentrated due to reduced [vertical] turbulence" rates over the ocean water, and that if wind direction "then shifts toward populated areas," contaminants which will have "remain[ed] relatively undiluted," may cause "hot spots of radioactivity in unexpected locations."<sup>90</sup> In support, Pilgrim Watch cited to a passage in a report by Mr. Jan Beyea, and to two articles (which were cited in Mr. Beyea's report). The cited articles, concerning the transport of pollutants in New England, Pilgrim Watch had identified in its disclosure statement as items of evidence it intended to rely upon at hearing.<sup>91</sup>

The majority did not address the reduced turbulence/"hot spots" claim. It rejected Mr. Beyea's report in its entirety, concluding that the report "proffer[ed] no information regarding the facts at issue."<sup>92</sup> Mr. Beyea prepared his report in support of a contention on spent fuel pool

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dose is obtained by statistical averaging over many hundreds of randomly selected hourly weather sequences (based on hourly meteorological data points obtained from the site).

<sup>89</sup> Opposition to Summary Disposition at 19.

<sup>90</sup> See *id.* at 19-20, 55-56. See also *Pilgrim Watch's Brief in Response to CLI-09-11 (Requesting Additional Briefing)* (June 25, 2009) (Pilgrim Watch Initial Brief) at 5-6, 17-18.

<sup>91</sup> See *Document Disclosure List* (Nov. 15, 2006) at 4 (listing articles by Angevine et al.).

<sup>92</sup> LBP-07-13, 66 NRC at 148.

fires that the Massachusetts Attorney General submitted in this proceeding – a contention ultimately rejected by the Board and later by us as an impermissible challenge to NRC regulations and the license renewal GEIS.<sup>93</sup> Mr. Beyea did not provide a supporting affidavit for Pilgrim Watch on Contention 3, and there is no indication that he has any familiarity with the specific arguments concerning Contention 3. The majority therefore found that Mr. Beyea’s report on potential releases from spent fuel pool fires had no bearing on the SAMA contention (SAMAs do not encompass spent fuel pool accidents).<sup>94</sup> The majority further stressed that the Beyea report largely rested on cancer risk claims that went well beyond the scope of the issues in Contention 3, including distinctly new claims that the “dollar equivalent of cancers” should be estimated differently in SAMA analysis.<sup>95</sup>

For the reasons the Board majority gave, we agree that nearly all of Mr. Beyea’s report is not relevant to the SAMA issues in Contention 3. But to the extent that Pilgrim Watch, in arguing a meteorological claim, relies upon a specific portion of the report that addresses meteorological patterns or phenomena in the New England coastal area, we see no basis to ignore Mr. Beyea’s statements. The dissent states that it would have considered Mr. Beyea’s report “with regard to meteorological issues,”<sup>96</sup> an approach we find reasonable. We do not

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<sup>93</sup> See LBP-06-23, 64 NRC at 280-300; see also *id.* at 283 n.103; *Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc.* (Vermont Yankee Nuclear Power Station); *Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), CLI-07-3, 65 NRC 13 (2007), *reconsid. denied*, CLI-07-13, 65 NRC 211 (2007). The NRC subsequently denied a related petition for rulemaking filed by the Attorney General. See *Petition for Rulemaking; Denial*, 73 Fed. Reg. 46,204 (Aug. 8, 2008), *aff’d*, *New York v. NRC*, 589 F.3d 551 (2<sup>d</sup> Cir. 2009). Pilgrim Watch also submitted a contention on spent fuel pool accidents (Contention 4), similarly found inadmissible by the Board. See LBP-06-23, 64 NRC at 280-300. Pilgrim Watch has appealed dismissal of Contention 4, an issue we will address in a forthcoming decision.

<sup>94</sup> See *infra* Section III. E.

<sup>95</sup> See LBP-07-13, 66 NRC at 148.

<sup>96</sup> *Id.* at 160 n.25.

mean to suggest that Pilgrim Watch's evidence on the "hot spots" claim would have sufficed to raise a genuine material dispute over the SAMA cost-benefit conclusions,<sup>97</sup> but the claim was raised with sufficient particularity to have warranted consideration by the majority.<sup>98</sup>

Ultimately, the majority's decision is not sufficiently comprehensive to support the summary disposition of Contention 3. In our view, genuine factual questions remain. As we noted, it is not clear to us that Pilgrim Watch's expert on air dispersion modeling failed to dispute the conservatism of the straight-line Gaussian plume model and Entergy analysis. And while Entergy and the Staff presented additional key arguments in support of summary disposition (*i.e.*, the potential limited significance of the 'sea breeze' effect to the Pilgrim SAMA analysis),

