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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

OFFICE OF SECRETARY
RULEMAKINGS AND
ADJUDICATIONS STAFF

BEFORE THE U.S. NUCLEAR REGULATORY COMMISSION

In the Matter of)
)
Entergy Nuclear Generation Co. and)
Entergy Nuclear Operations, Inc.)
)
)
(Pilgrim Nuclear Power Station))

Docket No. 50-293-LR

ASLBP No. 06-848-02-LR

**PILGRIM WATCH BRIEF IN RESPONSE TO ENTERGY'S RESPONSE TO
CLI-09-11 (REQUESTING ADDITIONAL BRIEFING)**

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Entergy's Initial Brief says that the Board majority correctly excluded challenges to the MACCS2 code, and that Pilgrim Watch (PW) presented no genuine material dispute. The arguments made by the NRC Staff in its Initial Brief are largely the same. PW is responding to both initial briefs, but in doing so has tried to avoid unnecessary duplication. Thus, the Commission should consider what is said in both of PW's responses, and should conclude that the positions of both Entergy and the NRC Staff are wrong.

I. Contention 3 Includes PW's Challenges to Entergy's Use of its MACCS2 Code

PW does not generically challenge the MACCS2 code. Rather, PW's challenge is that the code as used by Entergy does not utilize important site-specific meteorological factors and other information.¹

When the Board rewrote and admitted Contention 3, it made quite clear that the admitted contention covered the Entergy MACCS2 code's use of input data, and whether the input data that Entergy's code used accurately reflected conditions at Pilgrim Nuclear Power Station.

[T]he focus of the contention, and that part that *we admit*, is on *what input data should be utilized* in the SAMA analysis with regard to evacuation times, economic realities and meteorological, patterns, *and whether the input data used by the Applicant accurately reflect the respective conditions at issue.* (LBP-06-23,64 NRC, at 3)

Entergy's new argument that "[t]he admitted Contention did not question Entergy's use of the MACCS2 Code" (Entergy Br., 1) is simply wrong.²

A. Entergy's New Argument Contradicts What it Told the Board.

When Entergy filed its Motion for Summary Disposition, it told the Board precisely the contrary, that Contention 3 included both "*meteorological code and input data*" (Entergy's Motion for Summary Disposition of Pilgrim Watch Contention 3, p. 10, italics added); precisely the opposite of what Entergy says now.

¹ The Gaussian plume model (ATMOS) is simply one module imbedded in MACCS2. Had Entergy wished to do so, it could have input into MACCS2 a computational module capable of accepting and analysing variable meteorological data.

² The NRC Staff made essentially the same argument: "[T]he Board omitted from this revision of the contention any challenge to Entergy's use of the MACCS2 code or any of the methodologies employed in its SAMA analysis which are incorporated in the MACCS2 Code." NRC Staff's Initial Brief., p 10.

“PW Contention 3 as amended by the Board raises a host of issues concerning the adequacy of (1) the meteorological code and input data used in the PNPS SAMA analysis, (2) the evacuation delay and speed estimates for evacuating the 10-mile Emergency Planning Zone (‘EPZ’) following a postulated accident event at PNPS, and (3) the economic costs accounted for in the analysis

This statement by Entergy was no one-time misunderstanding. When Entergy requested Washington Safety Management Solutions LLC (WSMS) to perform additional analyses to help Entergy address the admitted contention, Entergy again clearly understood that

“[A]s admitted as part of the license renewal process for the Pilgrim Nuclear Power Station in Plymouth, Massachusetts, ... Contention 3 ... , raises issues on the applicability of the MACCS2 computer code to support the Pilgrim Severe Accident Mitigation Alternatives (SAMA) analysis, and consequently, the ability to draw conclusions about the economic impacts relative to benefits of possible mitigation alternatives.

