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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'S BRIEF IN RESPONSE TO NRC STAFF'S INITIAL BRIEF
IN RESPONSE TO CLI-09-11 (REQUESTING ADDITIONAL BRIEFING)**

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The arguments made by the NRC Staff in its Initial Brief (“Staff Br.”) are largely the same as those made by Entergy. PW is responding to both initial briefs, but in doing so has tried to avoid unnecessary duplication. This response to the Staff focuses principally on points not made in Entergy’s brief or that are particularly appropriate to the NRC. With respect to arguments common to Entergy and the Staff, the Commission should consider what is said in both of PW’s responses, and the Commission should conclude that the positions of both Entergy and the NRC Staff are wrong.

FUNDAMENTAL ERRORS IN NRC STAFF’S BRIEF

A. It is the Staff (and Entergy) that would now like to rewrite Contention 3.

The Staff says it “must be emphasized that PW did not file any appeal from the Board’s admission of Contention 3, as modified and restated by the Board.” (Staff Br., 4) The Staff apparently fails to recognize that PW’s position remains that “Contention 3, as modified and restated by the Board,” includes challenges to Entergy’s “use of particular methodologies, such as the use of the straight-line Gaussian plume model to predict the atmospheric dispersion of radionuclides.” PW does not agree with the Board’s *rationale* for rewriting Contention 3, but that is a separate question.

At the time the Board rewrote Contention 3, Entergy correctly understood that the rewritten contention included both “*meteorological code* and input data.” (Entergy’s Motion for Summary Disposition of Pilgrim Watch Contention 3, p. 10, italics added) The Staff apparently agreed. In June 2007, NRC Staff asked their own experts, Dr. Nathan Bixler and Joseph Jones, to evaluate Entergy’s Material Facts to determine whether the Gaussian Plume model and MACCS2, *as used* by Entergy, accurately reflected conditions at Pilgrim.¹

Contrary to the Staff’s current position, the Board did not “omit[] 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.” [Staff’s Initial Br., 10, italics added] It is too late for the Staff to change its mind and try to rewrite Contention 3 now. The Staff correctly

¹ 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 NRC Staff response to Entergy’s Motion for Summary Disposition of Pilgrim Watch Contention 3, June 29, 2007

understood what that Contention covered when the Board admitted it. Had the Staff questioned what the rewritten Contention covered, or had it wanted it rewritten to say what the Staff now wants it to say, it could have sought clarification or filed an appeal. It did not do so.

The issues raised in Contention 3 as admitted included “[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.” (PW Response to Entergy Initial Br., 2)

The Staff says that “PW chose to limit Contention 3 to the data entered into the MACCS2 Code (i.e., the input data) rather than presenting expert opinion to support a challenge to the Gaussian plume model and use of the MACCS2 Code.” (Staff Br., 8). The statement is doubly incorrect. First, it was the Board, not PW, that “modified and restated” Contention 3. Second, PW never limited, by choice or otherwise, Contention 3 to what the Staff calls “input data;” rather PW has challenged, with expert opinion, Entergy’s use of the Gaussian plume model and use of the MACCS2 code.

The Staff’s statement that “the parties, the Board majority, and the dissent all agreed that the Gaussian Model is not ‘input data,’ and as such, it was beyond the scope of the Contention 3 as admitted” is also not true. PW does not agree; the dissent did not agree; and the Board majority decision makes very clear that, far from being beyond the scope, the MACCS2 code and what it did were central to the Majority decision granting summary disposition.

II. NRC Staff Incorrectly Assert that PW Failed to Present a Genuine Issue of Material Fact that would Affect the SAMA Analysis [Staff Br., 12-]

NRC Staff, like Entergy, did not answer the Commission’s first question, whether the use of a variable trajectory model would materially affect whether any additional SAMAs would be cost effective. Instead, like Entergy, the Staff chose to change its position on the contention itself, and say that challenges to Entergy’s use of the MACCS2 code and straight-line Gaussian plume embedded in it were excluded. PW demonstrated otherwise in PW’s Response to Entergy’s Brief Responding to CLI-09-11, Section I.

