

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

Alex S. Karlin, Chairman  
Dr. Richard E. Wardwell  
Dr. William H. Reed

DOCKETED  
USNRC

July 16, 2008 (11:45am)

OFFICE OF SECRETARY  
RULEMAKINGS AND  
ADJUDICATIONS STAFF

**SERVED July 16, 2008**

In the Matter of

ENTERGY NUCLEAR VERMONT YANKEE  
L.L.C.,  
and  
ENTERGY NUCLEAR OPERATIONS INC.

(Vermont Yankee Nuclear Power Station)

Docket No. 50-271-LR

ASLBP No. 06-849-03-LR

July 16, 2008

ORDER

(Rulings on Motions to Strike and Motions in Limine)

Pursuant to the Board's initial scheduling order (ISO),<sup>1</sup> the parties in this proceeding have filed a number of motions to strike, motions in limine, and associated motions. This order sets out the Board's rulings on these motions.

I. BASIC EVIDENTIARY STANDARDS

Evidentiary hearings under 10 C.F.R. Part 2 are not bound by the formal rules of evidence. See 10 C.F.R. § 2.319(d) (The "strict rules of evidence do not apply to written submissions" in hearings before Licensing Boards). Instead, the Commission has stated that although the rules of evidence provide guidance, Boards may proceed with greater flexibility:

Although the Commission has not required the application of the Federal Rules of Evidence in NRC adjudicatory proceedings, presiding officers and Licensing Boards have always looked to the Federal Rules for guidance in appropriate circumstances. The Commission continues to believe that greater informality and flexibility in the presentation of evidence in hearings, rather than the inflexible use of the formal rules of evidence imposed in the Federal courts, can result in more effective and efficient issue resolution.

---

<sup>1</sup> Licensing Board Order (Initial Scheduling Order) (Nov. 17, 2006) at 11 (unpublished).

69 Fed. Reg. 2182, 2187 (Jan. 14, 2004).

This is the approach that we have used in evaluating the various motions to strike and motions in limine presented here today. In particular, with regard to challenges to purported expert testimony, we have consulted Rule 702 of the Federal Rules of Evidence (FRE) and find it to be a useful guide.<sup>2</sup>

## II. ENTERGY MOTION 1

On June 12, 2008, Entergy Nuclear Vermont Yankee, L.L.C., and Entergy Nuclear Operations, Inc. (collectively, Entergy) filed a motion to strike certain testimony and exhibits filed by the New England Coalition, Inc. (NEC).<sup>3</sup> The NRC Staff filed an answer supporting the motion,<sup>4</sup> and NEC opposed it.<sup>5</sup>

Entergy Motion 1 raises a number of issues, and our rulings are as follows.

### A. Statements About Indian Point License Renewal

Entergy moves to strike portions of NEC's rebuttal statement of position on Contentions 2A and 2B, the associated rebuttal testimony of Dr. Joram Hopenfeld, and NEC Exhibit NEC-JH\_67 that refer to the environmentally assisted fatigue program in the Indian Point (New York) license renewal proceeding. Entergy Motion 1 at 5-6. Entergy claims that these statements

---

<sup>2</sup> "Rule 702. Testimony by Experts: If scientific, technical or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case." Fed. R. Evid. 702.

<sup>3</sup> Entergy's Motion in Limine (June 12, 2008) [Entergy Motion 1].

<sup>4</sup> NRC Staff's Answer in Support of Energy's Motion in Limine (June 19, 2008).

<sup>5</sup> New England Coalition, Inc's Opposition to Entergy's Motion in Limine (June 19, 2008) [NEC Answer to Entergy Motion 1].

“are irrelevant to the issues raised in NEC Contentions 2A and 2B and must be excluded.” Id. at 6. NEC claims that the challenged material addresses the policy question of whether Entergy is required to complete its environmentally assisted fatigue analysis at the license application stage, or whether it can put off this analysis until later. NEC Answer to Entergy Motion 1 at 3.

The Board grants this portion of Entergy’s motion. The factual status of the Indian Point license renewal proceeding and the strategies of the parties thereto are simply not relevant evidence in this proceeding. However, in granting this portion of the motion, we note that we have instructed the parties to brief the underlying legal issue of when the fatigue analysis must be completed.<sup>6</sup>

B. Rebuttal Testimony Concerning EPU Stress Analysis

Entergy moves to strike portions of NEC’s rebuttal testimony on Contention 3 that were submitted by Dr. Hopenfeld and that relate to the acceptability of the steam dryer stress analysis during the implementation of Vermont Yankee’s extended power uprate (EPU). Entergy Motion 1 at 6-7. According to Entergy, the Board determined that this issue was outside the scope of Contention 3 in an earlier ruling on a Motion for Summary Disposition (MSD) on that contention.<sup>7</sup> NEC argues that this portion of Dr. Hopenfeld’s rebuttal testimony was responsive to direct testimony by Entergy’s witness, Mr. John R. Hoffman. NEC Answer to Entergy Motion 1 at 4. According to NEC, Mr. Hoffman’s testimony indicates that the stress analysis carried out as part of the EPU will be used as a basis for Entergy’s aging management plan for the steam dryer. Id.