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<sup>97</sup> We note, for example, that Mr. Beyea's discussion appears more in the manner of a "suggest[ion]" for further study to see *if* reduction of turbulence could lead to radiological impacts as far away as Boston or could impact any "cost-benefit computations." See "Report to the Massachusetts Attorney General on the Potential Consequences of a Spent Fuel Pool Fire at the Pilgrim or Vermont Yankee Plant" (May 25, 2006)(Beyea Report) at 7, 11-12, attached to Opposition to Summary Disposition. Whether and to what extent the cited articles on pollutant transport bears on the Pilgrim SAMA analysis is an issue we do not reach; neither Mr. Beyea nor Pilgrim Watch provided any discussion of the articles.

Entergy argues that Pilgrim Watch relies upon several documents that were not "offered as [an] exhibit" in this case and should not be considered by the Commission. *Entergy's Reply to Pilgrim Watch's Brief in Response to CLI-09-11* (July 6, 2009)(Entergy Reply to Pilgrim Watch Initial Brief) at 8. We examined the following documents, which were both referenced by Pilgrim Watch before the Board and which we were able to obtain readily on the internet: J.D. Spengler and G.J. Keeler, "Feasibility of Exposure Assessment for the Pilgrim Nuclear Power Plant (May 12, 1988)(discussed also by Mr. Egan in his declaration); Zagar, M. Tjernstrom, W. Angevine, "New England Coastal Boundary Layer Modeling" (Aug. 2004)(referenced by Mr. Beyea); and SAND96-0957, "Site Restoration: Estimation of Attributable Costs from Plutonium-Dispersion Accidents" (May 1996). Our decision today to remand the meteorological patterns issue does not depend upon any of these documents. For future proceedings, we make clear that any documents or other evidence referenced in parties' briefs must be available in the case record. Licensing Boards and the Commission should not be expected to consider items never provided on the record.

<sup>98</sup> Pilgrim Watch also referenced Mr. Beyea's report to support a claim that because the MACCS2 code is not used to measure dispersion within 100 meters of the source, it ignores resuspension of material deposited there but blown further offsite, ultimately impacting cost. We do not decide whether Mr. Beyea's report provides any probative support for these claims. Since the Board on remand will consider Pilgrim Watch's arguments in regard to meteorological patterns, it can assess the timeliness and merit of Pilgrim Watch's air dispersion modeling arguments regarding wind-driven resuspension.

these considerations were left unaddressed by the majority. Nor are all of Pilgrim Watch's claims on the meteorological patterns issue addressed in the majority's decision (*i.e.*, the "hot spots" argument). In short, we cannot conclude that no material dispute remains on the meteorological patterns issue. The best course at this stage is to remand the contention for hearing.

In a case such as this one, with a voluminous case record and numerous factual issues and competing expert declarations, proceeding to an evidentiary hearing where factual claims appropriately can be weighed, clarified, and resolved with merits findings may be more efficient for all parties, as the dissent in this case suggested.<sup>99</sup> Where the Licensing Board is itself the trier of fact, the time required for careful consideration of the evidence, including expert declarations and referenced exhibits, often may be more effectively used to resolve factual claims on the merits following consideration of testimony and a brief hearing.

For the reasons outlined above, we reverse the majority's summary dismissal of the meteorological patterns issue in Contention 3, and remand the issue for hearing. In addition to the meteorological patterns issue, Contention 3 included challenges to offsite economic costs considered in the analysis, and to the inputs on evacuation times. In disagreeing with the majority's grant of summary disposition, the dissent stated that it would have permitted a hearing "at least with regard to meteorological patterns, and how the meteorological analysis might affect analysis of the evacuation and cost data."<sup>100</sup>

Because the Board has yet to reach a merits conclusion on the adequacy of the meteorological patterns/air dispersion modeling issue, we agree that it would be premature to dismiss entirely from this proceeding other portions of Contention 3 that may be linked to the adequacy of the meteorological modeling underpinning the SAMA analysis. For example, the

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<sup>99</sup> LBP-07-13, 66 NRC at 167-68.

<sup>100</sup> *Id.* at 162-63.

plume/air dispersion modeling depicts projected patterns and amounts of radioactive doses, as well as the projected amount and extent of land contamination. These in turn impact the calculations of averted offsite economic costs and evacuation time assumptions. Consequently, 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.