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

In arguing that there is no material dispute regarding whether Entergy’s analysis was “conservative,” NRC’s Staff Brief said that “PW did not controvert Entergy’s declarations regarding conservatisms in the MACCS2 code and the Gaussian plume model as applied in Entergy’s SAMA analysis.” Not true. Not only did PW controvert Entergy’s declarations, but NRC Staff’s own expert did also. [*Supra*, page 1] There is clearly a material dispute - between Entergy’s expert on one side and both Dr. Egan and the NRC Staff’s Expert on the other.

Dr. Nathan Bixler (NEB), a Principle Member of the Technical Staff in Sandia National Laboratories, directly addressed the conservatism of the Gaussian plume. Although NRC Staff’s Initial Brief to the Commission says that, “The Gaussian model produced conservative results for the SAMA cost-benefit analysis” [Staff Br., 19], the declaration of their own expert disagrees:

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)

Therefore NRC Staff’s expert is in full accordance with PW’s argument that whether a Gaussian model is conservative depends entirely on “*the trajectory of the plume compared with population centers;*” and PW submitted significant evidence that the straight-line Gaussian plume could not, and did not, predict site-specific atmospheric dispersion for Pilgrim’s coastal region, or accurately predict what population centers the likely variable plume would affect. [PW Br., 4-10, 14,17]

For example, while Entergy assumed that a plume blowing out to sea would have no impact on any population centers, PW showed that a plume over water, rather than being rapidly dispersed, will remain tightly concentrated due to the lack of turbulence, and will remain concentrated until winds change the plume’s trajectory and blow it ashore. This can lead to hot spots of concentrated radioactivity

in places along the coast, certainly including densely populated Metropolitan Boston; or to Cape Cod directly across the Bay with a summer population of 600,000. [PW Br., 5, 17, Rep. Patrick Decl., 2]

The Staff Initial Brief also argues (pp. 18-21) that Entergy's sensitivity studies support the Board majority's grant of summary disposition. Again the Staff's expert, Dr. Bixler, supported PW's Dr. Egan, not the position now taken by the Staff; and Dr. Bixler's testimony supports PW's position that there is a material dispute that could not properly have been resolved by summary disposition.

Dr. Bixler said very plainly that Entergy's claim, that its study was conservative because it used conditions at the beginning of a plume release, was "erroneous."

9. (NEB) Material fact number 16 states that Sensitivity Case 2 estimated the effects of changing wind direction trajectory and was conservative because it used conditions at the beginning of a plume release, when the release has larger dose quantity and less decay has occurred. The MACCS2 value modified in Sensitivity Case 2 appears to have been REFTIM (Representative Time Point for Dispersion and Radioactive Decay). *REFTIM* affects the way in which dispersion, deposition, and radioactive decay are calculated. It *does not affect the manner in which "wind direction trajectory" is calculated.* This statement appears to be *erroneous...*"

Again, the Staff's expert is in full accordance with PW's expert, leaving Entergy and NRC Staff at odds.

In replying to Dr. O'Kula, Dr Egan said:

Item 16: This declaration seems to state that randomly chosen meteorological conditions would give the same results as inputting meteorological conditions as a function of time. This is an *erroneous* concept with real meteorology which does not generally behave in a random manner. In order to take into account meteorological conditions 'as a function of time' a model must process the meteorological data sequentially with time. Common phenomena in weather data analysis is the role of persistence of combinations of meteorological events over periods of hours to many days. The probability that the next hour's meteorology will be similar to the previous hour's or that tomorrow's weather will be like today's is fairly high and certainly not random or independent of what happened in the previous time period.

The sea breeze effect, ignored by Entergy's model, is a critical feature at Pilgrim's coastal site and results in multiple changes in the plumes trajectory affecting population centers during their peak population periods. [PW Br., 4, 17; KLD Associates Inc., Pilgrim Nuclear Power Station Development of Evacuation Time Estimates, October, 2004, 3-9 to 3-22]

Here, again, Dr. Bixler agrees with PW and Dr Egan, [Egan Decl.,13, Item 20] and says that “*the effect of sea breeze is not taken into account*” in Entergy’s studies.