---

<sup>6</sup> Licensing Board Order (Regarding Briefing of Certain Legal Issues) (June 27, 2008) at 2-3.

<sup>7</sup> Id. at 6 (citing Licensing Board Memorandum and Order (Ruling on Motion for Summary Disposition of NEC Contention 3) (Sept. 11, 2007) [Contention 3 MSD Order]).

The Board denies this portion of Entergy's motion. Rebuttal testimony by NEC's witness is responsive to points raised by Entergy's witness in his direct testimony.

C. Hopenfeld Testimony Concerning IGSCC Cracks in the Steam Dryer

Entergy moves to strike those portions of NEC's rebuttal statement of position on Contention 3, the associated rebuttal testimony of Dr. Joram Hopenfeld, and NEC Exhibit NEC-JH\_68 that discuss the possibility that intergranular stress corrosion cracks (IGSCCs) in the steam dryer may become fatigue cracks and lead to steam dryer failure. Entergy Motion 1 at 7-9. Entergy claims that Contention 3 is limited to cracks caused by fatigue, and that the IGSCC issue was raised for the first time in rebuttal testimony. Id. at 7-8. Furthermore, Entergy says, NEC's testimony is based on a misleading reference to a draft document that has since been revised. Id. at 8. NEC argues that Dr. Hopenfeld's statements are made in response to direct testimony by Entergy's witness, Mr. Larry D. Lukens. NEC Answer to Entergy Motion 1 at 6.

The Board denies this portion of Entergy's motion. Rebuttal testimony by NEC's witness addresses points that are similar to those raised by Entergy's witness in his direct testimony.

D. Dr. Hopenfeld Testimony Regarding Whether CHECWORKS Has Been "Qualified" and Whether it Can Produce Accurate Results

Entergy moves to strike those portions of Dr. Hopenfeld's rebuttal testimony on Contention 4 that raise a number of allegedly new questions about the CHECWORKS computer code. Entergy Motion 1 at 14-15. According to Entergy, the CHECWORKS issue in Contention 4 is limited to the question of whether sufficient benchmarking data is available to permit the use of CHECWORKS in the flow-accelerated corrosion (FAC) program during the period of extended operations. Id. at 14. For that reason, Entergy says, questions that go beyond this issue are outside the scope of the admitted contention. Id. at 15. NEC argues that Dr. Hopenfeld's observations are relevant to his claim that "the CHECWORKS model is difficult

to use properly because it must be carefully calibrated to plant conditions.” NEC Answer to Entergy Motion 1 at 8.

The Board denies this portion of Entergy’s motion. We acknowledge that the issues mentioned by Entergy are not the heart of Contention 4. However, we find them to be tangentially relevant and therefore admissible.

E. Applicability and Appropriateness of NSAC-202L

Entergy moves to strike those portions of NEC Exhibit NEC-JH\_36 and of Dr. Hopenfeld’s rebuttal testimony that criticize the Electric Power Research Institute’s guidelines related to CHECWORKS in Nuclear Safety Analysis Center (NSAC)-202L. Entergy Motion 1 at 16. According to Entergy, claims related to the adequacy of NSAC-202L are outside the scope of Contention 4. Id. at 17. NEC argues that Dr. Hopenfeld’s observations are relevant to his more general claims about CHECWORKS. NEC Answer to Entergy Motion 1 at 8.

The Board denies this portion of Entergy’s motion. While the NSAC-202L issue is not central to Contention 4, it is tangentially relevant and therefore admissible.

F. Definition of Flow Accelerated Corrosion

Entergy moves to strike those portions of NEC’s rebuttal statement of position and rebuttal testimony by Dr. Hopenfeld and Dr. Hausler that address the the definition of FAC. Entergy Motion 1 at 18-20. According to Entergy, NEC had not previously challenged the definition of FAC presented in the license renewal application (LRA or Application). Id. at 17. Therefore, Entergy argues, NEC’s attempts to challenge the definition in rebuttal testimony are improper. Id. at 20. NEC argues that the issue is not being raised for the first time on rebuttal, but rather has been raised at the contention admissibility stage and in direct testimony. NEC Answer to Entergy Motion 1 at 7-8. Furthermore, NEC says, the discussion found in rebuttal testimony is a response to the direct testimony of an Entergy witness. Id. at 8.

The Board denies this portion of Entergy's motion. Contention 4 deals with "flow accelerated corrosion." We see no reason why we should automatically accept Entergy's definition of this term and exclude any other evidence or testimony on this point.