“Three areas of issues raised in Contention 3 have been admitted into the license renewal proceeding:

- *The 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. Also spatial and temporal data resolutions were questioned.*
- *The adequacy of the input data and assumptions influencing the evacuation and sheltering model in MACCS2, and the capabilities of the code itself to model actual and worst case scenarios.*
- *The adequacy of the model for economic losses, especially those characterizing tourism and business costs.”*

(Radiological Dispersion/Consequence Analysis for Pilgrim NPS SAMA Analysis, WSMS-TR-07-005, REVISION 0, May 2007, p. 1, italics added)

In short, “the meteorological code *and* input data used in the PNPS SAMA analysis” is, as Entergy understood, plainly part of admitted Contention 3. Indeed, any other understanding of the contention would be nonsensical. In predicting what might happen in the event of a radiological accident, the code and the meteorological inputs it uses are inextricable bound together; neither has any value or use without the other. If the meteorological information is inaccurate or incomplete, the code cannot provide a correct prediction; and the same is true if the code, because of its own limitations, is unable to use meteorological information.

In asserting the contrary, Entergy ignores: (1) its inconsistent statements quoted above; (2) the portions of the Board October 16, 2006 Order amending Contention 3 that are explicit that the focus of the admitted contention is “*what input data should be utilized ... with regard to ... meteorological*

patterns; and (3) the portions of the Board's decision granting summary disposition in which Board itself plainly considered (and based its decision on) the way in which Entergy's MACCS2 used the information provided to it.

Entergy's new argument ultimately rests on nothing more than an incomplete and misleading truncation of a statement by Judge Young. Entergy says that Judge Young "concedes that the plume model is not 'input' per se in the technical sense." (Entergy Br., 17). What Entergy fails to tell the Commission is that Judge Young's complete statement contradicts Entergy's new position that Contention 3 excludes challengers to the Gaussian plume model:

[I]n admitting Contention 3 as to input data regarding meteorological patterns we were clearly aware that the Intervenor's contention, insofar as it concerned meteorological issues, centrally involved challenges to the 'straight-line Gaussian plume model,' and we did not exclude this. The plume model, while not 'input' per se in the technical sense, is implicitly part of what is 'put in' to the MACCS2 code to produce results about meteorological patterns. (Citation)³

B. The Board Order Admitting Contention 3 is Inconsistent with Entergy's New Argument

As Judge Young's just quoted statement makes clear, when the Board amended Contention 3 it did not exclude PW's challenges that the Gaussian Plume model and MACCS2, as used by Entergy, did not accurately reflect conditions at Pilgrim Nuclear Power Station.

The Board found that PW's original contention⁴ was inadmissible, but *only* "to 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,...*" (Board, 103). Thus, the Board excluded a generic

³ Entergy and the Staff ignore the context in which the admitted contention uses the term "input data ... resulting in incorrect conclusions." Rather, they repeatedly focus on the word "input" alone, but without even attempting to provide a definition. In its general sense, consistent with what the Board said it meant in context, "input" is as "something fed into a process with the intention of it shaping or affecting the outputs of that process" (www.thefreedictionary.com); "something fed into a process with the intention of shaping or affecting the outputs of that process." (en.wiktionary.org). "Data" similarly can be used in various ways. One accepted meaning is simply "a large quantity of bits and bytes that help make up the programs you use every day." (www.computerhope.com) As Entergy should know, computation modules, such as ATMOS (the Gaussian plume mode) are inputs to the MACCS2 code. The NRC technical staff is apparently considering upgrading existing MACCS2 code by inputting improved models. See SECY 09-0051.

⁴ As characterized by Entergy, PW's original (Entergy Br., p. 3, italics added) "Contention 3 sought to raise two issues: (1) that *probabilistic modeling* should not be used....; and (2) Entergy may also have minimized consequences by *using incorrect input parameters* for the computer consequences model."

challenge to probabilistic modeling, but it did not exclude PW's challenge that Entergy's modeling of conditions at the Pilgrim site was inaccurate because the model used only limited straight-line meteorological information and did not consider or make any proper use of site-specific meteorological information. The Board specifically said that PW had raised admissible questions about the meteorological data that governs the movement of the plume and whether Entergy had used that data in its analyses.

