RAS# J-112

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

Entergy Corporation

Pilgrim Nuclear Power Station

License Renewal Application

Docket # 50-293

May 5, 2008

Pilgrim Watch Motion Regarding the Cumulative Usage Factor (CUF)

Pilgrim Watch herein files a motion regarding a serious public safety issue – the Cumulative usage factor (CUF).

A. Background

On April 9, 2008 Pilgrim Watch Filed A Motion Requesting that *The Record Be Held Open So That The Board May Address A New And Significant Issue Method To Calculate Cumulative Usage Factors (CUF) Sua Sponte And Provide Pilgrim Watch An Opportunity For Hearing.*

Entergy and NRC Staff objected, April 21, 2008. Pilgrim Watch replied to their objections on April 30, 2008. In turn, Entergy filed a *Motion to Strike Pilgrim Watch's Reply to Entergy's and NRC's Responses Opposing Pilgrim Watch's Motion Requesting That the Record Be Held Open for Sua Sponte Consideration of Cumulative Usage Factors.* Pilgrim Watch replied April 30, 2008. Both Entergy and NRC filed motions – respectively, Entergy filed on May 1, 2008 and NRC on May 2, 2008.

Temp - SECY-041

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Pilgrim Watch responds to both of these later motions by filing a new Motion regarding the cumulative usage factor (CUF).[1] Entergy's May 1, 2008 objection to Pilgrim Watch's April 30, 2008 reply was that Pilgrim Watch had no right to reply except as permitted by the ASLB and that the ASLB had not granted such permission; in other words, that Pilgrim Watch had not filed a Motion. Therefore for that reason, Pilgrim Watch now files a motion.

The second reason for filing this motion is that there is yet another "new and significant" piece of information regarding CUF.

The NRC on May 1, 2008 filed notice that they were seeking public comment on a proposed regulatory issue summary (RIS) to notify plant licensees that a methodology used by some license renewal applicants to demonstrate the ability of plant components to withstand the stress of an additional 20 years of operation may not be sufficiently conservative if not applied correctly. [Attachment A].[2] The notice establishes that NRC has recognized that this is an important issue and it states that,

> The methodology in question calculates the fatigue usage of certain components during plant startups and shutdowns. The full calculation requires consideration of six stress components, as detailed by the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. However, some licensees have performed a simplified version of this calculation using only one stress value for the evaluation of actual plant conditions.
>
> The simplified calculation *may* provide acceptable results for some applications; however, it also *requires a great deal of judgment by the analyst* to ensure that the simplification still provides a conservative result.
>
> The NRC requested recent license renewal applicants who used the simplified calculation to perform confirmatory analyses using all six stress components. *To date,* the confirmatory analysis of one component – a boiling-water reactor feedwater nozzle – indicated that the simplified calculation did not produce conservative results in the nozzle bore area when compared to the detailed analysis. However, the confirmatory analysis still demonstrated that the nozzle had acceptable fatigue usage. [Emphasis added].

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[1] NRC Staff was contacted, they object; Entergy was not directly contacted although PW called and left a voice mail message around 10:00 AM, May 5 and followed with an email at 12:29, May 5, 2005.

[2] NRC Regulatory Issue Summary 2005-20, REV. 1, Revision to NRC Inspection Manual Part 9900 technical Guidance, "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety," April 16, 2008, ADAMS "ML0734401030." NRC Inspection Manual Part 9900:Technical Guidance; ADAMS "ML073531346."

Pilgrim Watch makes note that the proposed RIS is simply a proposal out for comment. It simply says that, "The simplified calculation *may* provide acceptable results for some application." The flip side of that statement is that it "may not" and, most important, may not for Pilgrim. Last, the proposal simply says that, "*To date,* the confirmatory analysis of one component – a boiling-water reactor feedwater nozzle- did not produce conservative results; there may be more than one component at other reactors, such as at Pilgrim. RIS" statement is drawn from lessons learned at Vermont Yankee, and only after citizen intervention. To the best of our knowledge, a confirmatory analysis of components not meeting the acceptable CUF has yet to be determined at Pilgrim or at other affected reactors.

Entergy has made a habit out of filing license renewal applications with cumulative usage factors exceeding (1.0) – Arkansas Until 1 and Unit 2, Vermont Yankee, Pilgrim, Oyster Creek, and Indian Point. At each one of these reactors, Entergy filed essentially the same license renewal application and then waited to see if there is any objection before negotiating commitments with NRC.