G. Inclusion of "Susceptible Reactor Components" in FAC Program

Entergy moves to strike those portions of Dr. Hopenfeld's rebuttal testimony that extend his FAC concerns to "susceptible reactor components." Entergy Motion 1 at 21. According to Entergy, Contention 4 extends only to the problem of FAC in the plant's carbon steel piping. Id. NEC does not reply to this part of the motion.

The Board denies this portion of Entergy's motion. While we agree that Contention 4 focuses on piping, we do not see Dr. Hopenfeld's testimony as expanding the scope of the original contention. Rather, it deals with the same piping and associated components susceptible to FAC that the contention has addressed from the outset.

H. Exclusion of Mr. Witte's Testimony

Entergy moves to strike the direct testimony of Mr. Ulrich Witte on Contention 4, along with associated NEC Exhibit NEC-UW\_03, in its entirety, on the ground that "Mr. Witte does not qualify as an expert on the issues raised by NEC Contention 4 by 'knowledge, skill, experience, training, or education.'" Entergy Motion 1 at 22. According to Entergy, Mr. Witte's curriculum vitae (CV) provides no indication that he is qualified to offer opinions on FAC programs. Id. at 23. Furthermore, Entergy says, Mr. Witte's allegations are not stated adequately or supported by sufficient evidence. Id. at 23- 25.

NEC replies that Mr. Witte's expertise is in "licensing and regulatory compliance of commercial nuclear facilities, which does qualify him to identify problems in Entergy's implementation of its FAC management program based on a review of program documentation." NEC Answer to Entergy Motion 1 at 9. According to NEC, he has extensive

---

experience evaluating “the compliance of nuclear facilities with regulatory requirements and industry guidance.” Id. NEC notes that expert witnesses are not required to supply a citation for every statement made, and claims that Entergy’s own experts would not meet that test. Id. at 11. However, NEC notes that Mr. Witte has identified some errors in his exhibits and has filed corrections. Id.

The Board grants in part and denies in part this portion of Entergy’s motion.

First, as to factual matters, we are not willing to strike Mr. Witte’s testimony as to events and activities that are primarily factual and otherwise historically verifiable in this proceeding. Indeed, all of the “expert” witnesses propounded by Entergy and the NRC Staff seem to offer hearsay testimony about factual matters that they apparently did not participate in or witness. In this respect, while we note that Mr. Witte has a penchant for qualifying his statements with phrases such as “it appears,” we decline to throw out all of his testimony because of his cautious terminology. Mr. Witte’s factual testimony is not without some support, and the degree of support he offers will go to the weight to be given to his testimony rather than to its admissibility.

Second, as to his areas of expertise, and his ability to proffer expert opinions that might be helpful to the Board and acceptable under the standards of FRE 702, we segregate Mr. Witte’s testimony into two categories. As to the category of configuration management issues, we find that Mr. Witte is qualified and his opinion testimony acceptable under FRE 702. This is in keeping with our previous decision to admit his testimony on Contention 3 at the MSD phase.<sup>8</sup> However, as to the predictive accuracy of the CHECWORKS model, the requirements

---

<sup>8</sup> Contention 3 MSD Order at 13 (“[T]he Board finds that [Mr. Witte’s] background in the areas of configuration management, engineering design change controls, and licensing basis reconstitution provides him with the management-level capability to review results and assess whether there are apparent issues with the data that may raise concerns warranting further

(continued...)

necessary to benchmark it, and other technical aspects of predicting and modeling FAC, we see nothing in Mr. Witte's CV that would qualify him to offer expert opinions on these subjects. and we therefore grant this portion of Entergy's Motion 1.

Those portions of Mr. Witte's direct testimony that are stricken are displayed on two attachments hereto:

Attachment 1: NEC Exhibit NEC-UW\_01 With Strike-Outs

Attachment 2: NEC Exhibit NEC-UW\_03 With Strike-Outs

The remainder of Entergy Motion 1 with regard to Mr. Witte is denied, including specifically Entergy's request to strike Mr. Witte's CV, NEC-UW\_02, and the other exhibits related to Mr. Witte's direct testimony, NEC-UW\_04 to \_22.

I. Rulings on Entergy Motion 1 Exhibit 1

Entergy Motion 1 includes an exhibit 1 entitled "NEC Materials Subject to Exclusion Pursuant to Entergy's Motion in Limine." Attachment 3 hereto provides our rulings on each item listed on Entergy's exhibit, along with citations to the sections of this order in which the listed items are addressed.

### III. STAFF MOTION 1

On June 12, 2008, the NRC Staff filed a motion to strike certain testimony and exhibits filed by the NEC in this proceeding.<sup>9</sup> Entergy filed an answer supporting this motion,<sup>10</sup> and NEC

---

<sup>8</sup>(...continued)  
investigation and resolution.")