While we disagree with some of the majority's conclusions on the meteorological patterns issue and find that the issue warrants further analysis in the record, we otherwise agree with the majority that the bulk of Pilgrim Watch's arguments before the Board were unsupported by significantly probative evidence, go well beyond the scope of Contention 3 as originally proffered and admitted, or raise issues beyond the intent and scope of a SAMA analysis. Insofar as Pilgrim Watch raises distinct "economic costs" or "evacuation times" challenges that extend beyond its meteorological modeling concerns, we agree with the majority that Pilgrim Watch fails to raise a genuine material dispute for hearing. Accordingly, if the Board on remand concludes that there is no significant meteorological modeling deficiency calling into question the overall Pilgrim SAMA cost-benefit analysis conclusions, no genuine dispute concerning economic costs or evacuation timing inputs will remain. To expedite consideration of Contention 3 on remand, below we outline the majority's conclusions with which we agree and therefore affirm, and additional, related observations of our own. We do not list all of Pilgrim Watch's numerous unsupported assertions.

C. *New Arguments Not Part of the Original Contention*

NRC threshold contention standards require petitioners to review application materials and set forth their contentions “with particularity.”<sup>101</sup> Where any issue arises over the proper scope of a contention, “NRC opinion has long referred back to the bases set forth in support of the contention.”<sup>102</sup> The “reach of a contention necessarily hinges upon its terms *coupled with its stated bases.*”<sup>103</sup> Our contention rules require “‘reasonably specific factual and legal’ allegations at the outset” to assure that matters admitted for hearing have at least some minimal foundation, are material to the proceeding, and provide notice to opposing parties of the issues they will need to defend against.<sup>104</sup> Intervenors therefore may not “freely change the focus of an admitted contention at will” to add a host of new issues and objections that could have been raised at the outset.<sup>105</sup> Where warranted we allow for amendment of admitted contentions,<sup>106</sup> but do not allow distinctly new complaints to be added at will as litigation progresses, stretching the scope of admitted contentions beyond their reasonably inferred bounds.

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<sup>101</sup> 10 C.F.R. § 2.309(f)(1); *see also Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-03-17, 58 NRC 419, 426-28 (2003)(contention standards require pleading “specific grievances, not simply to provide general ‘notice pleadings’”).

<sup>102</sup> *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)(Catawba/McGuire); *see also Louisiana Energy Services, L.P.*, (National Enrichment Facility), CLI-05-28, 62 NRC 721, 727 (2005).

<sup>103</sup> *See, e.g., Public Serv. Co. of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-899, 28 NRC 93, 97 (1988), *aff’d sub nom. Massachusetts v. NRC*, 924 F.2d 311 (D.C. Cir.), *cert. denied*, 502 U.S. 899 (1991); *see also Catawba/McGuire*, CLI-02-28, 56 NRC at 379, 383 (2002).

<sup>104</sup> *Catawba/McGuire*, CLI-02-28, 56 NRC at 381, 383; *Duke Energy Corp.* (Oconee Nuclear Station, Units 1, 2, and 3), CLI-99-11, 49 NRC 328, 333-35 (1999).

<sup>105</sup> *Catawba/McGuire*, CLI-02-28, 56 NRC at 386 & n.61 (internal quotation and citation omitted).

<sup>106</sup> *See* 10 C.F.R. § 2.309(f).

Pilgrim Watch raises a number of distinctly new arguments not fairly encompassed by Contention 3 as originally proffered and admitted. For example, on the issue of off-site “economic costs,”<sup>107</sup> Contention 3 as pled challenged the SAMA analysis for failure to account for “the loss of economic activity in Plymouth County.”<sup>108</sup> Specifically, the contention claimed that the economic costs analysis “only included the assessed value” of property but did not assess “business value” – the “fact that the building is an ongoing business with inventory equipment and income generation capability.”<sup>109</sup> The contention particularly highlighted a potential loss of tourism, noting that the SAMA analysis did not “account[] for the destruction of this region’s economy as a major tourist, and historical and recreational area.”<sup>110</sup> More generally, Pilgrim Watch asserted that the economic costs analysis “should include loss of economic infrastructure and tourism.”<sup>111</sup> These were the specific bases for Pilgrim Watch’s challenge to the Entergy SAMA analysis of off-site economic costs.

In moving for summary disposition, Entergy provided a supplemental sensitivity analysis intended to account for loss of tourism and other county and metropolitan area gross domestic product.<sup>112</sup> Pilgrim Watch then responded with numerous distinctly new asserted deficiencies. It claimed that Entergy had not accounted for “health costs” such as “medical costs, loss of

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<sup>107</sup> SAMA analysis conducts initial separate analyses for off-site population dose and off-site economic costs.

<sup>108</sup> See Petition at 44.