It has taken citizen intervention at each reactor site to bring this issue to the attention of the NRC. If it were not for citizen intervention in Entergy's Vermont Yankee site, followed by Entergy's Oyster Creek and Indian Point sites the issue would have gone unnoticed by NRC and the public. Again it is not Pilgrim Watch but Entergy and NRC that are "inexcusably late" in properly addressing and fixing this important public safety concern.

B. Issue of Law

The LRA does not include an adequate plan to monitor and manage the effects of aging due to metal fatigue on key reactor components that are subject to an aging management review, pursuant to 10 C.F.R. § 54.21(a), and an evaluation of time limited aging analysis, pursuant to 10 C.F.R. § 54.21(c).

C. Basis

1. The cumulative usage factor (CUF) is a number used to assess the possibility of fatigue failure. It is the ratio of the number of cycles experienced by a structure or component divided by the number of allowable cycles for that structure or component. At a nuclear power plant, the maximum number of cycles that should be experienced by any structure or component should always result in a CUF of less than 1.0. In other words, the number of actual cycles experienced should always be less than the number of allowable cycles.

2. The data that Entergy provided in the LRA and reviewed in NUREG-1891 (the SER) indicates that key components have a CUF value of greater than 1.0; and thus they will have a greater potential to crack and/or fail due to metal fatigue during the proposed license renewal term. This could potentially result in catastrophic failure during day-to-day operation, or more likely during anticipated or unanticipated transients. The commitments agreed to by Entergy [No. 31 and No. 35][3] do not provide reasonable assurance to the public that the issue is resolved, discussed below.

C. Issue Raised is within the Scope of the Proceeding

1. Pilgrim Watch files this Motion to allow for public participation regarding this "new and significant" issue that has the potential to severely impact public safety at Pilgrim Station where certain plant systems, structures, and components suffer the effects of metal fatigue.

2. Specifically, the applicant's own data demonstrates that (a) the reactor vessel shell and lower head, (b) reactor vessel feedwater nozzles, (c) reactor recirculation system piping (including inlet and outlet nozzles), and (d) feedwater piping have an environmentally adjusted CUF greater than 1.0 [4] and thus are at a higher risk for failure due to metal fatigue. These (4) systems were identified by NUREG/CR-6260 Section 5.7 to be among the nine systems most sensitive to environmental effects for PNPS vintage General Electric plants.[5]

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[3] NUREG-1891, Appendix A, Commitments 31 and 35; ADAMS ML073241016; Attachment
[4] Ibid, 4.3.3.1 *Summary of Technical Information in the Application*
[5] Ibid

3. Because the issue of metal fatigue of plant systems requires aging management review this issue is within the scope of this license renewal proceeding.

D. The Issue Raised Is Material

The issue of metal fatigue is material to this relicensing proceeding. The commitments made by Entergy to NRC do not provide reasonable assurance that public safety will be protected. Therefore the NRC must make certain findings to protect the public health and safety, and the environment, and either deny the license extension, or impose significant modifications to the commitments.

E. Concise Statement of the Facts

1. Entergy must comply with the following requirements of 10 C.F.R. § 54.21(c) (1):

   Each application must contain the following information:
   (c) An evaluation of time-limited aging analyses.
   (1) A list of time-limited aging analyses, as defined in § 54.3, must be provided.
   The applicant shall demonstrate that--
   (i) The analyses remain valid for the period of extended operation;
   (ii) The analyses have been projected to the end of the period of extended operation; or
   (iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation [10 C.F.R. § 54.21(c)(1)].

2. Data in the SER indicates that some key reactor components will have a greater potential for cracking due to metal fatigue before the year 2032, during the period of extended plant operation

3. **PNPS's data is summarized as follows:**
Component Plant Environmentally Adjusted CUF (Entergy's data) that exceeds 1.0 CUF criterion includes [NUREG-1891, SER 4.3.3.1 at 4-44]:

Reactor vessel shell and lower head

Reactor vessel feedwater nozzles

Reactor recirculation system piping (including inlet and outlet nozzles); and

Feedwater piping

4. Component fatigue, which can lead to ultimate failure, is an aging phenomenon that results from cyclic mechanical and thermal stresses. Failure from fatigue can result in dangerous pipe ruptures, component malfunction, or the migration of loose pieces of metal through the reactor system, which can interfere with safe operation of a plant.