<sup>9</sup> NRC Staff's Motion in Limine to Strike Testimony and Exhibits Filed by New England Coalition, Inc. (June 12, 2008) [Staff Motion 1].

<sup>10</sup> Entergy's Response in Support of Staff's Motion in Limine (June 19, 2008).

opposed it.<sup>11</sup>

Staff Motion 1 raises a number of issues, and our rulings are as follows.<sup>12</sup>

A. Testimony and Exhibits of Mr. Ulrich Witte, as Unsupported

The NRC Staff moves to strike NEC witness Ulrich Witte's direct testimony in its entirety on the ground that large portions are allegedly "unsupported by facts or evidence." Staff Motion 1 at 5. As evidence for this claim, the Staff notes Mr. Witte's use of language such as "may have" and "apparently." Id. The Staff also argues that some of the exhibits Mr. Witte supplies in support of his testimony do not, in fact, stand for the propositions for which he cites them. Id. at 6. For these reasons, the Staff says, Mr. Witte's testimony "can only be of marginal use, if any, to the trier of fact." Id. NEC replies that Mr. Witte is not required to submit a citation for every statement he makes, and acknowledges and corrects certain citation errors in Mr. Witte's original submission. NEC Answer to Staff Motion 1 at 5.

The Board denies this portion of the Staff's motion. As we noted in our ruling on Entergy Motion 1, Mr. Witte's testimony is not completely unsupported. The degree of support he offers and the qualifying language he employs go to the weight to be given to his testimony and do not render his factual testimony inadmissible.

B. Mr. Witte's Testimony Regarding Entergy's "Commitments"

The NRC Staff moves to strike Mr. Witte's testimony related to Entergy's "commitments." Staff Motion 1 at 6. The Staff says that Mr. Witte does not provide any exhibits or evidence to demonstrate the existence of these alleged commitments, and that he has

---

<sup>11</sup> New England Coalition, Inc's Opposition to NRC Staff's Motion in Limine to Strike Testimony and Exhibits Filed by New England Coalition, Inc. (June 19, 2008) [NEC Answer to Staff Motion 1].

<sup>12</sup> The portions of Mr. Witte's testimony, and of associated exhibit NEC-UW\_03, that have already been stricken are identified in Attachments 1 and 2 to this order.

identified certain things (such as generic letters issued by NRC) that cannot be licensee commitments. Id. at 6-7. NEC claims that the Staff moves to exclude this material because it disagrees with NEC's definition of "commitments." NEC Answer to Staff Motion 1 at 5. Mr. Witte has identified the materials he reviewed in evaluating Entergy's "commitments," NEC says, and his testimony should be considered. Id.

The Board denies this portion of the Staff's motion. Any shortcomings in Mr. Witte's citations go to the weight of his testimony rather than its admissibility.

C. Mr. Witte's Testimony Regarding Current Licensing Basis (CLB) Issues

The Staff moves to exclude Mr. Witte's statements regarding compliance with the CLB on the ground that they are outside the scope of a license renewal proceeding. Staff Motion 1 at 7. NEC argues that some of these statements are admissible because they address aspects of Entergy's FAC program that will carry forward into the license renewal term. NEC Answer to Staff Motion 1 at 4.

The Board grants in part and denies in part this portion of the Staff's motion. While a challenge to the CLB is outside the scope of a license renewal, the CLB itself is relevant to the extent that a plant's current practices will form part of its aging management program during the license renewal term. Additionally, past reductions in the safety margin of the CLB may be relevant to a reactor's ability to withstand an additional 20 years of operation. Thus, we are not willing to exclude evidence merely because it touches upon Entergy's CLB. On the other hand however, this is not an enforcement proceeding and allegations that Entergy is in violation of its CLB are outside the scope of this proceeding and must be stricken.

D. Dr. Hopenfeld's Testimony in Response to Staff Witness Mr. Fair

The Staff moves to strike statements by NEC witness Dr. Hopenfeld on the grounds that they are "commentary" on testimony offered by Staff witness Mr. John R. Fair. Staff Motion 1 at

9. NEC argues that Dr. Hopenfeld's statements merely indicate disagreement with Mr. Fair's testimony and should be admitted. NEC Answer to Staff Motion 1 at 3.

The Board denies this portion of the Staff's motion. While Dr. Hopenfeld's testimony on this point may be strongly stated, it is not inadmissible.