<sup>109</sup> See *id.*

<sup>110</sup> *Id.* at 45.

<sup>111</sup> See *id.*

<sup>112</sup> See Summary Disposition Motion at 26-27; O’Kula Declaration at 20-21.

productivity and costs associated with disability, psychological effects,<sup>113</sup> loss of well-being or changes in quality of life such as grief, pain, and changed social functioning.”<sup>114</sup> Pilgrim Watch also argued that the analysis underestimated cancer mortality risk, failed to include health costs other than cancer mortality, failed to base health costs on new cancer coefficients, and assigned an insufficient dollar value per person-rem.<sup>115</sup> It further claimed that the analysis failed to account for the “difficulty of conducting ecological restoration” at a coastal and wetlands location and that porous surfaces are more difficult to decontaminate, stressing that the Pilgrim coastal area has buildings made of wood, brick and concrete.<sup>116</sup> Pilgrim Watch repeats these claims in its brief before us, adding that the MACCS2 decontamination “assumptions are based on a radiological weapon event” where “particulates are relatively large and swept up with a broom,” but that with a reactor accident a release “cannot be swept up with a broom.”<sup>117</sup>

The majority properly rejected the various new “health” or cancer risk arguments as late because they are not fairly encompassed by the description of Contention 3 that Pilgrim Watch set forth in its petition for hearing.<sup>118</sup> Pilgrim Watch’s new claims of dramatically underestimated decontamination or clean-up costs also are not reasonably inferable from the economic cost

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<sup>113</sup> We note that NEPA does not require an agency to assess potential psychological impacts due to fear of radiological harm. *See generally Metropolitan Edison Co. v. People Against Nuclear Energy*, 460 U.S. 766 (1983).

<sup>114</sup> Opposition to Summary Disposition at 81.

<sup>115</sup> *See id.* at 46, 81-84.

<sup>116</sup> *Id.* at 90.

<sup>117</sup> *See* Pilgrim Watch Initial Brief at 10, 12-13, 17, 19-20.

<sup>118</sup> *See* LBP-07-13, 66 NRC at 145-46. The majority further correctly noted that SAMA analyses typically address *separately* those costs “relating to population dose” from “those relating to offsite economics,” and that the Entergy SAMA analyses obviously had followed this approach. Contention 3 as pled addressed only off-site economic costs (not population dose issues) in its arguments challenging the economic costs analysis. *See id.* at 145, 148; *see also id.* (“the scope of the admitted contention does not include errors in estimating the dollar-equivalent of cancers caused by a severe accident”).

challenges proffered in Contention 3, as both Entergy and the Staff argue.<sup>119</sup> These claims simply were not encompassed by the specific business-related bases – e.g., “economic infrastructure and tourism” – proffered by Pilgrim Watch in Contention 3. Pilgrim Watch never sought to amend Contention 3 to add these issues, and the record was never developed on them. We have long stressed that “NRC adjudicatory proceedings would prove endless if parties were free . . . to introduce entirely new claims which they either originally opted not to make or which simply did not occur to them at the outset.”<sup>120</sup> Nor does Pilgrim Watch, in any event, demonstrate a *supported* genuine material issue – bearing on the overall SAMA cost-benefit results – for these new economic cost analysis claims.<sup>121</sup>

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<sup>119</sup> See, e.g. Entergy Reply to Pilgrim Watch Initial Brief at 3; *NRC Staff’s Reply to Pilgrim Watch’s Brief in Response to CLI-09-11* (July 6, 2009) at 9-10. The only references in the contention to “decontamination,” for example, were (1) acknowledgments that the MACCS2 model analysis of economic costs *includes* the cost of decontamination, the cost of condemnation of property that cannot be decontaminated to a specified level, and decontamination or interdiction for the longer term; and (2) in reference to tourism, the claim that tourism-related revenues in the historical sites within 10 miles of Pilgrim would never fully recover after a severe accident, even if the sites were cleaned and decontaminated. See Petition at 43-44.

<sup>120</sup> *National Enrichment Facility*, CLI-05-28, 62 NRC at 727-28 (internal quotations and citation omitted).