5. Data in NUREG-1891, referred to above, indicates that the requirements of 10 C.F.R. §§ 54.21(c)(1)(I) and (ii) are not satisfied because they exceed the CUF on their face.

6. **Commitments**

To satisfy section 54.21(c)(1)(iii) – that "the effect of aging on the intended functions(s) will be adequately managed for the period of extended operation" – Entergy agreed to License Renewal Commitments 31 and 35 (NUREG-1891, SER, Appendix A, A-10 thru A-13].

Commitment 31 says that: At least 2 years prior to entering the period of extended operation, for the locations identified in NUREG/CR-6260,for BWRs of the PNPS vintage, PNPS *will* [emphasis added] refine our current fatigue analyses to include the effects of reactor water environment and verify that the cumulative usage factors (CUFs) are less than 1. This includes applying the appropriate Fen [sic] factors to valid CUFs determined in accordance with one of the following:

1. For locations, including NUREG/CR-6260 locations, with existing fatigue analysis valid for the period of extended operation, use the existing CUF to determine the environmentally adjusted CUF.

2. More limiting PNPS-specific locations with a valid CUF may be added in addition to the NUREG/CR-6260 locations.

3. Representative CUF values from other plants, adjusted to or enveloping the PNPS plant specific external loads may be used if demonstrated applicable to PNPS.

4. An analysis using an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case) may be performed to determine a valid CUF.

During the period of extended operation, PNPS *may* also use one of the following options for fatigue management *if ongoing monitoring indicates a potential for a condition outside the analysis bounds noted above*: [emphasis added]

1. Update and/or refine the affected analyses described above.

2. Implement an inspection program that has been reviewed and approved by the NRC (e.g., periodic nondestructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC).

3. Repair or replace the affected locations before exceeding a CUF of 1.0.

Enhancement or Implementation Schedule: June 8, 2012; June 8, 2010 for submitting the AMP *if* [emphasis added] PNPS selects the option of managing the effects of aging due to environmentally assisted fatigue

Commitment 35 says that: At least 2 years prior to entering the period of extended operation, for reactor vessel components, including the feedwater nozzles, PNPS *will* implement *one or more* of the following [emphasis added]:

(1) Refine the fatigue analyses to determine valid CUFs less than 1. Determine valid CUFs based on numbers of transient cycles projected to be valid for the period of extended operation.

Determine CUFs in accordance with an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC- approved code case).

(2) Manage the effects of aging due to fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC).

(3) Repair or replace the affected locations before exceeding a CUF of 1.0. Should PNPS select the option to manage the aging effects due to fatigue during the period of extended operation, details of the AMP such as scope, qualification, method, and frequency will be submitted to the NRC at least 2 years prior to the period of extended operation.

Should [emphasis added] PNPS select the option to manage the aging effects due to fatigue during the period of extended operation, details of the AMP such as scope, qualification, method, and frequency will be submitted to the NRC at least 2 years prior to the period of extended operation.

Enhancement or Implementation Schedule: June 8, 2012; June 8, 2010 for submitting the AMP *if* [emphasis added] PNPS selects the option of managing the effects of aging due to environmentally assisted fatigue

7. What's wrong?

a) The Commitments are vague, incomplete, and lacking in transparency. The commitment says they will "refine the current fatigue analyses to include the effects of reactor water environment and verify that the cumulative usage factors (CUFs) are less than 1." We note that "verify that the cumulative usage factors (CUFs) are less than 1" appears to suggest doing the math to get the "right" answer. Further they "may" choose to do more inspections or fix or replace the component. Then again, they may not choose to do so.

b) In Appendix A's *PNPS License Renewal Commitments* [Nureg-1891, A-10-13] under "Enhancements or Implementation Schedule" for Commitment 31 it says, "Enhancement or Implementation Schedule: June 8, 2012; June 8, 2010 for submitting the AMP if PNPS selects the option of managing the effects of aging due to environmentally assisted fatigue;" and for Commitment 35 it says, "Enhancement or Implementation Schedule: June 8, 2012; June 8, 2010 for submitting the AMP if PNPS selects the option of managing the effects of aging due to environmentally assisted fatigue."

Both say "*if*" PNPS selects the option..." not PNPS *shall* select..." In effect, it is no commitment, without a requirement.

c) To make our point, consider Commitment 35. It offers Entergy the following "options"- choose from a menu 1, 2 or 3.