E. Dr. Hopenfeld Testimony Regarding Requirements of ASME Code and of 10 C.F.R. § 54.21(c)

The Staff moves to strike portions of Dr. Hopenfeld's testimony related to his assertions that the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code requires licensees to account for environmental conditions that are more aggressive than air, and that 10 C.F.R. § 54.21(c) requires licensees to demonstrate "that components will operate safely in a reactor environment." Staff Motion 1 at 9. The Staff argues that the ASME Code is non-mandatory guidance, not a regulatory requirement, and that 10 C.F.R. § 54.21(c) requires an evaluation of time-limited aging analyses and not the demonstration that Dr. Hopenfeld asserts. Id. NEC replies that the question of the ASME Code is an area of disagreement between the Staff and NEC, and that this disagreement is no reason to dismiss Dr. Hopenfeld's testimony. NEC Answer to Staff Motion 1 at 3. NEC does not reply to the portion of the Staff's motion that addresses the content of 10 C.F.R. § 54.21(c).

The Board denies this portion of the Staff's motion. Witnesses for all parties seem to proffer their opinions on the law (e.g., what the relevant laws or regulations mean or require). The Board does not intend to be misled by such "evidence." The Board will rule on questions of law in this proceeding, guided by our own best lights and the legal briefs by the parties. We see no need to single out Dr. Hopenfeld and strike his occasional assertions on points of law.

F. Dr. Hopenfeld's Assertion that Entergy Has Withheld Information

The Staff moves to strike those portions of Dr. Hopenfeld's direct testimony that make claims that Entergy has failed to disclose necessary information, perhaps to thwart public

scrutiny of its methods. Staff Motion 1 at 10. According to the Staff, these statements are argumentative and speculative. Id. If NEC knows that Entergy is withholding specific information, the Staff says, then a motion to compel is the proper way to obtain the missing materials. Id. NEC replies that Dr. Hopenfeld's statements address the issue of whether Entergy has met its burden of proof. NEC Answer to Staff Motion 1 at 4.

The Board grants this portion of the Staff's motion. Casting aspersions regarding alleged non-disclosures and strategies is not appropriate, and these statements will be stricken.

G. Qualifications of Dr. Hopenfeld and Dr. Hausler

The Staff moves to exclude the testimony of Dr. Hopenfeld with regard to Contentions 2A and 2B, and of Dr. Hausler with regard to Contention 4. Staff Motion 1 at 11. The Staff argues that Dr. Hopenfeld's qualifications lack specificity, and that Dr. Hausler has not demonstrated experience using CHECWORKS. Id. NEC argues that the Staff's allegations regarding Dr. Hopenfeld are inconsistent in that the Staff actually admits that his qualifications are relevant to the subject matter of Contentions 2A and 2B. NEC Answer to Staff Motion 1 at 2. NEC also argues that Dr. Hausler's testimony deals with FAC in general and with data interpretation and analysis, areas that do not require direct experience using CHECWORKS. Id. at 7.

The Board denies this portion of the Staff's motion. Both NEC witnesses appear to be qualified to speak in the areas for which they have submitted testimony, and the Board will evaluate their statements (like those of all witnesses) for what they are worth in ruling on the merits of the contentions in question.

#### IV. NEC MOTION TO STRIKE

Also on June 12, 2008, NEC filed a motion to strike the NRC Staff's rebuttal testimony concerning Contention 4, and associated exhibits, to the extent it responded to NEC's initial

statement of position.<sup>13</sup> The NRC Staff filed an answer opposing NEC's motion,<sup>14</sup> and Entergy did the same.<sup>15</sup>

In its motion, NEC argues that the Staff's rebuttal testimony responding to NEC should be stricken in its entirety because NEC believed that the staggered filing schedule for direct testimony necessarily implies that Staff and Entergy responses to NEC's direct testimony must only be made in their initial/direct testimony rather than in their rebuttal testimony. NEC Motion to Strike at 2. According to NEC, the NRC Staff should have limited its rebuttal testimony to responses to Entergy's direct testimony. Id. According to NEC, Entergy's rebuttal testimony follows this pattern. Id. Both the NRC Staff and Entergy argue that nothing in the ISO supports NEC's interpretation. Staff Answer to NEC Motion to Strike at 2-3; Entergy Answer to NEC Motion to Strike at 3.

The Board denies this motion. While NEC's stated interpretation of the ISO is understandable (and apparently followed by Entergy), there is nothing in the letter of the ISO that restricts the Staff's rebuttal to responding to Entergy's direct testimony. Nor was such a restriction the Board's intent. The contentions that were admitted in this proceeding were stated very broadly. Allowing the Intervenor to file its statement of position and testimony first was meant to give the Intervenor the opportunity to better define the scope of its litigation position, and to reduce the need for the NRC Staff and Entergy to file testimony responding to matters that NEC did not intend to litigate. The Board provided only a short interval between

---

<sup>13</sup> New England Coalition, Inc's Motion to Strike NRC Staff Rebuttal Testimony Concerning NEC Contention 4 (June 12, 2008) [NEC Motion to Strike].