<sup>121</sup> Repeatedly, as we examined Pilgrim Watch’s evidence (when it had any) on economic costs, we could not discern any direct connection to the Pilgrim SAMA cost-benefit results. For example, as support for a claim that clean-up costs are underestimated, Pilgrim Watch cites to a page in a Sandia National Laboratories report. See, e.g., Petition for Review at 18; Pilgrim Watch Initial Brief at 12 (citing to SAND96-0957, “Site Restoration: Estimation of Attributable Costs from Plutonium-Dispersal Accidents” (May 1996)); see also Pilgrim Watch Initial Brief at 21. But the cited page merely states that after the Chernobyl accident it became recognized that decontamination of urban areas and particularly porous surfaces can be very difficult, although the acknowledged difficulties of the Chernobyl clean-up may largely have been due to poor training, lack of equipment, and a nearly complete break-down in leadership. Pilgrim Watch provided no specific argument of error in the SAMA cost-benefit analysis calculations or conclusions. Merely citing to pages in diverse reports without any additional explanation or other obvious link to the SAMA analysis is insufficient to raise a genuine material dispute for hearing.

We agree, additionally, with Entergy that Contention 3 as pled did not challenge *all* use of the MACCS2 code for determining economic costs. See, e.g., Entergy Initial Brief at 14. As we outlined, in challenging the economic costs analysis, Pilgrim Watch argued that the analysis (Continued....)

D. Issues Outside the Scope of SAMA Analysis

Many of Pilgrim Watch's arguments on the need for improving meteorological monitoring by, for example, installing continuous recording meteorological instruments along the coast and at additional sites, go to improving the ability to predict – in “real time” fashion during an actual accident – where a *specific* identifiable plume is heading, to know precisely whether and where to direct people to evacuate.<sup>122</sup> These concerns are not directly relevant to probabilistic risk assessment in NRC SAMA analysis, which examines a spectrum of hypothetical accident scenarios and under NRC practice utilizes the mean value of population dose risk and offsite economic costs. To the extent, however, that Pilgrim Watch claims that additional meteorological information would significantly *change the Pilgrim SAMA cost-benefit*

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was deficient because the economic model in the MACCS2 code did not account for the loss of all economic activity – specifically, that it “models only the economic cost of mitigative actions” and did not account for lost business value, economic infrastructure and tourism. In short, Pilgrim Watch claimed that particular costs *were missing* from the analysis, not that the economic analysis done to date could not be considered *at all* or revised because the MACCS2 code's economic model is completely invalid. Indeed, Pilgrim Watch specifically stated that what it sought was to have the asserted missing economic costs “add[ed] in,” “supplementing” the existing “analysis data.” See *Pilgrim Watch Reply to Entergy Answer to Request for Hearing and Petition to Intervene By Pilgrim Watch* (July 3, 2006)(Pilgrim Watch Reply to Entergy Answer to Request for Hearing) at 21. Entergy's revised economic analyses sought to address the costs Pilgrim Watch asserted had been missing.

In opposing summary disposition, however, Pilgrim Watch presented excerpts from the “MACCS2 Support Forum” blog, in which Mr. David Chanin (a primary developer of the MACCS2 computer code) states that the MACCS2 cost model is “seriously flawed” and “not worth anyone's time.” See attachments to Declaration of David I. Chanin in Support of Pilgrim Watch's Response Opposing Entergy's Motion for Summary Disposition of Pilgrim Watch Contention 3. To the extent that Pilgrim Watch now claims that *no aspect* of a MACCS2 code SAMA off-site economic costs analysis can be considered valid, we find Pilgrim Watch's argument well beyond the scope of its proffered contention. In any event, Mr. Chanin's comments do not address Entergy's supplemental economic analyses, demonstrate no specific knowledge of the analysis, and, as the majority stressed, do not “indicat[e], even broadly” that the Pilgrim SAMA economic cost-benefit conclusions are not sufficiently conservative. See LBP-07-13, 66 NRC at 149.

<sup>122</sup> See, e.g., Pilgrim Watch Initial Brief at 19 (on “emergency response implications”).

*conclusions* – e.g., Pilgrim Watch’s plume modeling claims – the issue falls within the scope of Contention 3.

Pilgrim Watch raises numerous new claims relating to spent fuel pool fires, and argues that the SAMA analysis is deficient for failing to address potential spent fuel pool accidents.<sup>123</sup> These claims fall beyond the scope of NRC SAMA analysis and impermissibly challenge our regulations.<sup>124</sup> The NRC’s GEIS for license renewal provides a generic evaluation of potential spent fuel pool accidents, encompassing the potentially *most serious* accident – a seismic-generated accident causing catastrophic failure of the pool – and concludes that there is no further need for a site-specific spent fuel pool accident or mitigation analysis for license renewal.<sup>125</sup> In its intervention petition, Pilgrim Watch submitted a separate Contention 4 centered on the claim that the Entergy Environmental Report should have addressed mitigation alternatives to reduce the potential for spent fuel pool water loss and fires.<sup>126</sup> The Board in LBP-06-23 rejected this contention as a challenge to NRC regulations and outside the scope of

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<sup>123</sup> Contention 3 as submitted and admitted did not include specific challenges to the Pilgrim SAMA analysis’s consideration of source term magnitude, timing, duration and energy of release.