"PW has supported its call for further analysis by raising relevant and significant questions about the input that that appears (from the Application) to have been used in the Pilgrim SAMA analysis regarding ... (2) *the meteorological data that govern the movement of the plume....*" (Board Order, 101)

"[T]he contention, insofar as it *challenges the data* on these three points and *proposes the use of more accurate data relating to meteorologic plume behavior*, has been sufficiently raised and supported for the purposes of contention admissibility." (Board, Order, Pp 101-102)

"Pilgrim Watch has ... demonstrate[d] a genuine dispute with the Applicant on the *material factual issues* of whether in its SAMA analysis the applicant has adequately taken into account relevant and realistic data *with respect to* evacuation times in the area surrounding the Pilgrim plant, economic consequences of a severe accident in the area, and *meteorological patterns that would carry the plume in the event of such an accident....*" (Board Order, P 103)

In summarizing what rewritten Contention 3 includes, the Board said (italics added)

[T]he focus of the contention, and that part that *we admit, is on what input data should be utilized* in the SAMA analysis with regard to evacuation times, economic realities and meteorological, patterns, *and whether the input data used by the Applicant accurately reflect the respective conditions at issue.*

Entergy's new argument that,

"The Board majority appropriately excluded challenges *to the use of the MACCS2 code*, including its embeded Straight-line Gaussian Plume model and economic model..." (Entergy Br., 14)

simply does not square with what the Board said was the focus of admitted Contention 3. Neither does it square with Entergy's previous statement to the Board that "Contention 3 as amended raises a host of issues concerning the adequacy of (1) *the meteorological code and input used* in the PNPS SAMA analysis" or its earlier recognition that one of the issues raised in admitted Contention 3 is "[t]he validity of the MACCS2 *meteorological model and data used* in the SAMA analysis...." See page 2 above.

C. The Board Majority Decision

The decision of the Board majority granting summary disposition also shows, contrary to Entergy's new assertion, that admitted Contention 3 did not "exclude" PW's challenge. The Board did not reject PW's Contention 3 on the ground that whether the MACCS2 Code used by Entergy failed to account for a site-specific variable plume was not part of the admitted contention. Rather, it rested its decision on what it called

"the undisputed fact that *the probabilistic methods used by Applicant [i.e., the MACCS2 code] sample the entire range of wind data ... and incorporate that data into hundreds of computations from which the overall statistics and probabilistic results are obtained, and thereby subsumes all reasonably possible meteorologic patterns.*" (LBP-07-13, 20)

The majority's view of what facts were "undisputed" was wrong,⁵ but the decision is also clear that the fundamental issue before the Board was the adequacy of Entergy's SAMA analysis – what data Entergy incorporated, what results Entergy obtained, and did the code "subsume[]" all reasonably possible meteorologic patterns."

That the Board understood admitted Contention 3 to include what Entergy now says is excluded is also shown by the Majority's treatment of Richard Rothstein and Dr. Egan. The Majority dismissed what Rothstein said because, according to the Majority, he did not "address[] *any specific portion of Applicant's SAMA modeling or any potential flaws or errors in the SAMA analysis.*" (Rothstein, 18) Dr. Egan's testimony was similarly dismissed on the ground that the "approach taken by *users* of the MACCS2 code is technically sound" because it "*subsumes all reasonably possible meteorologic patterns,*" again recognizing that the code *used* by Entergy and what it *subsumes* are within the scope of the admitted contention.

Finally, and perhaps most tellingly, the Board admitted that "[t]he computations performed by MACCS2 and the results obtained depend, nearly entirely, upon the input parameters and information provided by the code user." (LBP-07-13, fn 19, p. 17)

⁵ The so-called "fact" is hardly "undisputed," and the majority's characterization of it as such is striking evidence of the extent to which the majority's grant of summary disposition improperly rested on resolving disputed material facts.

