

RAS E-407

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ATOMIC SAFETY AND LICENSING BOARD

-----X  
In re: Docket Nos. 50-247-LR; 50-286-LR  
License Renewal Application Submitted by ASLBP No. 07-858-03-LR-BD01  
Entergy Nuclear Indian Point 2, LLC, DPR-26, DPR-64  
Entergy Nuclear Indian Point 3, LLC, and October 12, 2010  
Entergy Nuclear Operations, Inc.  
-----X

STATE OF NEW YORK AND RIVERKEEPER, INC.'S  
JOINT REPLY TO ENTERGY AND NRC STAFF'S SEPARATE ANSWERS TO  
THE STATE AND RIVERKEEPER'S NEW AND AMENDED CONTENTION  
NEW YORK STATE 26B/RIVERKEEPER TC-IB (METAL FATIGUE)

Office of the Attorney General  
for the State of New York  
The Capitol  
State Street  
Albany, New York 12224

Riverkeeper, Inc.  
20 Secor Road  
Ossining, New York 10562

TEMPLATE = SECY 041

DS03

## Table of Contents

INTRODUCTION.....	1
STANDARD.....	5
ARGUMENT.....	6
I.    STAFF AND ENTERGY IGNORE CENTRAL CONCLUSIONS IN THE COMMISSION'S DECISION IN <i>VERMONT YANKEE</i> .....	6
II.   THE FACT THAT ENTERGY HAS FAILED TO EXPAND THE SCOPE OF THE CUF <sub>EN</sub> REANALYSIS TO INCLUDE ALL RELEVANT CONSIDERATIONS IS A VALID BASIS FOR THE PROPOSED NEW CONTENTION .....	7
A.   The Scope of Reactor Pressure Vessel Boundary Components Analyzed Is Too Limited.....	7
B.   Entergy Should Have Included An Evaluation of Metal Fatigue of Reactor Pressure Vessel Internals in its CUF <sub>en</sub> Analysis.....	11
C.   Entergy Should Have Conducted Its CUF <sub>en</sub> Reanalysis By Considering All LOCAs and ATWSs as Relevant Transient Events.....	12
D.   These Bases Are Timely.....	13
III.  ENTERGY'S FAILURE TO CONDUCT AN ERROR ANALYSIS AS PART OF ITS CUF <sub>EN</sub> REANALYSIS IS A VALID BASIS FOR THE PROPOSED NEW CONTENTION.....	14
IV.  ENTERGY'S FAILURE TO DEMONSTRATE THAT IT USED A RELIABLE METHODOLOGY FOR REMOVING ALLEGED CONSERVATISMS AND TO IDENTIFY THE CRITERIA IT USED TO SELECT VALUES FOR KEY PARAMETERS IN THE CUF <sub>EN</sub> REANALYSIS ARE VALID BASES FOR THE PROPOSED NEW CONTENTION.....	15
V.   ENTERGY'S FAILURE TO PRODUCE EITHER ITS THERMAL HYDRAULIC EQUATIONS OR THE WESTEMS CODE MANUAL PREVENTS IT FROM BEING ABLE TO DEMONSTRATE THAT ITS CUF <sub>EN</sub> REANALYSIS IS RELIABLE AND CAN MEET THE GALL GOAL AND FORMS A VALID BASIS FOR THE PROPOSED NEW CONTENTION.....	19

<b>VI.</b>	<b>NRC STAFF HAS MISCONSTRUED APPLICABLE LAW AND REGULATIONS.....</b>	<b>21</b>
<b>A.</b>	<b>Whether Entergy Conducted a CUF<sub>en</sub> Calculation or Not, It Must Still Demonstrate That the Methodology It Has and Will Use for that Calculation Is Reliable .....</b>	<b>21</b>
<b>B.</b>	<b>Whether Or Not Entergy Has Done or Must Do a CUF<sub>en</sub> Analysis, Deficiencies In the Methodology It Has Used or Will Use In the CUF<sub>en</sub> Calculation Are Legitimate Issues In the License Renewal Proceeding. ....</b>	<b>23</b>
<b>VII.</b>	<b>ENTERGY'S ANSWER IS REplete WITH MATERIAL ISSUES OF FACT ON WHICH THERE IS A DISPUTE.....</b>	<b>25</b>
<b>A.</b>	<b>The Criticisms of the F<sub>en</sub> Factors Used by Westinghouse Have Adequate Support and Undoubtedly Establish a Genuine Material Dispute. ....</b>	<b>26</b>
<b>B.</b>	<b>The Criticisms of the Dissolved Oxygen Levels Used by Westinghouse Have Adequate Support and Undoubtedly Establish a Genuine Material Dispute. ....</b>	<b>27</b>
<b>C.</b>	<b>The Criticisms of the Plant Transient Numbers Used by Westinghouse Have Adequate Support and Establish A Genuine Issue of Material Fact.....</b>	<b>29</b>
<b>D.</b>	<b>There Is A Material Dispute Regarding the Need for Benchmarking.....</b>	<b>29</b>
	<b>CONCLUSION.....</b>	<b>31</b>

## INTRODUCTION

The State of New York and Riverkeeper, Inc., as authorized by 10 C.F.R. § 2.309(h)(2), respectfully submit this joint reply to the two separate Answers filed by Entergy and NRC Staff to the State and Riverkeeper's joint submission of a new and supplemental contention concerning metal fatigue.

On August 10, 2010, Entergy filed a "Notification of Entergy's Submittal Regarding Completion of Commitment 33 for Indian Point Units 2 and 3" including a revised environmentally-assisted fatigue analysis. On September 9, 2010, the State and Riverkeeper filed a joint contention challenging that revised analysis. On October 4, 2010, NRC Staff and Entergy filed Answers raising the following objections: the contention is out of scope and lacks adequate factual and legal support (Entergy), and is not material and fails to raise a genuine dispute on a material issue of law or fact as required by 10 C.F.R. § 2.309(f)(1)(iii)-(vi) (Entergy and Staff). Staff challenges the contention as untimely, and Entergy alleges that the contention is partially untimely.

At the outset, unlike the situation in Vermont Yankee, there is no dispute among petitioners, Entergy, and NRC Staff over certain foundational issues. There is no dispute that: (1) Entergy's initial April 2007 LRA presented  $CUF_{en}$  results for certain RPV components and locations and that for some of those components and locations the  $CUF_{en}$  values exceeded 1.0; (2) in January 2008, Entergy obligated itself to prepare an Aging Management Program ("AMP") to address metal fatigue of reactor pressure vessel ("RPV") components and locations pursuant to 10 C.F.R. § 54.21(c)(1)(iii) (January 22, 2008 Indian Point License Renewal Application Amendment 2, NL-08-021, modification of Commitment No. 33); and (3) in August 2010 Entergy provided the Board and the parties in this proceeding with the results of a "refined"

CUF<sub>en</sub> Reanalysis that Westinghouse prepared for Entergy and that Entergy submitted to NRC pursuant to 10 C.F.R. § 54.21(c)(1)(iii) (August 9, 2010 Indian Point License Renewal Application – Completion of Commitment No. 33, NL-10-082). *See* Entergy Answer at 11. Given Entergy's amendments to the LRA and recent CUF<sub>en</sub> Reanalysis, 10 C.F.R. § 54.21(c)(1)(i) or (ii) are not at issue with respect to reactor pressure vessel metal fatigue in this proceeding.

A fundamental and material dispute, however, does exist between Entergy/Staff and the State/Riverkeeper as to the significance of Entergy's recent attempt to claim that the CUF<sub>en</sub> Reanalysis actually satisfies 10 C.F.R. § 54.21(c)(1)(iii) and precludes any further review of the CUF<sub>en</sub> Reanalysis in this Atomic Energy Act § 189 proceeding. The parties are in sharp disagreement over what Entergy (and its agent Westinghouse) must do to demonstrate that their AMP and their refined CUF<sub>en</sub> Reanalysis actually comply with 10 C.F.R. § 54.21(c)(1)(iii).