<sup>14</sup> NRC Staff's Response to NEC's Motion to Strike NRC Staff's Rebuttal Testimony Concerning NEC Contention 4 (June 19, 2008) [Staff Answer to NEC Motion to Strike].

<sup>15</sup> Entergy's Response in Opposition to NEC's Motion to Strike Staff's Rebuttal Testimony (June 23, 2008) [Entergy Answer to Staff Motion to Strike].

the due date for NEC's initial testimony and the initial testimony of Entergy and the NRC Staff. This is because the former was merely intended to help scope the latter.

#### V. NEC MOTION FOR LATE-FILED REBUTTAL TESTIMONY

On June 6, 2008, NEC filed a motion requesting permission to file Ulrich Witte's rebuttal testimony late.<sup>16</sup> An illness prevented Mr. Witte from completing his testimony on time, NEC said, and counsel for the organization was unaware of that fact until the deadline arrived. Id. at 1. NEC attached Mr. Witte's testimony to the motion as an exhibit. Id., Exh. 3. Entergy subsequently filed an answer opposing the untimely filing.<sup>17</sup> Both Entergy and the NRC Staff filed Motions addressing the content of this rebuttal testimony.<sup>18</sup>

The Board grants NEC's motion to file Mr. Witte's rebuttal testimony late. We address the specific challenges to the content of this testimony in the following two sections.

#### VI. ENTERGY MOTION 2

On June 23, 2008, Entergy filed a motion to exclude the rebuttal testimony of Ulrich Witte in its entirety, along with associated exhibits NEC-UW\_24 to \_26.<sup>19</sup> In this motion, Entergy argues that Mr. Witte's rebuttal testimony should be stricken because Mr. Witte is not an expert in the areas of Contentions 2A, 2B, and 4, and because he fails to provide any relevant factual support for his opinions. Id. at 2. NEC responds with the same argument it

---

<sup>16</sup> New England Coalition, Inc's Motion to Late-File Rebuttal Testimony of Ulrich Witte (June 6, 2008).

<sup>17</sup> Entergy's Response in Opposition to NEC Motion to File Untimely Rebuttal Testimony by Ulrich Witte (June 23, 2008).

<sup>18</sup> See Sections VI and VII, infra.

<sup>19</sup> Entergy's Motion in Limine to Exclude the Rebuttal Testimony of Ulrich Witte (June 23, 2008) [Entergy Motion 2].

uses in response to the motions challenging Mr. Witte's initial/direct testimony.<sup>20</sup>

The Board grants in part and denies in part Entergy's motion. We find no evidence that Mr. Witte is qualified to offer expert opinion on the subject matter of Contentions 2A and 2B, and we therefore strike those portions of his rebuttal testimony that address these contentions. (Mr. Witte did not submit direct testimony addressing these contentions.) However, we have previously found that Mr. Witte is qualified to offer expert testimony on some aspects of Contention 4, see Section II.H, supra, and we decline to strike his rebuttal testimony in its entirety for that reason.

Those portions of Mr. Witte's rebuttal testimony that are stricken are reflected on Attachment 4 hereto, NEC Pre-Filed Rebuttal Testimony of Ulrich Witte Regarding New England Coalition, Inc's Contentions 2A, 2B and 4 with Strike-Outs.

#### VII. STAFF MOTION 2

Also on June 23, 2008, the NRC Staff filed a motion to strike the rebuttal testimony and associated exhibits of NEC witness Ulrich Witte.<sup>21</sup> With respect to Contentions 2A and 2B, the Staff argues that "[t]hroughout Mr. Witte's rebuttal testimony, there are discussions that are not relevant to the admitted contentions." Id. at 4. In addition, the Staff says, much of Mr. Witte's rebuttal testimony is unsupported. Id. at 4, 7. The bulk of the motion consists of a list of statements the Staff challenges as falling into one of these two categories. Id. at 5-12. Finally, the Staff argues that Mr. Witte is not qualified to testify in the subject matter area of Contention 4. Id. at 7. NEC responds with the same argument it uses in response to the motions

---

<sup>20</sup> New England Coalition, Inc's Opposition to Entergy's and the NRC Staff's Motions in Limine to Exclude Rebuttal Testimony of Ulrich Witte (June 30, 2008) [NEC Answer to Entergy Motion 2 and Staff Motion 2].

<sup>21</sup> NRC Staff's Motion in Limine to Strike Late-Filed Rebuttal Testimony and Exhibits of NEC Witness Ulrich Witte (June 23, 2008) [Staff Motion 2].

challenging Mr. Witte's direct testimony. NEC Answer to Entergy Motion 2 and Staff Motion 2 at 2-4.