<sup>124</sup> See *supra* at 25 n.92.

<sup>125</sup> See Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437, Vol. 1, Final Report (May 1996)(GEIS) at 6-70 to 6-83, 6-85 to 6-86, 6-91 to 6-92; see also *Massachusetts v. NRC*, 522 F.3d 115 (1<sup>st</sup> Cir. 2008); Petition for Rulemaking; Denial, 73 Fed. Reg. 46,204, 46,212 (Aug. 8, 2008). The GEIS concludes – without exception or qualification for any type of spent fuel pool accident – that “regulatory requirements already in place provide adequate mitigation incentives for on-site storage of spent fuel,” and therefore mitigation alternatives for the spent fuel pool need not be considered for the license renewal review. See GEIS at 6-86, 6-91 to 6-92. The NRC is in the process of revisiting and updating the GEIS, including the spent fuel pool accident analysis. The proposed GEIS (which is still under consideration) describes that the potential for any cost-effective SAMAs related to the spent fuel pool is “substantially less than for reactor accidents” and therefore no change is warranted to the existing GEIS conclusion that mitigation alternatives for spent fuel pool accidents need not be considered on a site-specific basis. See Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Appendices, Draft Report for Comment (July 2009)(Proposed GEIS) at E-42.

<sup>126</sup> Petition at 50-78.

license renewal.<sup>127</sup> As previously stated, we will address in a separate decision all remaining issues raised in Pilgrim Watch's petition for review, including Pilgrim Watch's arguments on Contention 4.

E. Challenges to Evacuation Inputs

Pilgrim Watch argues that Entergy used "unrealistically low time estimates" for evacuation, ignored the potential of "shadow evacuation"<sup>128</sup> from outside of the 10-mile emergency planning zone (EPZ), ignored "peak traffic times" and otherwise failed to account for "[i]ncreased exposure from delayed evacuation."<sup>129</sup> Pilgrim Watch's petition for review, however, fails to address the majority's grounds for rejecting the evacuation times input claims.<sup>130</sup> The majority's grounds include that Entergy's sensitivity analyses assumed *no evacuation or sheltering at all* (Sensitivity Case 6), thereby assuming "that everyone within the EPZ carried on with their normal activities" and bounding the effects of possible uncertainties in evacuation speed and other potential evacuation delays.<sup>131</sup> The sensitivity analysis showed only a difference of 6% in population dose risk (PDR), and a 2% increase in Overall Economic Cost Risk (OECR).<sup>132</sup> Further, as the majority noted, Mr. O'Kula presented evidence that most of the population dose (about 83%) in this SAMA analysis is received during the long-term

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<sup>127</sup> See LBP-06-23, 64 NRC at 288-300.

<sup>128</sup> "Shadow evacuation" refers to voluntary evacuation by individuals who have not been directed to evacuate.

<sup>129</sup> See Petition for Review at 17.

<sup>130</sup> See LBP-07-13, 66 NRC at 144-45.

<sup>131</sup> See O'Kula Declaration at 14, 16; WSMS Report at 26.

<sup>132</sup> See LBP-07-13, 66 NRC at 145.

phase after the accident, indicating that evacuation and sheltering actions during the initial 7-day emergency phase would have relatively small impacts on overall population dose.<sup>133</sup>

Pilgrim Watch presented no supported argument raising a genuine material dispute over the bounding nature of Sensitivity Case 6. The Staff notes, for example, that because Sensitivity Case 6 “assessed the population as though they were continuing regular activities,” it “assesse[d] any effect of a shadow evacuation where a portion of the public may be in their vehicles.”<sup>134</sup> In addition, Pilgrim Watch did not contest Entergy’s evidence that in the two accident scenarios that dominated nearly 95% of the risk in this Pilgrim SAMA analysis (because of their high frequency and large release), there would be at least 12 hours after initiation of the accident until a release would begin.<sup>135</sup> We therefore agree with the majority that none of Pilgrim Watch’s arguments regarding evacuation speed and timing, traffic and other delays, shadow evacuation, etc., raise a genuine material dispute for hearing over the current evacuation times assumptions in the Pilgrim SAMA analysis.<sup>136</sup>

F. Economic Inputs

As we earlier outlined, many – indeed most – of Pilgrim Watch’s economic cost arguments sought to improperly expand the scope of Contention 3 (e.g., distinctly new claims on cancer co-efficients used in the analysis) or effectively challenged NRC regulations (e.g., spent fuel pool claims). We have carefully considered, *de novo*, all of Pilgrim Watch’s arguments to us going to lost business, economic infrastructure, or tourism, including claims

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<sup>133</sup> See O’Kula Declaration at 13; LBP-07-13, 66 NRC at 144-45.