Entergy and NRC Staff assert that all that Entergy must do to demonstrate such compliance is to simply state that it agrees to comply with the guidelines contained in GALL and that Entergy is not obligated to actually conduct a CUF<sub>en</sub> analysis prior to license renewal. However, in the Commission's most recent expression of opinion on the meaning of 10 C.F.R. § 54.21(c)(1), the Commission made clear that challenges to claims that an applicant had met the requirements of that section, particularly the requirements of § 54.21(c)(1)(iii), were still appropriate for license renewal proceedings, particularly where, as here, the challenge was based on an applicant's failure, when it purports to comply with GALL, to actually demonstrate compliance with the guidance in GALL. *Entergy Nuclear Vermont Yankee, L.L.C.* (Vermont Yankee Nuclear Power Station), CLI-10-17 at 45 and 47 (July 8, 2010). The Commission's CLI 10-17 *Vermont Yankee* holding is consistent with this Board's July 31, 2008 order admitting the

metal fatigue contentions filed by the State and Riverkeeper in this proceeding. In that Order, the Board confirmed that the material issue in dispute is whether Entergy has “demonstrated” that what it proposes to do will in fact meet its regulatory obligations. *Entergy Nuclear Operations, Inc.*, (Indian Point Units 2 and 3), LBP 08-13, Memorandum and Order (Ruling on Petitions to Intervene and Requests for Hearing) 68 NRC 43, 138 (2008)(“Contention Admissibility Order”)(“While the implementation of the AMP can anticipate future actions . . . , the actual plan must be sufficient to *demonstrate* the specific aging management actions that will take place in the future, and not just that the AMP will be developed in the future.”)(emphasis added)).

The proposed new contention identifies with specificity several ways in which Entergy has failed to demonstrate that it meets the requirements of § 54.21(c)(1)(iii):

1. The scope of the CUF<sub>en</sub> analysis is inadequate in several respects including: (a) the components for which Entergy must do a CUF<sub>en</sub> analysis are too narrow and do not meet the standards set forth in GALL, the guidance from EPRI, or what Drs. Lahey and Hopenfeld have put forward; (b) the components for which it must do a CUF<sub>en</sub> analysis fail to include the vulnerable components of the reactor vessel internals; and (c) the types of transients that were evaluated do not include all types of transients, such as LOCAs and ATWSs, that will produce metal fatigue stress.
2. The CUF<sub>en</sub> calculation is subject to errors due to assumptions used and Entergy has failed to demonstrate that the results it has produced from its CUF<sub>en</sub> calculation are reliable because it refuses to create a “propagation of error” analysis by which it would be able to disclose the range of CUF<sub>en</sub> values that would be produced depending on which of several possible assumed values it used in its calculation. As discussed below, contrary to Entergy’s assertion, the 2008 *Vermont Yankee* ASLB decision does not foreclose consideration of this fact-specific issue here.
3. By not disclosing the criteria it used for selecting certain parameters required to determine the environmental adjustment factor, Entergy is not able to demonstrate that the parameters it has chosen are appropriate or reliable. As discussed below, contrary to Entergy’s assertion, the 2008

*Vermont Yankee* ASLB decision does not foreclose consideration of this fact-specific issue here.

4. By not providing the thermal-hydraulic equations or more than a few pages of the WESTEMS Code Manual used in the  $CUF_{en}$  calculations Entergy has failed to demonstrate that the methodology it is using for the  $CUF_{en}$  calculation is reliable and will achieve the goals identified in GALL.

Faced with this well-supported challenge to the adequacy of Entergy's AMP for metal fatigue, NRC Staff and Entergy take two different approaches in their opposition to the proposed contention, neither of which has merit. NRC Staff primarily bases its opposition on the proposition that the Commission's July 2010 *Vermont Yankee* decision foreclosed consideration of the adequacy of the methodology for conducting the  $CUF_{en}$  calculation and thus the proposed contention is beyond the scope of this license renewal proceeding. In particular, NRC Staff opposes the admission of the contention primarily on the grounds that the new contention fails to meet the requirements of 10 C.F.R. §§ 2.309(f)(1)(iv) and (vi). NRC Staff Answer at 2. On the other hand, Entergy's opposition to the contentions is based primarily on challenging the merits of the proposed contention, although it offers no expert declaration or other form of admissible evidence to challenge the expert declarations submitted with the proposed contention and essentially confirms the existence of material issues of fact and law that are in dispute and require resolution by the Board. In admitting Riverkeeper's metal fatigue contention, the Board stated that "many of the arguments proffered by Entergy and the NRC Staff and subsequently addressed by Riverkeeper in its Reply, present us with material disputes that under NRC rules are best litigated in the course of a hearing" (Contention Admissibility Order, 68 NRC at 172), and that holding remains equally valid with respect to Entergy's latest challenges to the proposed new metal fatigue contention.

## STANDARD

As this Board has stated, pursuant to 10 C.F.R. § 2.309(f), an admissible contention must

(1) provide a specific statement of the legal or factual issue sought to be raised; (2) provide a brief explanation of the basis for the contention; (3) demonstrate that the issue raised is within the scope of the proceeding; (4) demonstrate that the issue raised is material to the findings the NRC must make to support the action that is involved in the proceeding; (5) provide a concise statement of the alleged facts or expert opinions, including references to specific sources and documents, that support the petitioner's position and upon which the petitioner intends to rely at hearing; and (6) provide sufficient information to show that a genuine dispute exists with regard to a material issue of law or fact, including references to specific portions of the application that the petitioner disputes, or in the case when the application is alleged to be deficient, the identification of such deficiencies and supporting reasons for this belief.

*See* Contention Admissibility Order, 68 NRC at 60-61. Entergy's lengthy opposition, which includes 17 attachments and addresses the merits of the proposed new contention, illustrates both that the State and Riverkeeper have met these standards, and that a genuine issue of material fact exists. The State and Riverkeeper have met the Board's standards, which require at the contention admissibility stage, only that the petitioner provide an expert opinion or "some alleged fact, or facts, in support of its position." Contention Admissibility Order, 68 NRC at 64, *citing* 54 Fed. Reg. at 33,170 ("This requirement does not call upon the intervener to make its case at this stage of the proceeding, but rather to indicate what facts or expert opinions, be it one fact or opinion or many, of which it is aware at that point in time which provide the basis for its contention.") The State and Riverkeeper, in offering detailed affidavits from two leading experts on metal fatigue issues, have met this standard, notwithstanding Entergy's protestations to the contrary.

## ARGUMENT

### I. STAFF AND ENTERGY IGNORE CENTRAL CONCLUSIONS IN THE COMMISSION'S DECISION IN *VERMONT YANKEE*

Staff relies on *Entergy Vt. Yankee, L.L.C* (Vermont Yankee Nuclear Power Station), CLI-10-17 (July 8, 2010) (“*Vermont Yankee*”), apparently believing the Commission concluded that as long as Entergy and NRC Staff agree that the AMP complies with GALL, the issue is closed and beyond challenge by any intervenor in an Atomic Energy Act § 189 proceeding. But that is not what the Commission ruled. Instead, the Commission:

reiterate[s] here that a commitment to implement an AMP that the *NRC finds* is consistent with the GALL Report constitutes one acceptable method for compliance with 10 C.F.R. § 54.21(c)(1)(iii).

*Vermont Yankee*, CLI-10-17 at 44 (emphasis added) and 47 (accepting as correct, but rejecting as applied to the case before it, the argument that an applicant’s “commitment to comply with the GALL provision related to metal fatigue, [may] satisf[y] the Staff but [it] does not and cannot prevent the Board from reviewing the substance of the commitment and . . . explor[ing] any deficiencies alleged in that commitment to the extent they are raised by an intervenor”). NRC Staff is a part of the NRC, just as is this Board and the Commissioners, but in this proceeding NRC Staff is a party, not the decider. The issue of compliance with AMP requirement is one the Board is authorized to decide.

The Commission also ruled in *Vermont Yankee* that it is not sufficient for an applicant to merely assert that it will comply with GALL. “[A] commitment does not absolve the applicant from demonstrating, prior to issuance of a renewed license, that its AMP is indeed consistent with the GALL Report. We do not simply take the applicant at its word . . . And of course, any AMP is subject to challenge before a board in a license renewal proceeding.” *Id.* CLI-10-17 at 45, 47. Consistent with *Vermont Yankee*, Entergy could have demonstrated compliance with

§54.21(c)(1)(iii) by describing the parameters of the  $CUF_{en}$  calculation it “will” use in any refined  $CUF_{en}$  calculation and by demonstrating the methodology would meet the GALL goal:

In order not to exceed the design limit on fatigue usage, the aging management program (AMP) monitors and tracks the number of critical thermal and pressure transients for the selected reactor coolant system components. The AMP addresses the effects of the coolant environment on component fatigue life by assessing the impact of the reactor coolant environment on a sample of critical components for the plant.

GALL at X M-1. However, a mere assertion of compliance, without providing the relevant parameters, as described by Drs. Lahey and Hopfeld in the declarations annexed to the proposed new contention, does not “demonstrate” compliance. Entergy must make the case that what it has done meets the requirements with which it claims to be in compliance. All Entergy has done is provide self-serving descriptions of the results of the calculations. Because it has not described the most crucial methodology or criteria used for selecting the values for the critical parameters in the calculations, Entergy has failed to “demonstrate” compliance with GALL or NRC regulations.