II. PW Showed A Genuine Material Dispute That Could Lead to a Different Conclusion on Potential Cost-Beneficial SAMAS.

The Commissioners' Second Question is whether PW "present[ed] a supported genuine dispute that could materially affect the ultimate conclusions of the SAMA cost-benefit analysis." PW's brief in response to CLI-09-11 provides ample evidence that there is. Entergy's argument (Br.,18-19) that PW failed to identify any dispute of material fact that would affect whether a particular SAMA is cost effective is wrong in two important respects. It overlooks that PW's contention is that "further analysis is called for." It also ignores PW's showing that further analysis could show an "increase in baseline benefit" far greater than the 100% that Entergy says is needed to make an additional SAMA beneficial.

A. The Admitted Contention Requires Only that "Further Analysis Is Called For."

Accepted Conention 3 says "that further analysis is called for" [LBP-06-23,64 NRC at 341]; it does not allege, or require PW to show, that any particular SAMAs are cost effective. Rather, PW is only required to show that Entergy's SAMA analysis is so deficient that furthur analysis might show additional SAMAs might be required – and PW has done so.

The contention calling for "further analysis," but not proof that any particular SAMAs would be cost justified, recognized that a dispute whather Entery's SAMA analysis is defective is a "material" issue, and that "resolution of the dispute would make a difference in the outcome of the licensing proceeding." [54 Fed. Reg. at 33,172]. NRC Regulations are quite clear that it is the applicant's burden to perform a site-specific appropriate SAMA analysis. 10 C.F.R § 2.325. If the analysis that Entergy has so far performed is not appropriate, it has not met its burden, and its license cannot properly be renewed. Entergy cannot show that its to-date analysis is sufficient simply by arguing that the only "material" dispute is "whether or not there are facts at issue which can affect whether or not a particular SAMA is cost-effective." [Entergy at 18-19 citing, LBP-07-13, 66 NRC at 140] A decision in PW's favor on its contention that Entergy has not performed a sufficient analysis and that further analysis is called could result in "a difference in outcome of the licensing proceeding" [See *In the Matter of Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Units 2 and 3) Docket Nos. 50-336-LR, 50-423-LR

ASLBP No. 04-824-01-LR July 28, 2004, p. 7]. Difference in outcome is the standard of “material” and it is far different from “whether or not a particular SAMA is cost-effective.”

Duke Energy Corp., (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-02-17, 56 NRC(2002), at 13, [CHECK CITATION] supports this conclusion. There, the Board said "if ‘further analysis’ is called for, that in itself is a valid and meaningful remedy under NEPA." (cited in PW Motion to Intervene, p. 48-49, emphasis added). As the Board should have done here, the Board in *Duke Energy* rejected the licensee’s argument that NEPA could not require it to implement any particular SAMA: “While NEPA does not require agencies to select particular options, it is intended to ‘foster both informed decision making and informed public participation, and thus to ensure the agency does not act upon incomplete information, only to regret its decision after it is too late to correct’” (citing *Louisiana Energy Services* (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77,88 (1998) emphasis added. Entergy’s current analysis is “incomplete information,” and the Commission should require further analysis to insure that it will not “regret its decision after it is too late to correct.”