<sup>134</sup> See Pilgrim EIS, Final Report-Appendices at G-15.

<sup>135</sup> See, e.g., WSMS Report at 8-10.

<sup>136</sup> To the extent, however, that the Board’s merits conclusions on meteorological modeling may have a material impact on or otherwise may materially call into question the evacuation timing inputs used in the analysis, the Board on remand should revisit the evacuation matters raised in Contention 3. See *supra* at pp. 28-29.

that farm wealth was underestimated, that the SAMA analysis does not include the “business value of property,” and that “a myriad of smaller economic costs were underestimated or totally ignored . . . that when added together would in all likelihood add up collectively to a significant amount.”<sup>137</sup> We agree with the majority’s conclusion that Pilgrim Watch failed to present significantly probative evidence countering the Entergy expert evidence and supplemental analyses on economic costs.<sup>138</sup> Pilgrim Watch provides no supported evidence raising a genuine material dispute with the SEIS’s conclusion that “further adjustments to more precisely account for business and tourism would not change the overall conclusions of the SAMA analysis.”<sup>139</sup> At the summary disposition stage, the “quality of the evidentiary support” provided is “expected to be of a higher level than that at the contention filing stage.”<sup>140</sup> Even viewing Pilgrim Watch’s claims on economic costs in the most favorable light, we do not find significantly probative evidence of a genuine material dispute for hearing on any of Pilgrim Watch’s particular economic cost input claims. Pilgrim Watch’s arguments, largely based on its own unsupported reasoning and computations, are insufficient to demonstrate a genuine material dispute with Pilgrim SAMA analysis’s current overall cost-benefit conclusions.

Again, however, we will not foreclose entirely the possibility that the offsite economic cost challenges could be revisited in this proceeding, given that SAMA economic cost calculations ultimately depend upon the results of the meteorological modeling. Therefore, as earlier outlined, we include as part of our remand the economic costs issue, but only to the extent that the Board’s merits findings on the adequacy of the meteorological modeling may

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<sup>137</sup> Petition for Review at 18; *see also* Pilgrim Watch Initial Brief at 22.

<sup>138</sup> *See* LBP-07-13, 66 NRC at 146, 148-49, 153-154,

<sup>139</sup> Pilgrim EIS, Final Report-Appendices at G-18.

<sup>140</sup> *See, e.g.*, Rules of Practice for Domestic Licensing Proceedings – Procedural Changes in the Hearing Process, Final Rule, 54 Fed. Reg. 33,168, 33,171 (Aug. 11, 1989).

have a material impact on the economic cost matters raised and admitted as part of Contention 3.

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We conclude by emphasizing that the issue here is whether the Pilgrim SAMA analysis resulted in erroneous conclusions on the SAMAs found cost-beneficial to implement. The question is not whether there are “plainly better” atmospheric dispersion models or whether the SAMA analysis can be refined further. There is no NEPA requirement to use the best scientific methodology,<sup>141</sup> and NEPA “should be construed in the light of reason if it is not to demand” virtually infinite study and resources.<sup>142</sup> Nor is an environmental impact statement intended to be a “research document,” reflecting the frontiers of scientific methodology, studies and data.<sup>143</sup> NEPA does not require agencies to use technologies and methodologies that are still “emerging” and under development, or to study phenomena “for which there are not yet standard methods of measurement or analysis.”<sup>144</sup> And while there “will always be more data that could be gathered,” agencies “must have some discretion to draw the line and move forward with decisionmaking.”<sup>145</sup> In short, NEPA allows agencies “to select their own methodology as long as that methodology is reasonable.”<sup>146</sup>

Significantly, NRC SAMA analyses are not a substitute for, and do not represent, the NRC NEPA analysis of potential impacts of severe accidents. The NRC’s GEIS for license

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<sup>141</sup> See, e.g., *Hells Canyon Alliance v. United States Forest Serv.*, 227 F.3d 1170, 1185 (9<sup>th</sup> Cir. 2000).

<sup>142</sup> See *Natural Resources Defense Council v. Hodel*, 865 F.2d 288, 294 (D.C. Cir. 1988).

<sup>143</sup> See *Town of Winthrop v. FAA*, 535 F.3d 1, 11-13 (1<sup>st</sup> Cir. 2008).