The Board grants in part and denies in part Staff Motion 2. In accordance with our decision on Entergy Motion 2 above, all of Mr. Witte's testimony on Contentions 2A and 2B has been stricken for reasons other than those proposed by the Staff. See Section VI, supra. Our reasoning regarding Mr. Witte's general qualification to offer testimony on Contention 4 is set forth in our ruling on Entergy Motion 1, and we decline to exclude the whole of Mr. Witte's rebuttal testimony on that contention. See Section II.H, supra. Rather, we strike only those portions of his Contention 4 rebuttal testimony that fall into those areas for which he was deemed unqualified to offer direct testimony.

Those portions of Mr. Witte's rebuttal testimony that are stricken are displayed, along with those stricken in response to Entergy Motion 2, on Attachment 4 hereto, NEC Pre-Filed Rebuttal Testimony of Ulrich Witte Regarding New England Coalition, Inc's Contentions 2A, 2B and 4 with Strike-Outs.

VIII. CONCLUSIONS

All parties are instructed to file their testimony and exhibits at the hearing in accordance with the above rulings. In so doing, the parties are instructed to assume that all materials not explicitly stricken in the text of this order or in the attachments hereto are admitted.

It is so ORDERED.

FOR THE ATOMIC SAFETY  
AND LICENSING BOARD<sup>22</sup>



---

Alex S. Karlin

ADMINISTRATIVE JUDGE

Rockville, Maryland

July 16, 2008

---

<sup>22</sup> Copies of this order were sent this date by Internet e-mail transmission to counsel for (1) licensees Entergy Nuclear Vermont Yankee, L.L.C., and Entergy Nuclear Operations, Inc.; (2) intervenors Vermont Department of Public Service and New England Coalition of Brattleboro, Vermont; (3) the Staff; and (4) the State of New Hampshire and the Commonwealth of Massachusetts.

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

Before Administrative Judges:

Alex S. Karlin, Chairman  
Dr. Richard E. Wardwell  
Dr. William H. Reed

---

In the Matter of

ENTERGY NUCLEAR VERMONT  
YANKEE, LLC, and  
ENTERGY NUCLEAR OPERATIONS, INC.

Docket No. 50-271-LR

ASLBP No. 06-849-03-LR

(Vermont Yankee Nuclear Power Station)

**PRE-FILED DIRECT TESTIMONY OF ULRICH WITTE**  
**REGARDING NEC CONTENTION 4**

**Q1. Please state your name and address.**

**A1.** My name is Ulrich Witte. I reside on 71 Edgewood Way, Westville, Connecticut, 06515.

**Q2. What is your educational and professional background?**

**A2.** I obtained a BA in physics from the University of California, Berkeley in 1983. I have over twenty-six years of professional experience in engineering, licensing, and regulatory compliance of commercial nuclear facilities. I have considerable experience and expertise in the areas of configuration management, engineering design change controls, and licensing basis reconstitution. I have authored or contributed to two EPRI documents in the areas of finite element analysis, and engineering design control optimization programs. I have chaired the development of industry guidelines endorsed by the American National Standards Institute regarding configuration management programs for domestic nuclear power plants. My 26 years

of experience has generally focused on assisting nuclear plant owners in reestablishing fidelity of the licensing and design bases with the current plant design configuration, and with actual plant operations. In short, my expertise is in assisting problematic plants where the regulator found reason to require the owner to reestablish competence in safely operating the facility in accordance with regulatory requirements. My experience is further detailed on my curriculum vitae filed with this testimony as Exhibit NEC-UW\_02.

**Q3. What is your understanding on NEC Contention 4 in this proceeding?**

A3. NEC Contention 4 asserts that Entergy's plan for managing flow-accelerated corrosion (FAC) in plant piping fails to meet the requirements of 10 C.F.R. § 54.21(a)(3), *i.e.*, "fails to demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operations."

**Q4. Did you prepare a report regarding this contention?**

A4. Yes I did. My report is filed with this testimony as Exhibit NEC-UW\_03. This testimony and my report provide, to the best of my knowledge, true and accurate statements of the facts and my conclusions regarding the issues relevant to NEC's Contention 4.

**Q5. What materials did you review in support of your report and testimony?**

A5. I reviewed the implemented FAC program and FAC inspection program, other inspection programs that Entergy has in place, and records and histories of these inspections. I also reviewed industry-wide standards for FAC programs, NRC data, information and reports, the CHECWORKS program and Entergy's commitments to

upgrade the CHECWORKS model to EPU design conditions, inspection reports, EPU parameters, Plant Quality Assurance audits, Condition Reports, Corrective Actions, NRC regulations, EPRI review of the VY plant, Cornerstone Rollup, examples from other plants, and Entergy's application and the record (including reports, proposed programs, and testimony to the NRC Advisory Committee on Reactor Safeguards Subcommittee on Plant License Renewal) provided by Entergy or others in support of its application, including pipe wall thinning structural evaluation.

Further materials that I reviewed are specified in my attached report.