At summary disposition it was not, and in the hearing that should take place it is not, PW’s burden to redo the SAMA analysis using variable trajectory models that Entergy should have used, or to run the number of “scenarios” that would be required to provide precise costs. “A petitioner is not required to redo a SAMA analyses in order to raise a material issue” [In re Entergy Nuclear Operations, ASLBP No. 07-858-03-LR, BD01, Order of July 31, 2008, at 79]. Judge Young in her dissent agreed that requiring PW to “provide calculations proving the negative of Entergy’s sensitivity analysis is unreasonable....” [LBP-07-13, 66 NRC, Dissent, 39]

The admitted contention obliged PW only to show that “further analysis is required.” In that “further analysis,” “computational time should not be a major factor in the choice of dispersion model for use in non- real-time applications.” [Egan, 13 in response O’Kula Item 15]. NRC Staff expert, Dr. Bixler, [Affidavit Of Joseph A. Jones And Dr. Nathan Bixler Concerning Entergy’s Motion For Summary Disposition Of Pilgrim Watch Contention 3, June 25, 2007 Prepared For The NRC Staff, (NEB, 7)] agrees that although “the effort to perform a multi-weather station consequences analysis is significantly

greater than the efforts to perform a similar analysis with MACCS2... such multi-state analyses have been and continue to be performed.”

B. Use Of A Variable Trajectory Model Could Materially Affect Whether Additional SAMA May Be Cost-Beneficial

Entergy did not directly respond to the Commission’s question whether the use of a variable trajectory model would materially affect whether any additional SAMA would be cost effective. Instead, Entergy chose to avoid the question by claiming, incorrectly as shown above, that challenges to the MACCS2 code and straight-line Gaussian plume embedded in it were excluded from Contention 3.

PW’s evidence (see PW Initial Brief beginning at 16) showed that the use of a variable trajectory model and MACCS2 code modified to accept site specific conditions could raise the costs of a potential accident to levels orders of magnitude higher than those projected by Entergy. These potential costs materially affect whether any additional SAMAs may be cost beneficial; and they and the facts presented by PW provided substantial evidence that there is a material dispute whether Entergy’s use of the straight-line Gaussian plume model was deficient to characterize consequences at PNPS site (PW Br., 3-7,14,15,17,19,2,22,23).

C. The Alleged “Conservatism” Of The Gaussian Plume Model And The MACCS2 Code

Entergy spends pages arguing, in various ways, that Dr. Egan did not challenge Entergy’s claim that the Entergy analysis was “conservative.” The length of Entergy’s argument, and the evidence that it ignores, show that there is a genuine material dispute whether Entergy’s analysis was “conservative” as applied to the PNPS site.

Entergy overlooks that when Dr. O’Kula said that the results reported in the WMSM Report were “generally conservative, when compared with more sophisticated models,”⁶ Dr. O’Kula was referring to the Lewellen and Molenkamp studies, not to the MACCS2 used by Entergy at Pilgrim. As pointed out in PW’s initial brief, these results were based on tests in Oklahoma and Kansas, where the “site-specific”

⁶ . Entergy’s brief (at 7) refers to Dr. O’Kula’s declaration, but omits that the NUREG/CR studies to which O’Kula referred and that he said showed that the straight-line Gaussian plume was conservative, were conducted in Idaho’s desert, Oklahoma and Kansas. See O’Kula . ¶ 17 and PW Initial Br. p. 15

conditions are immeasurably different than those at Pilgrim. Even the NRC has admitted that it would have “preferred” a different site. (See PW Initial Brief at 15-16)

Second, the statement of Dr. Egan that Entergy referenced was simply Dr. Egan’s response to Dr. O’Kula. Dr. Egan did not say that the Idaho-Kansas-Oklahoma model would be “conservative” in Massachusetts. As said in PW’s initial brief, whether the Gaussian plume model is “conservative” relative to the Pilgrim site cannot be determined without running both ATMOS (the Gaussian plume) and an alternative model (e.g. MMS and CALPUFF) with PNPS site specific data [PW Br., at 15], something Entergy did not do.