First, Entergy "may" choose to refine the fatigue analyses to determine valid CUF's less than 1.0 – redo the math. The commitment allows Entergy to simply do the computation again to get the "right" answer – that is a number < 1.0. We all know enough about computations that you can start with the answer and then work backwards. It is the equivalent of torture – if you cause the prisoner enough pain he or she will say anything. Because the license will be approved by the time the option is taken, if Entergy chooses to take the option, the public will not have the opportunity to review the numbers and check Entergy's math. It is clear that the commitment does not provide reasonable assurance. For example, Entergy got the "wrong" answer in the feedwater nozzle CUF numbers that were placed in the LRA – not simply wrong but indefensible. NUREG-1891, 4.3.1.2.1 says that in LRA Section 4.3.1.4 the applicant projected the 60-year feedwater nozzle CUF to be less than 0.899. The NRC Staff independently calculated the 60-year feedwater nozzle CUF value to be 1.217 on the same operational data and assumptions. Entergy withdrew their numbers. Now NRC gives Entergy an out in the Commitment – an opportunity to recalculate the numbers.

Second, NRC gives Entergy another "option" in the Commitment. Entergy "may" manage the effects of aging due to fatigue at certain locations by an inspection program that has been

reviewed by and approved by NRC. No specifics are provided to the public prior to license approval – there is no clear inspection schedule - it simply asks the public to take a leap of faith that NRC will assure the adequacy of a yet-to-be-determined program that might or might not occur.

Third, NRC gives Entergy yet another "option" in the Commitment. Entergy "may" choose to repair or replace the affected locations before exceeding a CUF of 1.0. Therefore, the public is provided no assurance that the affected components will not break before Entergy gets around to replacing them. The components that are now known to exceed the CUF factor of 1.0 should be replaced immediately. Indeed, it is telling that Entergy admits it has known of these conditions and has failed to make the necessary repairs and replacements.

This does not constitute an adequate aging management plan consistent with the intent of 10 C.F.R. §§ 54.21(c)(1)(iii) and 54.21(a)(3).

F. Conclusion

1. Pilgrim Watch has demonstrated above that NRC identified, and Entergy admitted, that four key components exceed the CUF criterion of 1.0. Entergy agreed to (2) commitments that upon closer inspection do not provide reasonable assurance to the public. If they choose to follow an option they may repair or replace these components or they may not; certainly if they do, it seems clear that it will be only as a last resort, not the most obvious and prudent first resort. Entergy may choose to "rework the numbers" (or, in Entergy's words, "refine the fatigue analyses") to "determine valid CUFs less than 1.0 when accounting for the effects of reactor water environment." By the Commitment's words ("determine valid CUFs"), NRC and Entergy have prejudged the outcome - gamed the licensing renewal process. Indeed, Entergy did just this after it filed its license renewal application for the Vermont Yankee Nuclear Power Station. This reworking of the numbers prompted the filing of an additional contention on metal fatigue, which the ASLB admitted in the license renewal proceeding. *See Mtr. of Entergy Nuclear Vermont Yankee, LLC (Vermont Yankee Nuclear Power Station)*, ASLBP No. 06-849-03-LR (Nov. 7, 2007). Here at Pilgrim, Entergy will not get caught - unless the ASLB steps in and this

contention is allowed; or in the alternative the ASLB chooses to appoint an outside, independent expert to examine the issue under full and open public scrutiny – a process that I believe is within the board's authority.

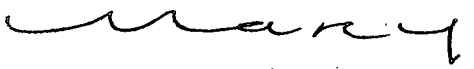
2. The integrity of these safety components has serious safety implications for the public – that goes without saying. Because Pilgrim's safety depends on proper resolution of the metal fatigue issue (among other issues), the Commission cannot honestly make the required findings that there is reasonable assurance that Pilgrim can operate within NRC requirements another 20 years.

3. This motion serves to further illustrate that, as previously alleged in Citizen's Petition, dated January 3, 2007, the license renewal safety reviews conducted by NRC Staff have failed to identify and fully resolve safety issues associated with operating degraded nuclear plants for 20 years beyond their initial 40 year life. The commitments themselves tell the story that the NRC Staff is unwilling to *require* the licensee to take specific and meaningful steps to provide real assurance. Further review is required at Pilgrim by the ASLB to assure that it will satisfy the AEA requirements to protect public health and safety and also to ensure that there will be meaningful opportunity for public participation in this important aspect of the licensing decision.

The Vermont Yankee proceeding has now confirmed that vigorous citizen involvement can lead to needed scrutiny and that inevitably leads to better decision-making.