10. (NEB) Material Fact number 19 states that the effect of sea breeze is taken into account in the Pilgrim site meteorological data. *Although the wind speed and direction of a sea breeze may be included in the actual PNPS meteorological data, the effect of sea breeze is not taken into account.* The effect that is not taken into account is that the *complex flow pattern under sea breeze conditions differs substantially from the straight-line pattern used in the MACCS2 analyses.* The sea breeze occurrences are typically diurnal events, occurring during daylight hours and during warmer seasons.

In short, Dr. Bixler supports the crux of PW’s material dispute of fact - “complex flow patterns” at Pilgrim’s coastal location “differ substantially from the straight-line pattern used in the MACCS2 analyses.” NRC regulations are clear that the SAMA cost-benefit analysis is a Category II (site specific) issue that must be considered as part of a license renewal; and PW’s contention is site specific – *for the Pilgrim Plant* – Entergy’s analysis at its core is not.

B. Conservatism Of MACCS2 Code’s Economic Model

Dr. Bixler’s testimony also supports PW’s position that there are genuine disputes of material facts whether Entergy’s SAMA significantly underestimated costs, not only by using the straight-line Gaussian model instead of a variable trajectory model, but also by minimizing or ignoring a host of other important costs. Like PW, Dr. Bixler examines Entergy’s sensitivity studies and points to economic losses that will result from a severe accident but were excluded from analysis.

PW established a significant material dispute that Entergy significantly minimized the true and significant costs of clean-up after a severe accident. [PW Initial Br., 12, 21] NRC’s expert agreed:

16. (NEB) Material fact number 46 states that the MACCS2 model accounts for losses associated with economic activity... However, *these losses do not apply to people relocated from property that has been condemned. For condemned property, the model simply accounts for the value of the condemned property and the cost to permanently relocate individuals from the condemned property.*

Dr. Bixler makes the essentially the same argument as PW once again at 17:

17. (NEB) Material fact number 47 states that that the SAMA analysis for PNPS allows for a return of 12% on the actual fair market value of all business property, including land, buildings, equipment and inventory and as such does account for loss of economic activity. Again, this statement is true for land that is interdicted and returned to use. *It does not apply to land that is*

condemned. However, the Pilgrim MACCS2 *analysis results show that most land is restored to use and not condemned;* thus, this statement is true in context. (Emphasis added)

PW's Initial Brief established a genuine material dispute that Entergy ignored a myriad of smaller economic costs that were underestimated or totally ignored in their use of the MACCS2, but that when added together would in all likelihood add up collectively to a significant amount. [PW Br., 22] Again NRC Staff's expert, Dr. Bixler, agreed:

19. (NEB) The sensitivity case to which material fact number 50 refers added one year's gross county product per person (GCP/person) to the value of the land. This does *not fully account for business losses.* During periods of decontamination and interdiction, the costs accounted for in the model are the cost of decontamination, the cost to temporarily relocate people from the land, and costs associated with depreciation of improvements to the property and loss of use of the land and improvements. Loss of use is based on an expected rate of return and on the value of the property. For this SAMA analysis, the expected rate of return is 12% and the depreciation rate is 20%. What this means is that only a fraction of the actual GCP/person (less than 28% in the first year) is accounted for in the costs assigned during decontamination and interdiction. Furthermore, only one year's GCP/person is accounted for in areas where the property is condemned even though the income associated with the land is lost permanently. Thus, *this sensitivity case does not fully address the issue of loss of income.* (Emphasis added)