**II. THE FACT THAT ENTERGY HAS FAILED TO EXPAND THE SCOPE OF THE  $CUF_{EN}$  REANALYSIS TO INCLUDE ALL RELEVANT CONSIDERATIONS IS A VALID BASIS FOR THE PROPOSED NEW CONTENTION**

**A. The Scope of Reactor Pressure Vessel Boundary Components Analyzed Is Too Limited.**

NRC Staff and Entergy ignore the fact that the  $CUF_{en}$  Reanalysis Entergy has now submitted is the second  $CUF_{en}$  analysis it has completed, and that since the initial  $CUF_{en}$  analysis demonstrated that several key components will reach a  $CUF_{en}$  of greater than 1.0 during the period of extended operation (LRA at pp. 4.3-24 to 4.3-25 (Tables 4.3-13, 4.3-14)), pursuant to

GALL, Entergy was directed to take corrective action.<sup>1</sup> While there is nothing improper about choosing the corrective action of refining an initial CUF<sub>en</sub> analysis in order to attempt to demonstrate compliance with AMP requirements, once a CUF<sub>en</sub> analysis has raised a red flag about any components exceeding the CUF<sub>en</sub> threshold of 1.0, according to GALL, industry guidance and sound engineering practice, Entergy should expand the scope of its CUF<sub>en</sub> analysis to include a greater number of components. Entergy failed to expand the scope of the CUF<sub>en</sub> analysis beyond the six sample locations for early vintage Westinghouse reactors identified in NUREG/CR-6260. Thus, whether Entergy did a second CUF<sub>en</sub> analysis or not, if it is to comply with GALL, as NRC Staff insists, it must commit to expand the scope of components to be examined to include “a review of additional affected reactor coolant pressure boundary locations.” GALL at X M-2.

Furthermore, although Entergy claims that the CUF<sub>en</sub> values for all the NUREG/CR-6260 locations are below 1.0, Entergy has not yet proven that claim. To begin with, application of basic rounding principles to the IP3 RHR CUF<sub>en</sub> value of 0.9961 would result in the 1.0 threshold being reached. Secondly, as discussed below and in the intervenors’ supporting declarations, a modest error or change in assumptions could result in the threshold being exceeded. Dr. Lahey has presented an expert opinion, which neither Entergy nor Staff has challenged at this stage, that an error band or margin exists in such complex calculations that

---

<sup>1</sup> Although Entergy now attempts to avoid the consequences of having conducted a CUF<sub>en</sub> analysis as part of its initial LRA (*see* LRA § 4.3.3) by referring to that analysis as “preliminary” and “screening” (Entergy Answer at 3) no such qualifiers appear in the LRA description of the analysis. The State and Riverkeeper assume that Entergy’s statement in the LRA, “IPEC evaluated the limiting locations using the guidance provided in NUREG-1801, Volume 2, Section X.M1” was accurate, and the CUF<sub>en</sub> analysis was neither preliminary nor screening but was done to comply with GALL. *See also* SER § 4.3.3.1 at 4-41 where Staff also treats the LRA CUF<sub>en</sub> calculation as a fully functional analysis, and not a mere “screening” or “preliminary” analysis.

could bring the result to 1.0 or higher, especially for the RHR pipe lines. Lahey September 8, 2010 Decl. at ¶ 10. Thus, the adequacy of Entergy's AMP for metal fatigue should be measured by evaluating the adequacy of the methodology for the  $CUF_{en}$  calculation it has conducted, particularly since it is the methodology for future  $CUF_{en}$  calculations during the proposed period of extended operation.

Entergy's Answer mischaracterizes the contention as one based upon an assertion that the original  $CUF_{en}$  calculation is the one to which Entergy is bound. Entergy Answer at 4, 12. The State and Riverkeeper never took that position. The initial  $CUF_{en}$  analysis does serve one continuing function – it provides a red flag that  $CUF_{en}$  values can exceed 1.0 and forms the basis for imposing on Entergy an obligation to expand the scope of components to be analyzed and/or to implement repair and replace corrective action. In addition, according to Entergy and NRC Staff, any  $CUF_{en}$  analysis that produces a value in excess of 1.0 will be replaced with a new  $CUF_{en}$  calculation that will further shave off conservatisms in order to always keep the value below 1.0. Thus, in their view, the admonition in GALL and in EPRI's MRP-47, to expand the scope of the  $CUF_{en}$  calculation when a value in excess of 1.0 is produced, is meaningless because the "offending" value will be eliminated by the next  $CUF_{en}$  calculation and thus the scope of components will never be expanded. It is not plausible that the authors of GALL or MRP-47 intended such a result, or would have wasted their time imposing an obligation that would never be met.

Staff mistakenly argues that the State's argument concerning the expansion of scope lacks legal foundation. NRC Staff Answer, n. 23. In fact, it is Staff's argument which lacks a foundation; Staff believes that Entergy expanded its scope in its August 2010 Reanalysis, when in fact Entergy did nothing more than perform an analysis in the first instance for certain

components which it did not do in its 2007 LRA. The following chart summarizes the components and locations examined by Entergy in its 2007 LRA and its 2010 CUF<sub>en</sub> Reanalysis as compared to the sample components discussed in NUREG/CR-6260:

Sample components and locations identified in NUREG/CR-6260 for IP-vintage Westinghouse plants	Components Evaluated in Entergy's 2007 License Renewal Application		Components Evaluated in Entergy's August 2010 CUF <sub>en</sub> Reanalysis	
	IP2	IP3	IP2	IP3
Reactor vessel shell and lower head	Yes	Yes	Yes	Yes
Reactor vessel inlet and outlet nozzles	Yes	Yes	Yes	Yes
Pressurizer surge line (including hot leg and pressurizer nozzles)	Yes	Yes	Yes	Yes
RCS piping charging system nozzle	Yes	No	Yes	Yes
RCS piping safety injection nozzle	No	No	Yes	Yes
RHR Class 1 piping	No	No	Yes	Yes

Thus, initially, Entergy had not performed a CUF<sub>en</sub> analysis for the RCS piping charging system on Unit 3, or for the RCS piping safety injection nozzle or RHR Class 1 piping for Units 2 or 3 (hence Dr. Lahey's statement that "for the first time, limiting fatigue analysis results were given for components whose CUF<sub>en</sub> results were not discussed in the initial license renewal application filing").<sup>2</sup> Staff fails to explain how Entergy's analysis, which is only now reaching the extent of the six sample components discussed in NUREG/CR-6260, "expands" Entergy's analysis as contemplated by EPRI, MRP-47.

Entergy and NRC Staff also charge that requirements which the proposed new contention seeks to impose run counter to, or are in conflict with, ASME or NRC regulations because the

<sup>2</sup> NRC Staff itself previously documented this deficiency in Entergy's initial LRA. See November 2009 SER, at 4-42.

requirement is not specifically mentioned in those sources. Entergy Answer at 4; NRC Staff Answer at 15-16. However, that does not make the requirement in conflict with or counter to those sources. That would occur only if meeting the requirements urged by the State and Riverkeeper and their experts would prevent compliance with other requirements or guidance. In no instance can that occur since the additional safety measures sought are, at most additive. In addition, the requirements sought, such as expanded component CUF<sub>en</sub> analyses and “propagation of error” analyses, are presented with the support of expert declarations that explain both why these requirements are technologically necessary but also how that point of view is supported by generally accepted technical textbooks and/or the guidance documents upon which NRC Staff and Entergy place reliance. The safety standard to which Entergy is held is the regulatory obligation to demonstrate that if Unit 2 and Unit 3 are allowed to extend their operation for an additional 20 years there will be adequate protection for the public health and safety. 10 C.F.R. § 50.57(a)(3). Nothing in NRC regulations provides a basis for treating the § 54.21(c)(1)(iii) regulatory requirements as the upper bound of the safety obligations for Entergy.