<sup>144</sup> *Id.* at 12-13.

<sup>145</sup> *Id.* at 11.

<sup>146</sup> *Id.* at 13; see also *The Lands Council v. McNair*, 537 F.3d 981, 1003 (9<sup>th</sup> Cir. 2008)(an EIS need not be based on the “best scientific methodology available”).

renewal provides a generic evaluation of severe accident impacts and the technical basis for the NRC's conclusion that "the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants."<sup>147</sup> The severe accident analysis provides a "prediction of environmental impacts of severe accidents for all plants,"<sup>148</sup> estimating and using 95 percent upper confidence bounding values. It further includes a discussion of the uncertainties associated with the likelihood of accident sequences and the estimates of environmental consequences, including the uncertainty in atmospheric dispersion modeling of radioactive plume transport, and acknowledges that plume dispersion may be influenced by the terrain surrounding the plant.<sup>149</sup> Because the GEIS provides a severe accident impacts analysis that envelopes the potential impacts at *all* existing plants, the environmental impacts of severe accidents during the license renewal term already have been addressed generically in bounding fashion.

The SAMA analysis is a site-specific *mitigation* analysis. For a mitigation analysis, NEPA "demands 'no fully developed plan' or 'detailed examination of specific measures which will be employed' to mitigate adverse environmental effects."<sup>150</sup> As a mitigation analysis, NRC SAMA analysis is neither a worst-case nor a best-case impacts analysis. It is NRC practice to utilize the *mean* values of the consequence distributions for each postulated release scenario or category – the mean estimated value for predicted total population dose and predicted off-site

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<sup>147</sup> See 10 C.F.R. Part 51, Subpart A, Appendix B, Table B-1 (regarding "severe accidents"); GEIS, Final Report, Vol.1 at 5-12 to 5-106.

<sup>148</sup> GEIS at 5-113, 5-115.

<sup>149</sup> See *id.* at 5-100 to 5-106, see also *id.* at 5-26.

<sup>150</sup> See *Catawba/McGuire*, CLI-03-17, 58 NRC at 431 (quoting *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 353 (1989)).

economic costs.<sup>151</sup> These mean consequence values are multiplied by the estimated frequency of occurrence of specific accident scenarios to determine population dose risk and offsite economic cost risk for each type of accident sequence studied. There is in SAMA analysis, therefore, an averaging of potential consequences. As a policy matter, license renewal applicants are not required to base their SAMA analysis upon consequence values at the 95<sup>th</sup> percentile consequence level (the level used for the GEIS severe accident environmental impacts analysis). 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, whose goal is only to determine what safety enhancements are cost-effective to implement.

#### IV. CONCLUSION

For the reasons outlined above, the majority's decision in LBP-07-13 is *reversed* in part and *affirmed* in part, and Contention 3 is remanded for hearing, consistent with this decision.

IT IS SO ORDERED.

For the Commission

[NRC SEAL]

/RA/

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Annette L. Vietti-Cook  
Secretary of the Commission

Dated at Rockville, Maryland  
this 26<sup>th</sup> day of March 2010.

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<sup>151</sup> See, e.g., NEI-05-01[Rev. A] at 15; see also *id.* at 28 (describing how detailed cost estimates often are not necessary to gauge the economic viability of a particular SAMA candidate).

**Additional Views of Commissioner Kristine L. Svinicki**

I agree with my colleagues on the reasoning and outcome of today's decision. I write separately, however, to underscore the difficulty of reaching that decision. In my opinion, the conclusion the Commission reaches in this order is generous to Pilgrim Watch, but not inappropriately so. As evidenced by the Board's decision in LBP-07-13, applying the summary disposition standard to a complex, technical case is no simple feat. Although judges must construe the evidence in the light most favorable to the party opposing summary disposition, they cannot be expected to extract and parse arguments that have not been clearly articulated. Were the Commission itself to delve into the evidence, it would risk engaging in the sort of weighing that is inappropriate at the summary disposition stage. Even though Pilgrim Watch's demonstration of a genuine issue of material fact is a close call, at bottom, I believe that the best course forward is to remand parts of Contention 3 for hearing. I recognize that this issue reasonably could have resulted in a different outcome, and I appreciate the challenge faced by the Board.

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

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

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing COMMISSION MEMORANDUM AND ORDER (CLI-10-11) in the above captioned proceeding have been served upon the following persons by electronic mail this date, followed by deposit of paper copies in the U.S. mail, first class, and NRC internal mail.

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[Original signed by Nancy Greathead]

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Office of the Secretary of the Commission

Dated at Rockville, Maryland  
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