On the question of "conservative," Bixler and Egan are clear. The Entergy model is conservative only if "conservative" means "limited;" but it is anything but "conservative" if the question is whether the results of Entergy's model will fairly reflect reality. PW recognizes that Bixler qualifies his misgivings about the Gaussian plume model and Entergy's use of the MACCS2 code by concluding, in effect, that whether the module and code is good or bad doesn't really matter because Entergy and their experts assume that a severe nuclear reactor accident at Pilgrim will not cause significant damage. For example NRC expert, Dr. Bixler qualified deficiencies of Entergy's cost-benefit analysis at 16 with "most of the contaminated property is restored in the Pilgrim MACCS2 analyses;" at 17 "the Pilgrim MACCS2 analysis results show that most land is restored to use and not condemned;" and at 19 "the MACCS2 analyses shows that most of the contaminated land is recovered and tourism would be calculated to return to the area."² PW strongly doubts that anyone within 1000 km of Chernobyl or anyone who knows what really happened at TMI would agree with Dr. Bixler's expectations.

² After a truly severe accident at Pilgrim it is absurd not to recognize that travel would be severely impacted in at least four Massachusetts counties- Plymouth, Barnstable, Dukes and Nantucket. The reason for this is in order to

In any event, what damage a severe radiological release would cause is subject to serious material dispute here. The only way to conclude that none of these flaws in Entergy's SAMA analysis matter if there is truly a severe accident is by falsely assuming minimal contaminants will be released and to minimize the likely consequences by: using an inappropriate meteorological module, the straight-line Gaussian module; underestimating health costs; overestimating evacuation time estimates; significantly minimizing the true and significant costs of clean-up; ignoring the dispersion of contamination deposited initially onsite to their being blown by coastal winds offsite; and ignoring or severely minimizing a myriad of other smaller economic costs that collectively add up to a significant amount. [PW Br., 17-23] PW understands that NRC does not require "worst case scenarios" but that does not give license to modeling only "best case scenarios," as was the case in Entergy's SAMA analysis.

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

Since the MACCS2 Code *used* by Entergy had only one embedded Gaussian Plume model to perform its SAMA analysis, the resulting cost-benefit analysis did not "subsume all reasonably possible meteorologic patterns." PW and NRC's expert, Dr. Bixler, both establish a genuine dispute of material fact that other codes for computing consequences exist. Dr. Bixler says that,

18. (NEB) Material fact number 49 states that no other code exists that performs similar analyses for severe accidents at nuclear power plants. There is at least one other code that is similar to MACCS2, and that code is COSYMA (and) [t]here are other codes for computing consequences."

In response to whether these other models would be impractical, as claimed by Entergy, NRC's expert, Dr. Bixler, said:

7. (NEB) (Entergy's) Material fact number 10 states that it is impracticable to use computer codes that accommodate multi-station data... (In contradicting this assertion, Dr. Bixler says) [s]uch multi-station analyses have been and continue to be performed in support of Final Safety Analysis Report (FSAR) documentation for space launches that involve significant quantities of radioactive materials.

travel to the Cape and Islands it is necessary to travel through Plymouth County; and, as PW showed, a plume would travel across the water in concentrated form to the Cape. Travel expenditures for simply these counties, in 2003 alone, exceeded >\$1 billion dollars. Specifically, they were: Plymouth, \$353.14 million; Barnstable, \$684.27 million; Dukes, \$91.86 million, Nantucket, \$139.93 million. Plimoth Plantation alone, which is < 5 miles from the plant, brings in almost \$ 10 million a year. [PW Motion to Intervene, 3.3.3.4 Economic data]

Again Staff's expert confirms testimony provided by Dr. Egan for PW [Egan Decl., 13]

CONCLUSION

PW demonstrated genuine material disputes, presented through reputable experts, as to material facts regarding Entergy's use of the straight-line Gaussian plume module to predict atmospheric dispersion of radionuclides and use of the MACCS2 code for determining economic costs. Nothing presented in NRC Staff's Initial Brief in Response to CLI-09-11 indicated otherwise. As the admitted contention says "further analysis is called for," This contention should be remanded for hearing.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Mary Lampert", with a large, sweeping flourish extending to the right.

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July 6, 2009

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 NRC 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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