**B. Entergy Should Have Included An Evaluation of Metal Fatigue of Reactor Pressure Vessel Internals in its CUF<sub>en</sub> Analysis.**

Entergy also argues that various RPV internal components are beyond the scope of the proposed contention and proffered AMP governing the reactor coolant pressure boundary. Entergy Answer at 17. While it may be that RPV internals such as bolts and formers are not explicitly referenced within the definition of reactor coolant pressure boundary in 10 C.F.R. § 50.2, it is entirely appropriate to consider the fatigue-related degradation of such components in a license renewal proceeding since, as Dr. Lahey has discussed, shock-load-induced failure may lead to a blocked or distorted core geometry which, in turn, may not allow the ability to cool the

core. Lahey September 8, 2010 Decl. at ¶ 12. In addition, Dr. Lahey noted in-core fatigue failures of irradiated baffle-to-former bolts have been observed in operating Pressurized Water Reactors and that B&W designed PWRs have experienced fatigue-induced failures of various in-core components – even when the CUF values have been less than 1.0. *Id.* Given 10 C.F.R. 54.4(a)(1), (2) and Dr. Lahey’s explanation that fatigue-induced failure of internals could affect the core’s geometry, it is appropriate to consider whether the recent CUF<sub>en</sub> Reanalysis and the AMP adequately manage the effect of metal fatigue on such internals and in turn on the reactor coolant pressure boundary.<sup>3</sup>

**C. Entergy Should Have Conducted Its CUF<sub>en</sub> Reanalysis By Considering All LOCAs and ATWSs as Relevant Transient Events.**

Although not directly stated in NL-10-082, it appears that the recent Westinghouse/Entergy CUF<sub>en</sub> Reanalysis did not include an examination of shock load inducing transients such as those associated with transients from Loss of Coolant Accidents (LOCA) and Anticipated Transient Without SCRAM (ATWS). *See* Entergy NL-10-082, Attachment 1 at p. 4 (“The evaluations were limited to the stress qualifications related to the fatigue requirements of the ASME code.”). Entergy’s Answer, which claims that a review of such significant transients is not necessary, confirms as much. Entergy Answer, at 17-18.<sup>4</sup> However, the exclusion of such critical transients belies Entergy’s assurances that surplus conservatism exists in the CUF<sub>en</sub> Reanalysis. While Entergy claims that the NB-3200 publication does not compel Entergy to examine the interplay of metal fatigue and a LOCA or ATWS event, this argument proves little, if anything, since the CUF design parameters also did not include an analysis of environmentally

---

<sup>3</sup> Moreover, the State of New York has also raised this issue in the context of Entergy’s Reactor Pressure Vessel Internals Aging Management Program. *See* September 15, 2010, State of New York Motion for Leave to Submit Additional Bases in Support of NYS Contention 25.

<sup>4</sup> NRC Staff’s Answer did not make or support Entergy’s argument on this point.

assisted fatigue (or  $F_{en}$ ) for the period of extended operation. Moreover, Entergy's legal argument is at odds with 10 C.F.R. §§ 54.4(a)(1)-(3) and 50.40(b)(1) that define design basis events to include "conditions of normal operation, including anticipated operational occurrences, design basis accidents, external events, and natural phenomena." Indeed, Part 54 acknowledges the importance of demonstrating compliance with the ATWS regulations. 10 C.F.R. § 54.4(a)(3). Thus, contrary to Entergy's argument, a LOCA or ATWS is within the scope of a design basis accident or anticipated operational occurrence and therefore appropriately within the scope of an Aging Management Program for an application to extend the operation of a reactor beyond its initial 40 year operating term.

**D. These Bases Are Timely.**

Entergy and NRC Staff each make a passing reference that the proposed bases related to the absence of consideration of reactor pressure vessel internals and the lack of consideration of LOCAs and ATWS as transients are untimely. Entergy Answer at 16-17; NRC Staff Answer at 19. Both fail to acknowledge that the State's initial metal fatigue contention explicitly mentioned a LOCA transient event or "other safety related events" as a significant concern. November 2007 Lahey Decl. at ¶ 19. In explaining his concerns about embrittlement earlier in the same document, Dr. Lahey had previously stated that LOCA and ATWS transients can cause significant shocks to already-embrittled PRV and RPV internal components. November 2007 Lahey Decl. at ¶¶ 11-13, 15. Additionally, the State made note of Entergy's representation that it might look at IPEC-specific locations in addition to the six locations discussed in NUREG/CR-6260 locations (November 30, 2007 NYS Contention 26 at ¶ 10), and asserted that an adequate aging management program would also "identify other components at risk of metal fatigue" and provide a monitoring plan and inspection schedule, *id.*, at ¶ 12. *See also* August 21, 2008 Joint

Contention NYS 26-A/RK TC1-A at pp. 3, 7-8, 15-16 (additional components needed to be examined). Until Entergy provided the CUF<sub>en</sub> Reanalysis in August 2010, intervenors could not tell whether Entergy would examine the LOCA or other safety-related events or whether Entergy would examine other components and locations within the RPV in addition to the six discussed in NUREG/CR-6260. Thus, proposed Contention 26-B/TC-1B, which is based on the newly filed and completely redone CUF<sub>en</sub> analysis and which challenges the adequacy of Entergy's CUF<sub>en</sub> Reanalysis, is timely.

**III. ENTERGY'S FAILURE TO CONDUCT AN ERROR ANALYSIS AS PART OF ITS CUF<sub>EN</sub> REANALYSIS IS A VALID BASIS FOR THE PROPOSED NEW CONTENTION**

Entergy and NRC Staff object to the argument that the CUF<sub>en</sub> calculational method is flawed because of the lack of a "propagation of error" analysis because, they assert, no actual errors were shown to exist in the calculation. This argument is flawed for two reasons. First, the declarations of Drs. Lahey and Hopenfeld identify a number of areas in which errors are possible because of the nature of assumptions that have to be used and explain how such errors can occur and the impact of such errors on CUF<sub>en</sub> output. Lahey September 8, 2010 Declaration at ¶¶ 9 and 11; Hopenfeld Sept. 9, 2010 Declaration at ¶¶ 10-15. Drs. Lahey and Hopenfeld cannot say whether those errors have occurred, because Entergy has failed to provide the information needed to determine the error band around the values used in the CUF<sub>en</sub> analysis or the methodology used for determining the values used. It is conceivable that Entergy has used the most conservative value for each of the critical parameters thus assuring that any error in the assumption can only make the CUF<sub>en</sub> value less. If that were so, Entergy presumably would have made such a statement in its factually-oriented opposition to the contention. In fact, as noted below, it appears that the way in which Entergy has gotten its CUF<sub>en</sub> values below 1.0,

albeit just barely in several instances, is to eliminate conservative assumptions with no standard except that by eliminating the conservatism they are able to keep the  $CUF_{en}$  value below 1.0.

Second, essentially, what Entergy and NRC Staff are attempting to do is to shift the burden to the State and Riverkeeper to prove which particular errors have occurred when the burden is on Entergy to demonstrate that the methodology it has used will produce numbers that are reliable. See *Entergy Nuclear Generation Company and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station) 64 N.R.C. 257, 359 (ASLB 2006) (“the strict contention admissibility requirements for a sufficient factual basis ‘do[ ] not shift the ultimate burden of proof from the applicant to the petitioner’” (footnote omitted)); Statement of Consideration 1989 Hearing Procedures, 54 Fed. Reg. 33168, 33171 (Aug. 11, 1989) (“The revised rule does not shift the ultimate burden of persuasion on the question of whether the permit or license should be issued; it rests with the applicant.”) At least one component of such a demonstration would be to conduct an error analysis and provide sufficient details regarding the methodology used to determine whether appropriate criteria were used in selecting parameters.

**IV. ENTERGY’S FAILURE TO DEMONSTRATE THAT IT USED A RELIABLE METHODOLOGY FOR REMOVING ALLEGED CONSERVATISMS AND TO IDENTIFY THE CRITERIA IT USED TO SELECT VALUES FOR KEY PARAMETERS IN THE  $CUF_{EN}$  REANALYSIS ARE VALID BASES FOR THE PROPOSED NEW CONTENTION**

Entergy claims that because there are so many conservatisms in the  $CUF_{en}$  calculation – none of which, they assert, are addressed in the proposed new contention – the new contention improperly criticizes the  $CUF_{en}$  Reanalysis by suggesting that the values achieved are insupportable. Entergy Answer at 13. But that argument misses the point. The issue is not

whether the original  $CUF_{en}$  calculation was conservative.<sup>5</sup> The issue is whether in eliminating some of that conservatism (1) Entergy has used defensible criteria that follow accepted methodologies for removing conservatisms and (2) Entergy has produced a final  $CUF_{en}$  analysis methodology that is reliable and based on sound engineering practice. This latter point is particularly important given how much judgment is built into the  $CUF_{en}$  calculations. For example, in the UFSAR for IP 3, the following appears:

To a large extent, the specific transient operating conditions considered for equipment fatigue analyses were based upon engineering judgment and experience. Those transients were chosen which are representative of transients to be expected during plant operation and which are sufficiently severe or frequent to be of possible significance to component cyclic behavior.