Thank you for your consideration.

Respectfully submitted,



Mary Lampert

Pilgrim Watch, pro se

148 Washington Street

Duxbury MA 02332

ATTACHMENT - A

NRC NEWS

U.S. NUCLEAR REGULATORY COMMISSION
Office of Public Affairs *Telephone: 301/415-8200*
Washington, DC 20555-0001 E-mail: opa@nrc.gov
www.nrc.gov

No. 08-088 May 1, 2008

NRC SEEKS PUBLIC COMMENT ON FATIGUE ANALYSIS OF NUCLEAR POWER PLANT COMPONENTS[6]

The Nuclear Regulatory Commission is seeking public comment on a proposed regulatory issue summary (RIS) to notify power plant licensees that a methodology used by some license renewal applicants to demonstrate the ability of plant components to withstand the stress of an additional 20 years of operation may not be sufficiently conservative if not correctly applied.

The methodology in question calculates the fatigue usage of certain components during plant startups and shutdowns. The full calculation requires consideration of six stress components, as detailed by the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. However, some licensees have performed a simplified version of this calculation using only one stress value for the evaluation of actual plant conditions.

The simplified calculation may provide acceptable results for some applications; however, it also requires a great deal of judgment by the analyst to ensure that the simplification still provides a conservative result.

The NRC requested recent license renewal applicants who used the simplified calculation to perform confirmatory analyses using all six stress components. To date, the confirmatory analysis of one component – a boiling-water reactor feedwater nozzle – indicated that the simplified calculation did not produce conservative results in the nozzle bore area when compared to the detailed analysis. However, the confirmatory analysis still demonstrated that the nozzle had acceptable fatigue usage.

Comments on the proposed RIS, which was published today in the *Federal Register*, will be accepted through June 16. Comments should be submitted to the Chief, Rulemaking, Directives

[6] http://www.nrc.gov/reading-rm/doc-collections/news/2008/08-088.html

and Editing Branch, Division of Administrative Services, Office of Administration, U.S. Nuclear Regulatory Commission, Mail Stop T6-D59, Washington, D.C. 20555-0001.

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the matter of — Docket # 50-293-LR

Entergy Corporation

Pilgrim Nuclear Power Station

License Renewal Application — May 5, 2008

CERTIFICATE OF SERVICE

I hereby certify that the following was served May 5, 2008 by electronic mail and by U.S. Mail, First Class to the Service List: Pilgrim Watch Motion Regarding the Cumulative Usage Factor (CUF).

Administrative Judge
Ann Marshall Young, Chair
Atomic Safety and Licensing Board
Mail Stop – T-3 F23
US NRC
Washington, DC 20555-0001

Administrative Judge
Paul B. Abramson
Atomic Safety and Licensing Board
Mail Stop T-3 F23
US NRC
Washington, DC 20555-0001

Administrative Judge
Richard F. Cole
Atomic Safety and Licensing Board
Mail Stop –T-3-F23
US NRC
Washington, DC 20555-0001

Secretary of the Commission
Attn: Rulemakings and Adjudications Staff
Mail Stop 0-16 C1
United States Nuclear Regulatory Commission [Two Copies]

Office of Commission Appellate Adjudication
Mail Stop 0-16 C1
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

Atomic Safety and Licensing Board
Mail Stop T-3 F23
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

Susan L. Uttal, Esq.
Kimberly Sexton, Esq.
James Adler, Esq.
David Roth, Esq.
Office of General Counsel
Mail Stop – O-15 D21
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

Paul A. Gaukler, Esq.
David R. Lewis, Esq.
Pillsbury, Winthrop, Shaw, Pittman, LLP
2300 N Street, N.W.
Washington, DC 20037-1138

Mr. Mark Sylvia
Town Manager, Town of Plymouth
11 Lincoln Street
Plymouth MA 02360

Sheila Slocum Hollis, Esq.
Town of Plymouth MA
Duane Morris, LLP
505 9th Street, N.W.1000
Washington D.C. 20004-2166

Richard R. MacDonald
Town Manager, Town of Duxbury
878 Tremont Street
Duxbury, MA 02332

Fire Chief & Director DEMA,
Town of Duxbury
688 Tremont Street
P.O. Box 2824
Duxbury, MA 02331

Mary

Mary Lampert
Pilgrim Watch, pro se
148 Washington St.
Duxbury, MA 023332