Finally, although both Entergy and the NRC Staff briefs fail to mention it, the NRC Staff’s own expert, Dr. Bixler, generally agreed with Dr. Egan and admitted that the Gaussian plume model results are “conservative” is correct only if the word “conservative” is defined narrowly:

8. (NEB) Material fact number 12 states that the MACCS2 Gaussian plume model results are in good agreement with, and generally more conservative than those obtained by more sophisticated models. If the word conservative implies that calculated plumes with the MACCS2 code are generally more focused and more concentrated than would be the case if the calculations had been performed with more sophisticated models, then the statement is accurate. However, a more focused, more concentrated plume does not always correspond to a smaller number of person-rem, depending on the trajectory of the plume compared with population centers.
(Emphasis added)

PW’s initial brief also pointed to evidence (at 16) that no matter how many “scenarios” WSMS may have studied using a “downwind in a straight line” assumption, they cannot provide a valid comparison to variable trajectory “scenarios” that WSMS never studied. The same holds true for Enercon. PW evidence showed that both the code used by Entergy and the meteorological and economic information it used were inadequate. Dr. Egan summed it up: “sensitivity studies do not add useful information if the primary model is flawed.” Egan Decl. ¶ 13. The NRC Staff’s Expert, Dr. Bixler, enumerated many of the flaws, not only in the MACCS2 code used but also in Entergy’s asserted “undisputed material facts.” [Bixler Affidavit at 8-13,16-19] Entergy’s Brief avoids any mention of a host of genuine material disputes brought forward by PW that could significantly affect the cost-benefit analysis. For example Entergy avoided: (a) the fact that input meteorological data was for only a single year and came from a single-site

[PW Br., 8]; (b) Dr. Beyea's testimony regarding health costs [Ibid., 12, 19]; clean-up costs (Ibid., 12, 19-20); dispersion offsite of material deposited on site [Ibid., 22]; and (e) a myriad of smaller economic costs when added together that would in all likelihood add up collectively to a significant amount, [Ibid., 23]

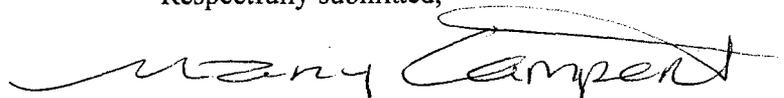
D. The Cost-Benefit Analysis Does Not "Subsume[] All Reasonably Possible Meteorologic Patterns.

The Gaussian Plume model plainly does not "subsume all reasonably possible meteorologic patterns" - it used but one - the MACCS2 code with its embedded Gaussian plume model (that incorrectly assumes a uniform wind field for the entire study area for each computational hour) to perform its SAMA analysis and its resulting cost-benefit analysis cannot do so either. Dr. Egan stated that a variable model in which winds vary spatially over time is fundamentally different from, and by definition cannot be "subsumed" by, Entergy's Gaussian plume model, which assumes and is limited to meteorological conditions steady in time and uniform spatially [Egan 9]. Dr. Egan, at 7, also described technologically advanced models that Entergy did not use such as AERMOD and CALPUFF that were feasible, appropriate to Pilgrim's site, and (unlike ATMOS) preferred by EPA.

The costs of a radiological release depends, among other things, on the size of the affected area and population, and the radioactive dose exposure. PW's evidence showed Entergy cost-benefit analysis was significantly flawed because its straight-line meteorological model did not include, i.e., did not "subsume," areas, population or radioactive dose that would be included if a variable meteorological pattern had been included. See PW Initial Br., pp. 5-7.

"Further analysis," utilizing better meteorological, input and evacuation time information, is plainly required.

Respectfully submitted,



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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE U.S. NUCLEAR REGULATORY COMMISSION

In the Matter of

Docket # 50-293-LR

Entergy Corporation

Pilgrim Nuclear Power Station

License Renewal Application

July 6, 2009

CERTIFICATE OF SERVICE

I hereby certify that the following was served July 6, 2009, Pilgrim Watch Brief in Response to Entergy's Response To CLI-09-11 (Requesting Additional Briefing) by deposit in the U.S. Mail, first class, postage prepaid, and where indicated by asterisk by electronic mail.

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