IP3 UFSAR at 27. Given that Entergy has refused to provide a full statement of the criteria it used in deciding which “conservatisms” to reduce, the amount of the reduction, the criteria used for the selection of the new assumed values or even an error analysis that would demonstrate the extent to which the accuracy of the values assumed can impact the result, its reliance on “judgment” in producing its  $CUF_{en}$  Reanalysis is particularly suspect and illustrates why Entergy has not “demonstrated” that what it has done will meet the goals of GALL to which it has

---

<sup>5</sup> Entergy claims that the original ASME code fatigue evaluations contained substantial conservatisms due to the methods and assumptions used in the analyses. This fails to recognize the uncontested understanding that  $CUF$  alone does not adequately account for the aging phenomenon of metal fatigue. The 1995 NRC report, NUREG-6260 underscores this: “[r]ecent test data indicate that the effects of the light water reactor (LWR) environment could significantly reduce the fatigue resistance of materials used in the reactor coolant pressure boundary components of operating nuclear power plants.” See Entergy Answer, Attach.3, pg. iii. Moreover, there is no agreement among the experts that the ASME fatigue curves are conservative, and Entergy has failed to quantify the degree of conservatism it assumed. Entergy cannot use arbitrary values for  $F_{en}$  simply because it states that the ASME code is “conservative” and will compensate for any errors that may be imbedded in the  $F_{en}$ . For example, while Entergy states that the ASME Code is “conservative by at least a factor of 1.7” (Entergy Answer at 14-15) this is still small in comparison to the lack of conservatism in Entergy's calculations as measured by the ratio of the bounding  $F_{en}$  value of 17 and the low values actually used (e.g., 2.45).

committed itself.

Entergy argues that it is entitled to alter the results of any  $CUF_{en}$  calculation by the elimination of “conservative” assumptions and, apparently, that these alterations can continue to be used to reduce the  $CUF_{en}$  number below 1.0 in all instances. Thus, it argues, its current  $CUF_{en}$  Reanalysis demonstrates compliance with 10 C.F.R. § 54.21(c)(1)(iii) because after elimination of certain conservative assumptions, the value was able to be brought below 1.0. In fact, Entergy appears to argue that this “procedure” is available to it without the use of a rigorous methodology that demonstrates that there is a legitimate justification for the use of the less conservative value other than that the value needs to be lowered to get the  $CUF_{en}$  below 1.0. For example, in defending the basis for the selection of the number of transients used in the  $CUF_{en}$  calculation, Entergy Counsel wrote that:

Generally, Westinghouse conservatively used CLB cycles that were higher than the numbers of transients projected based on actual plant operation. In a limited number of cases, Westinghouse used the 60-year projected cycles if: (1) the use of 60-year cycles was necessary to reduce extra conservatism, or (2) the 60-year projected cycles were higher than the CLB cycles.

Entergy Answer at 22. But this policy of abandoning conservative values whenever needed to keep the  $CUF_{en}$  calculation below 1.0 bears no resemblance to the technically acceptable use, and modification, of conservative values. Conservative values do not exist without a good justification which is usually because they are necessary to bound the uncertainties that surround the value for the number needed in an equation.

For instance, 10 C.F.R. § 50.49(g)(8) dealing with qualification of electrical equipment, specifies the use of margins of safety to account for uncertainties and provides guidance on how and when those margins can be reduced:

(8) Margins. Margins must be applied to account for unquantified uncertainty, such as the effects of production variations and inaccuracies in test instruments.

These margins are in addition to any conservatisms applied during the derivation of local environmental conditions of the equipment unless these conservatisms can be quantified and shown to contain appropriate margins.

*Id.* Similarly, 10 C.F.R. § 50.61(c) dealing with the calculation of the reference temperature (“RT PTS”) for compliance with the fracture toughness requirements provides the following standards to apply in deciding to depart from previous conservative values:

$$\text{Equation 3: } \Delta RT \text{ NDT} = (CF)f^{(0.28-0.10 \log f)}$$

(A) CF (°F) is the chemistry factor, which is a function of copper and nickel content. CF is given in table 1 for welds and in table 2 for base metal (plates and forgings). Linear interpolation is permitted. In tables 1 and 2, “Wt - % copper” and “Wt - % nickel” are the best-estimate values for the material, which will normally be the mean of the measured values for a plate or forging. For a weld, the best estimate values will normally be the mean of the measured values for a weld deposit made using the same weld wire heat number as the critical vessel weld. If these values are not available, the upper limiting values given in the material specifications to which the vessel material was fabricated may be used. If not available, conservative estimates (mean plus one standard deviation) based on generic data<sup>4</sup> may be used if justification is provided. If none of these alternatives are available, 0.35% copper and 1.0% nickel must be assumed.

<sup>4</sup>Data from reactor vessels fabricated to the same material specification in the same shop as the vessel in question and in the same time period is an example of “generic data.”

*Id.* The breezy way in which Westinghouse and Entergy appear to deal with the number of transients they will assume, driven by their “need” to keep the CUF<sub>en</sub> value below 1.0, bears no resemblance to the kind of rigor the Commission imposes on its licensees when they want to reduce a pre-existing margin of safety conservatism.

This cavalier attitude toward conservatism is reflected throughout the CUF<sub>en</sub> Reanalysis. Thus, the amended contention, based on the careful analysis by Dr. Lahey, identifies a number of potential errors that could occur in the selection of values to be used in the CUF<sub>en</sub> calculation, some of which have been altered by Entergy and Westinghouse to eliminate conservatism. *See*

Lahey 2010 Sept 8, 2010 Declaration at ¶¶ 11-13. Dr. Lahey explains how errors in these values can produce substantial variations in the actual  $CUF_{en}$  output number and explains why, in standard engineering practice, the use of a “propagation of error” analysis is essential to test the reliability and robustness of the final result. In response, Entergy says only that the ASME code does not require an error analysis and that none was done here. Entergy Answer at 6, n. 20. An expert, with citations to specific types of errors and to an error analysis endorsed by standard engineering texts, disagrees. No further basis or supporting evidence is required at the contention admissibility stage to admit this contention and to recognize that a material dispute of fact exists regarding the question of whether the  $CUF_{en}$  methodology that Entergy intends to use – one which includes no “propagation of error” analysis and one which does not reveal the criteria used to alter other  $CUF_{en}$  calculation values – is sufficiently reliable to meet the GALL goal of committing to using a  $CUF_{en}$  calculation method that will “maintain the fatigue usage factor below the design code limit.” GALL at X M-1.

**V. ENTERGY’S FAILURE TO PRODUCE EITHER ITS THERMAL HYDRAULIC EQUATIONS OR THE CODE MANUAL FOR WESTEMS PREVENTS IT FROM BEING ABLE TO DEMONSTRATE THAT ITS  $CUF_{EN}$  REANALYSIS IS RELIABLE AND CAN MEET THE GALL GOAL AND FORMS A VALID BASIS FOR THE PROPOSED NEW CONTENTION**

Entergy claims that the State and Riverkeeper’s criticisms of Westinghouse’s evaluation of thermal hydraulic conditions at Indian Point are not material because the State and Riverkeeper “merely advocate[] the use of different modeling techniques or assumptions.” *See* Entergy Answer at 18-19. However, the State and Riverkeeper are not merely “seeking ‘an alternative analysis,’” (*Id.* at 19) but rather criticize Entergy’s failure to demonstrate that the methodology employed was sufficient to ensure proper consideration of thermal loads in the  $CUF_{en}$  Reanalysis.

Indeed, Westinghouse's evaluation reports lack any kind of specificity regarding what thermal-hydraulic phenomena was taken into account. For example, in order to properly assess the accuracy of the final  $CUF_{en}$  values, it is imperative to have an understanding of the heat transfer coefficients used for each component during the transients, and the methodology used to arrive at such numbers. *See* Hopenfeld Sept. 9, 2010 Declaration, ¶ 12. Neither Entergy nor Westinghouse have provided such information, making it impossible to conclude that Entergy has "demonstrated" that the  $CUF_{en}$  Reanalysis is accurate or adequate.

As Dr. Lahey notes in his declaration, without the thermal-hydraulic equations and models and the complete Code Manual for WESTEMS it is not possible to know how the  $CUF_{en}$  Reanalysis was conducted or whether the methodology used was reliable. Lahey Sept. 8, 2010 Decl. at ¶ 9. Entergy makes no attempt to demonstrate that in the absence of these crucial documents it is possible to determine whether the proper equations and input values were used. Thus, Entergy is unable to demonstrate that its  $CUF_{en}$  Reanalysis is reliable and can meet the GALL goal.

Entergy makes much of NRC Staff statements in the Shearon Harris SER (involving an *uncontested* license renewal application) in an effort to preclude any challenge to the thermal-hydraulic analysis recently conducted by Westinghouse in this proceeding for the two Indian Point reactors. *See* Entergy Answer at 15-16; *see also* Entergy Answer Attachment 9 (excerpt of NUREG 1916, Vol. 2). The Shearon Harris SER, however, provides little or no assistance to Entergy. To begin with, the excerpt notes that a Shearon Harris "Trunnion Bolt Hole" had a  $CUF$  design value of 1.00 thereby making the point (perhaps unintentionally) that other candidate locations exist in addition to the six sample locations discussed in NUREG/CR-6260. Moreover, it appears that the  $CUF_{en}$  results for the Shearon Harris pressurizer lower head for 60

years of operation (*i.e.*, including the PEO) was 1.35 confirming that  $CUF_{en}$  values for Westinghouse reactors can exceed 1.0. Contrary to Entergy's claim, the Shearon Harris SER excerpt provides little detail about the thermal-hydraulics analysis used for that facility or about the rigor of Staff's review of that analysis. In addition, the Shearon Harris SER does not reflect the extent to which the Staff sought an error analysis for the calculations. Thus, Entergy's reliance on the Shearon Harris SER is misplaced and not analogous to Indian Point.

## **VI. NRC STAFF HAS MISCONSTRUED APPLICABLE LAW AND REGULATIONS**

Many of the NRC Staff arguments are based on two propositions, both of which are wrong. First, it argues that because Entergy was not required to conduct an actual  $CUF_{en}$  calculation as a prerequisite to license renewal, any challenge to the specifics of the methodology Entergy has used in conducting its  $CUF_{en}$  calculation must be rejected. As a corollary of this proposition, Staff argues that because it has not evaluated the  $CUF_{en}$  Reanalysis as part of the SER – because the SER was published before the  $CUF_{en}$  Reanalysis was completed – neither this Board nor any of the parties may evaluate the methodology used by Entergy. Second, Staff argues that under *Vermont Yankee* the only issues which may be considered regarding metal fatigue where an applicant is seeking to comply with § 54.21(c)(1)(iii) is whether the applicant commits to comply with GALL.

### **A. Whether Entergy Conducted a $CUF_{en}$ Calculation or Not, It Must Still Demonstrate That the Methodology It Has and Will Use for that Calculation Is Reliable.**

The NRC Staff argument rests on the mistaken perception that because an applicant is not required to conduct a  $CUF_{en}$  calculation for license renewal, the parties and the Board should ignore the fact that Entergy has conducted such a calculation and should ignore any

shortcomings that are revealed by that calculation. This argument ignores the history of this case.

Essentially, NRC Staff is arguing that, because in *Vermont Yankee* the Commission observed that it is not necessary to do a CUF<sub>en</sub> analysis in order to demonstrate that a proper AMP exists, Entergy's CUF<sub>en</sub> Reanalysis is actually surplusage and any critique of that Reanalysis is beyond the scope of this proceeding. Rather, Staff posits that license renewal should be approved solely on the fact that Entergy committed to do a CUF<sub>en</sub> Reanalysis that was in compliance with GALL. This interpretation of the relevant law is flawed in two important ways. First, as noted above, “[w]e do not simply take the applicant at its word.” *Vermont Yankee*, CLI-10-17 at 45. Second, had Entergy not done a CUF<sub>en</sub> Reanalysis, its LRA would have to be evaluated in light of the CUF<sub>en</sub> analysis it submitted with its LRA which demonstrated that a number of components would have CUF<sub>en</sub> values >1.0. By choosing not to do a “refined” CUF<sub>en</sub> analysis, the guidance in GALL would require Entergy to implement either of the two remaining “corrective actions to prevent the usage factor from exceeding the design code limit during the period of extended operation” - *i.e.*, “repair of the component, [or] replacement of the component.” GALL at X M-1 - M-2; *see also* Entergy's Motion for Summary Disposition at 21-22 where Entergy concedes that if it did not do the CUF<sub>en</sub> Reanalysis and show all the values <1.0 it would have had to implement “Option 2 (*i.e.*, ‘repair or replace the affected locations [before exceeding a CUF of 1.0]’).” To avoid that consequence, Entergy chose instead to do the CUF<sub>en</sub> Reanalysis. It is that reanalysis, not a promise to do that reanalysis, which forms the basis for evaluating the new metal fatigue contention.

**B. Whether Or Not Entergy Has Done or Must Do a CUF<sub>en</sub> Analysis, Deficiencies In the Methodology It Has Used or Will Use In the CUF<sub>en</sub> Calculation Are Legitimate Issues In the License Renewal Proceeding.**

NRC Staff argues that because Entergy was not required to do a CUF<sub>en</sub> calculation as a pre-condition for license renewal, the following identified deficiencies in that calculation are not legitimate issues for license renewal:

1. Absence of a “propagation of error” analysis (NRC Staff Answer at 14);
2. Failure to include a broader scope of components (NRC Staff Answer at 15-16);
3. Failure to include a bounding calculation for dissolved oxygen (“DO”) (NRC Staff Answer at 17); and
4. Failure to provide the criteria used in selecting essential parameters for the F<sub>en</sub> calculation (NRC Staff Answer at 19-20).

This argument ignores the clear directive in *Vermont Yankee* that even though an applicant need not do a CUF<sub>en</sub> calculation, it still must demonstrate that the CUF<sub>en</sub> methodology it will use is reliable and will be capable of meeting the goals of GALL. *Vermont Yankee*, CLI-10-17 at 45, 47.

Both Drs. Lahey and Hopfenfeld, in their supporting declarations, demonstrate with detailed analyses not only that certain methodological deficiencies exist, but that the missing methodologies can, depending on the choices made by Entergy, have a profound impact on the CUF<sub>en</sub> calculational result. Lahey Sept. 8, 2010 Declaration at ¶¶ 9 and 11; Hopfenfeld Sept. 9, 2010 Declaration at ¶¶ 10-15. NRC Staff never challenged those analyses and, other than asserting that the contention’s bases lack specificity, does not address the specificity provided by the two declarations or show why they are insufficient. It is not only an intervenor that cannot make bald, unsupported assertions. NRC Staff and Entergy must be held to the same standard of

specificity. *See, e.g., Sequoyah Fuels Corporation* (Gore, Oklahoma Site Decommissioning) CLI-01-02, 53 N.R.C. 9 (2001).

NRC Staff argues that because it has not evaluated the methodology for the  $CUF_{en}$  Reanalysis, such an evaluation is also off-limits for the Board and the parties. Staff Answer at 11-12. This argument rings hollow in the face of the evaluation conducted by NRC Staff of the original  $CUF_{en}$  calculation submitted by Entergy with its LRA. This analysis, described in some detail in the SER at § 4.3.3.2, demonstrates that contrary to the assertions made by Staff in its Answer, the variables identified in the proposed new contention as suspect are the same variables upon which Staff focused its attention in conducting the review of the LRA:

- The basis for the selection of the DO value (SER at 4-43 to 4-44);
- Sulfur content, temperature and strain rate (SER at 4-44); and
- The criteria for determining how many transients are likely to occur and when corrective actions will be taken (SER at 4-44 to 4-45).

It is not legitimate for NRC Staff to assert in its answer that the factors upon which the proposed new contention are based are beyond the scope of license renewal when, in fact, Staff itself focused on many of these same factors in conducting its review of the LRA.

Moreover, as a matter of law, NRC Staff is simply wrong when it attempts to limit the scope of the intervenors' metal fatigue contention by emphasizing that Staff is not now (during this AEA § 189 proceeding) going to review the  $CUF_{en}$  methodology used by Entergy in the  $CUF_{en}$  Reanalysis. Parties are not divested of their right to raise issues challenging the adequacy and accuracy of the applicant's analysis and submissions just because NRC Staff will not now evaluate the accuracy of Entergy-Westinghouse's  $CUF_{en}$  Reanalysis and prepare an amended SER.

**VII. ENTERGY'S ANSWER IS REplete WITH MATERIAL ISSUES OF FACT ON WHICH THERE IS A DISPUTE**

Entergy's Answer includes 17 exhibits which, according to Entergy, demonstrate that the bases and factual support offered in the proposed new contention are in error. The following sections of this pleading highlight the extent of the dispute regarding many of those facts and why the proposed new contention should be admitted to permit the Board to have the benefit of a full evidentiary record to resolve these disputes. In addition, in several instances Entergy relies on the record in other cases to support its claim that when considering the bases and supporting evidence submitted with the proposed new contention, the Board should now side with Entergy. This reliance underscores the extent of the dispute regarding material issues of fact.

For example, Entergy asserts that some of the positions advanced by Dr. Hopfenfeld in this case, when made in the context of an entirely different reactor (a BWR and not a PWR), were rejected based on the evidentiary record developed in that case after extensive evidentiary hearings. See Entergy Answer at 15 relying on the ASLB decision in *Entergy Vt. Yankee, LLC* (Vt. Yankee Nuclear Generating Station) LBP-08-25, 68 NRC 763, 804, 814 (2008), *rev'd and remanded on other grounds*, CLI-10-17. However, a review of the relevant pages of the decision demonstrates the extent to which the Board reviewed the specific testimony of the witnesses to resolve the disputed facts. For example, and most importantly, the  $CUF_{en}$  calculations at issue in *Vermont Yankee* were not in excess of 0.99 as they are for the IP3 RHR lines or 0.94 for the IP2 RHR lines, nor were they even near 0.8 as Entergy now reports for other components in this case. Thus, in this case even minor errors in the values used in the  $CUF_{en}$  calculation could result in producing  $CUF_{en}$  values in excess of 1.0, thus requiring additional corrective action. Until the hearing in this case it is not possible to know if Entergy or NRC Staff witnesses will have the same opinions regarding the absence of an error analysis and the absence of any

detailed analysis of the bases used for removing conservatisms or selecting new assumption values. Until this Board has the opportunity to question those witnesses and Drs. Lahey and Hopenfeld, it is not possible to know how these disputed issues will be resolved. Thus, the *Vermont Yankee* decision only illustrates why it is necessary to allow the issues to be fully developed on the record in this case before resolving the dispute between the parties.

**A. The Criticisms of the  $F_{en}$  Factors Used by Westinghouse Have Adequate Support and Undoubtedly Establish a Genuine Material Dispute.**

It is far from clear that Westinghouse “scrupulously” applied appropriate  $F_{en}$  factors in the  $CUF_{en}$  Reanalysis. As Entergy explains, Westinghouse used  $F_{en}$  values calculated as described in NUREG/CR-5704 and NUREG/CR-6585. Entergy Answer at 20. However, these reports provide equations generated from laboratory experiments that do not represent the real world reactor environment. *See* Hopenfeld Sept. 9, 2010 Declaration ¶ 10. Reactor components will experience conditions which would affect fatigue differently in the reactor during transients. These reports make it clear that, when calculating  $CUF_{en}$  values, it is up to the analyst to make allowances for the numerous differences between the laboratory and reactor environment. *See, e.g.,* NUREG/CR-6909 (discussing 13 uncertainties in applying  $F_{en}$  equations to actual reactor components); Transcript of the Advisory Committee on Reactor Safeguards, Subcommittee on Materials, Metallurgy, and Reactor Fuels, December 6, 2007, at 22, 25-26 (“To apply the laboratory data to actual reactor components, we need to adjust these results to account for parameters or variables which we know affect fatigue life but are not included in this data”).

As the State and Riverkeeper have already indicated, Entergy has presented no evidence to suggest that Westinghouse took into account all relevant variables in the  $CUF_{en}$  Reanalysis. *See* Hopenfeld Sept. 9, 2010 Declaration, ¶ 10. Nonetheless, by virtue of the fact that Entergy

completed a “refined” analysis using the above-referenced equations, Entergy appears to maintain that resulting  $CUF_{en}$  values are sufficiently accurate and/or conservative. *See* Entergy Answer at 20-21. However, Entergy’s failure to quantify or otherwise substantiate in any way how the  $CUF_{en}$  Reanalysis handled the numerous uncertainties in applying the  $F_{en}$  equations to the reactor components, makes it impossible to fully assess the accuracy of the results. *See* Hopenfeld Sept. 9, 2010 Declaration, ¶ 10.

The  $F_{en}$  values of 12 and 17 discussed in NUREG/CR-6909, based on a review of data from 41 sources, factor in a much wider range of parameters than the equations employed by Entergy, and should, therefore, be used when differences between laboratory and real reactor environments are ignored. Accordingly, in the absence of any justification of how flow, strain rate, loading history, mean stress, oxygen, surface finish, water impurities, and other variables were adequately accounted for in Entergy’s  $CUF_{en}$  Reanalysis, these bounding  $F_{en}$  values should have been applied. *See* Hopenfeld Sept. 9, 2010 Declaration, ¶ 10. Though Entergy claims that Petitioners have not justified why these  $F_{ens}$  should be used, quite the opposite, it is Entergy who has failed to provide “adequate technical justification” for why the “worst-case  $F_{en}$  values” should *not* be used. *See* Entergy Answer at 21.

**B. The Criticisms of the Dissolved Oxygen Values Used by Westinghouse Have Adequate Support and Establish a Genuine Issue of Material Fact.**

Next, Entergy maintains that Westinghouse used appropriate dissolved oxygen values in ascertaining the  $F_{en}$  factors for performing the  $CUF_{en}$  Reanalysis. *See* Entergy Answer at 21-22. In particular, Entergy explains that dissolved oxygen was “assumed to be less than 0.05 parts per million (“ppm”); *i.e.*, the bounding default value specified [sic] NUREG/CR-5704 and NUREG/CR-6583.” *Id.* at 21. Entergy states that this was an appropriate assumption since “Entergy maintains a DO content of less than or equal to 0.005 ppm for IPEC power operation.”

*Id.* However, it is not clear that this “bounding default” was appropriate, since NRC guidance indicates that “the value of temperature and DO may be conservatively taken as the *maximum* values for the transient.” See NUREG/CR-6583 at 78 (emphasis added). Moreover, NUREG/CR-6909 specifically quantifies what values for DO are appropriate:

The DO value is obtained from each transient constituting the stress cycle. *For carbon and low alloy steels, the dissolved oxygen content, DO, associated with a stress cycle is the highest oxygen level in the transient, and for austenitic stainless steels, it is the lowest oxygen level in the transient. A value of 0.4 ppm for carbon and low-alloy steels and 0.05 ppm for austenitic stainless steels can be used for the DO content to perform a conservative evaluation.*

NUREG/CR-6909, at A-5 (emphasis added).

Treating DO levels as indicated by these NUREG reports is consistent with basic laws of physics that oxygen solubility varies with temperature, as well as with EPRI assessments of oxygen behavior during transients. See MRP-47. Entergy dismisses EPRI data showing that oxygen concentrations vary significantly with changes in temperature because it was BWR data. Entergy Answer at n. 93. However, while absolute values of oxygen levels will of course vary between PWRs and BWRs, this does not undermine the principle derived from this EPRI data, which relates to how oxygen levels change during transients. Notably, the above-referenced NUREG reports do not distinguish PWRs from BWRs with regard to oxygen behavior during transients.

Yet, Entergy makes no distinction between oxygen concentrations during steady state operations during transients. By treating DO as it does, Entergy appears to suggest that oxygen during transients at Indian Point remains at a low steady state value of 0.005 ppm. This is not consistent with the prevailing understanding of oxygen behavior, and Entergy has not otherwise provided any information to support such a claim. See Hopenfeld Sept. 9, 2010 Declaration, ¶

11. Thus, in the absence of applying data on *actual* oxygen levels for each component *during the transients*, Entergy must follow the guidance of the above-cited NUREG reports, *i.e.*, apply a dissolved oxygen value of 0.4 ppm for carbon and low-alloy steels, to ensure that uncertainties in dissolved oxygen levels are adequately accounted for. *See id.*

**C. The Criticisms of the Plant Transient Numbers Used by Westinghouse Have Adequate Support and Establish a Genuine Issue of Material Fact.**

Entergy further claims that Westinghouse used an appropriate number of transients in the CUF<sub>en</sub> Reanalysis. *See* Entergy Answer at 22. Entergy explains that in certain instances, Westinghouse used transient numbers projected to 60 years based on actual numbers of cycles accrued to date. *See id.* Such an extrapolation necessarily involves certain assumptions in order to select the appropriate number of transients, which neither Entergy nor Westinghouse have discussed. *See* Hopenfeld Sept. 9, 2010 Declaration, ¶ 13. Merely stating that the number of transients was “projected” does not demonstrate that such a projection was adequate. Moreover, Entergy states that in certain instances, Westinghouse “conservatively used CLB cycles.” Entergy Answer at 22. However, Entergy does not quantify how this is “conservative,” and, thus, such a statement does not show that the number of transients used in the “refined” calculation was appropriate.

**D. There is a Material Dispute Regarding the Need for Benchmarking.**

Turning to benchmarking the WESTEMS computer code, Entergy notes that Westinghouse presented benchmarking information in connection with the Beaver Valley and Shearon Harris license renewal applications.<sup>6</sup> However, as described in publicly available documents submitted by Entergy as Attachments 10, 11, and 12, the State understands that the

---

<sup>6</sup> No AEA § 189 adjudicatory proceeding took place concerning the Beaver Valley license renewal application.

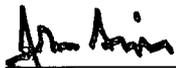
benchmarking was in connection with a stylized stress analysis that incorporated constant assumptions for heat transfer coefficients, as distinguished from a more dynamic heat transfer model.

Entergy places reliance on actions taken by NRC, apparently without any contested evidentiary hearing on the issue of metal fatigue, in the cases of Shearon Harris Unit 1 and Beaver Valley Units 1 and 2. Entergy Answer at 15-16 fn. 64, 65 and 66. Not only was there no contested issue regarding metal fatigue in those cases and apparently no ASLB decision, but the reactors involved in those cases were of a different design than Indian Point. The Indian Point reactors are four loop plants. The Shearon Harris and Beaver Valley units are three loop plants. *See NRC Information Digest, 2010–2011 (NUREG-1350, Volume 22)*. What those applications demonstrate is the importance of benchmarking, which has not been done (or provided) specifically for the Indian Point reactors, and the quality of the benchmarking, which has not been demonstrated for Indian Point. Entergy's assumption that a passing reference to benchmarking in other cases, without describing the benchmarking or providing the details of the analysis, meets its duty to "demonstrate" that its CUF<sub>en</sub> Reanalysis is reliable and will achieve the goals in GALL falls short of the mark.

## CONCLUSION

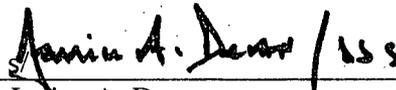
For the foregoing reasons, the State and Riverkeeper respectfully request that the Board admit New and Amended Contention New York State 26B/Riverkeeper TC-1B (Metal Fatigue).

### State of New York



---

John Sipos  
Assistant Attorney General  
Office of the Attorney General  
The Capitol  
Albany, New York 12224  
(518) 402-2251  
john.sipos@ag.ny.gov



---

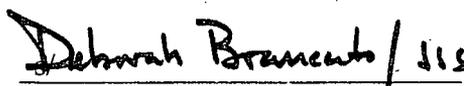
Janice A. Dean  
Assistant Attorney General  
Office of the Attorney General  
120 Broadway, 26th Floor  
New York, New York 10271  
(212) 416-8459  
janice.dean@ag.ny.gov

### Riverkeeper, Inc.



---

Phillip Musegaas  
Program Director  
Riverkeeper, Inc.  
20 Secor Road  
Ossining, New York 10562  
(914) 478-4501, x. 224  
phillip@riverkeeper.org



---

Deborah Brancato  
Staff Attorney  
Riverkeeper, Inc.  
20 Secor Road  
Ossining, New York 10562  
(914) 478-4501, x. 230  
dbrancato@riverkeeper.org

dated: October 12, 2010

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

-----X  
In re: Docket Nos. 50-247-LR and 50-286-LR  
License Renewal Application Submitted by ASLBP No. 07-858-03-LR-BD01  
Entergy Nuclear Indian Point 2, LLC, DPR-26, DPR-64  
Entergy Nuclear Indian Point 3, LLC, and  
Entergy Nuclear Operations, Inc. October 12, 2010  
-----X

CERTIFICATE OF SERVICE

I hereby certify that on October 12, 2010, copies of the State of New York and Riverkeeper, Inc.'s Joint Reply to Entergy and NRC Staff's Separate Answers to the State and Riverkeeper's New and Amended Contention New York State 26B/Riverkeeper TC-1B (Metal Fatigue) were served upon the following persons via U.S. Mail and e-mail at the following addresses:

Lawrence G. McDade, Chair  
Administrative Judge  
Atomic Safety and Licensing Board Panel  
U.S. Nuclear Regulatory Commission  
Mailstop 3 F23  
Two White Flint North  
11545 Rockville Pike  
Rockville, MD 20852-2738  
Lawrence.McDade@nrc.gov

Richard E. Wardwell  
Administrative Judge  
Atomic Safety and Licensing Board Panel  
U.S. Nuclear Regulatory Commission  
Mailstop 3 F23  
Two White Flint North  
11545 Rockville Pike  
Rockville, MD 20852-2738  
Richard.Wardwell@nrc.gov

Kaye D. Lathrop  
Administrative Judge  
Atomic Safety and Licensing Board Panel  
U.S. Nuclear Regulatory Commission  
190 Cedar Lane E.  
Ridgway, CO 81432  
Kaye.Lathrop@nrc.gov

Atomic Safety and Licensing Board Panel  
U.S. Nuclear Regulatory Commission  
Mailstop 3 F23  
Two White Flint North  
11545 Rockville Pike  
Rockville, MD 20852-2738

Josh Kirstein, Esq. Law Clerk  
Atomic Safety and Licensing Board Panel  
U.S. Nuclear Regulatory Commission  
Mailstop 3 F23  
Two White Flint North  
11545 Rockville Pike  
Rockville, MD 20852-2738  
Josh.Kirstein@nrc.gov

Office of Commission Appellate  
Adjudication  
U.S. Nuclear Regulatory Commission  
Mailstop 16 G4  
One White Flint North  
11555 Rockville Pike  
Rockville, MD 20852-2738  
ocaamail@nrc.gov

Office of the Secretary  
Attn: Rulemaking and Adjudications Staff  
U.S. Nuclear Regulatory Commission  
Mailstop 3 F23  
Two White Flint North  
11545 Rockville Pike  
Rockville, MD 20852-2738  
hearingdocket@nrc.gov

Sherwin E. Turk, Esq.  
David E. Roth, Esq.  
Andrea Z. Jones, Esq.  
Beth N. Mizuno, Esq.  
Brian G. Harris, Esq.  
Office of the General Counsel  
U.S. Nuclear Regulatory Commission  
Mailstop 15 D21  
One White Flint North  
11555 Rockville Pike  
Rockville, MD 20852-2738  
sherwin.turk@nrc.gov  
andrea.jones@nrc.gov  
david.roth@nrc.gov  
beth.mizuno@nrc.gov  
brian.harris@nrc.gov

Kathryn M. Sutton, Esq.  
Paul M. Bessette, Esq.  
Morgan, Lewis & Bockius LLP  
1111 Pennsylvania Avenue, NW  
Washington, DC 20004  
ksutton@morganlewis.com  
pbessette@morganlewis.com

Martin J. O'Neill, Esq.  
Morgan, Lewis & Bockius LLP  
Suite 4000  
1000 Louisiana Street  
Houston, TX 77002  
martin.o'neill@morganlewis.com

Elise N. Zoli, Esq.  
Goodwin Procter, LLP  
Exchange Place  
53 State Street  
Boston, MA 02109  
ezoli@goodwinprocter.com

William C. Dennis, Esq.  
Assistant General Counsel  
Entergy Nuclear Operations, Inc.  
440 Hamilton Avenue  
White Plains, NY 10601  
wdennis@entergy.com

Robert D. Snook, Esq.  
Assistant Attorney General  
Office of the Attorney General  
State of Connecticut  
55 Elm Street  
P.O. Box 120  
Hartford, CT 06141-0120  
robert.snook@ct.gov

Gregory Spicer, Esq.  
Assistant County Attorney  
Office of the Westchester County Attorney  
Michaelian Office Building  
148 Martine Avenue, 6th Floor  
White Plains, NY 10601  
gss1@westchestergov.com

Daniel E. O'Neill, Mayor  
James Seirmarco, M.S.  
Village of Buchanan  
Municipal Building  
236 Tate Avenue  
Buchanan, NY 10511-1298  
vob@bestweb.net

Daniel Riesel, Esq.  
Thomas F. Wood, Esq.  
Jessica Steinberg, Esq.  
Sive, Paget & Riesel, P.C.  
460 Park Avenue  
New York, NY 10022  
driesel@sprlaw.com  
jsteinberg@sprlaw.com

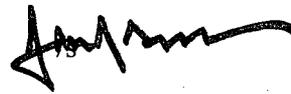
Michael J. Delaney, Esq.  
Vice President - Energy Department  
New York City Economic Development  
Corporation (NYCEDC)  
110 William Street  
New York, NY 10038  
mdelaney@nycedc.com

Manna Jo Greene, Director  
Hudson River Sloop Clearwater, Inc.  
724 Wolcott Avenue  
Beacon, NY 12508  
Mannajo@clearwater.org

Stephen Filler, Esq.  
Board Member  
Hudson River Sloop Clearwater, Inc.  
724 Wolcott Avenue  
Beacon, NY 12508  
stephenfiller@gmail.com

Ross H. Gould  
Board Member  
Hudson River Sloop Clearwater, Inc.  
270 Route 308  
Rhinebeck, NY 12572  
rgouldesq@gmail.com

Phillip Musegaas, Esq.  
Deborah Brancato, Esq.  
Riverkeeper, Inc.  
20 Secor Road  
Ossining, NY 10562  
phillip@riverkeeper.org  
dbrancato@riverkeeper.org



---

John J. Sipos  
Assistant Attorney General  
State of New York  
(518) 402-2251

Dated at Albany, New York  
this 12th day of October, 2010