These are materials that are regularly used by experts in my field to assess aging management programs and flow-accelerated corrosion. I applied these materials in a standard manner that is routine with experts in this field.

**Q6. Were these materials sufficient to allow you to form opinions and draw conclusions using your expertise?**

**A6.** Yes, I had sufficient information to formulate the assessment stated in my report and maintain standards that are widely accepted by experts in this field. The Applicant did not, however, produce complete information to NEC regarding its methodology. My report notes where the Applicant's materials fail to provide sufficient information. As I have explained in my report, the information the Applicant produced is insufficient to validate its aging management program.

**Q7. Please summarize your conclusions.**

**A7.** In summary, I reached two conclusions:

~~First, the data collected under the current VYNPS FAC program during the post-EPU refueling outages scheduled prior to the expiration of the current VYNPS license is insufficient to benchmark CHECWORKS to VYNPS's post-EPU conditions.~~

The Applicant states without ambiguity that the present program is sufficient not just for current operations and maintenance of the plant, but for the license renewal period as well. The record of a historical regulatory compliant program indicates otherwise.

~~Second, the current VYNPS FAC program does not appropriately implement industry guidance, and does constitute an adequate aging management plan with respect to FAC.~~

More specifically, my conclusions are:

- Contrary to EPRI recommendations, from 1999-2006, Entergy apparently failed to update the CHECWORKS model in use at VYNPS with plant inspection data or information concerning plant modifications. ~~This lengthy lapse may have significantly weakened the trending and predictive capability of the software, both during the lapse period and presently.~~

The update to incorporate EPU design data appears to still be in progress as of February 2008.

- Contrary to EPRI recommendations, the VYNPS FAC program apparently used an outdated version of the CHECWORKS software during the years 2000-2006.

- In 2005, the CHECWORKS model predicted wall thinning close to or exceeding acceptable code limits at several locations, but Entergy apparently produced no Condition Reports addressing these imminent potential pipe ruptures, or at least has not produced such reports to NEC in this proceeding.

- Numerous internal Entergy reports label the VYNPS FAC program unsatisfactory. The program was deemed unsatisfactory in the 2004, and the 2006 cornerstone report expressed concern about the program and specifically the continued slow progress in updating the CHECWORKS model.

- An FAC-related pipe rupture appears to have occurred during the third quarter of 2006.

- The 2006 refueling outage FAC inspection scope, planning, documentation and procedural analysis all appear to have been performed under a superseded program document, potentially invalidating the pre-EPU baseline for use of CHECWORKS.

- Entergy apparently reduced the number of FAC inspection data points by fifty percent (50%) between the 2005 refueling outage and the 2006 refueling outage, in violation of its commitment to *increase* inspection data points by fifty percent (50%).

Further detail and supporting information is in my attached report.

I declare pursuant to 28 U.S.C. § 1746 under penalty of perjury that the foregoing is true and correct.

Executed on April \_\_\_\_, 2008

\_\_\_\_\_  
Ulrich Witte

I declare under penalty of perjury that the foregoing is true and correct.

*Ulrich Witte*

\_\_\_\_\_  
Ulrich Witte

At Westville, Connecticut, this 23rd day of April, 2008 personally appeared Ulrich Witte, and having subscribed his name acknowledges his signature to be his free act and deed.

Before me: Danette Broadhurst

*Danette Broadhurst*  
\_\_\_\_\_

Notary Public

My Commission Expires 8-31-2011

**EVALUATION OF VERMONT YANKEE NUCLEAR POWER STATION LICENSE  
EXTENSION: PROPOSED AGING MANAGEMENT PROGRAM FOR FLOW  
ACCELERATED CORROSION**

**NEC-UW\_03  
CORRECTED**

**I. Introduction**

**REDACTED**

I submit the following comments in support of the New England Coalition, Inc.'s ("NEC") Contention 4. My comments concern the Applicant's aging management program, specifically addressing the fidelity of the Flow-Accelerated Corrosion ("FAC") Program (NEC Contention 4).

NEC asserts that the application for License Renewal submitted by Entergy for Vermont Yankee does not include an adequate plan to monitor and manage aging of plant equipment due to flow-accelerated corrosion ("FAC") during extended plant operation. The Applicant has represented that its FAC management program during the period of extended operation will be the same as its program under the current operating license, and consistent with industry guidance, including EPRI NSAC 202L R.3. The use of the CHECWORKS model is a central element in the Program implementation.

In the Applicant's motion for summary disposition, the Applicant proffered a response that credits the its current program for FAC management at the facility, and simply extends the current program for the renewal period, making the following statement: "furthermore, the FAC program that will be implemented by Entergy is the same program being carried out today, which has not been otherwise challenged by NEC, will meet all regulatory guidance." Ref. Entergy Motion for Summary Disposition on New England Coalition's Contention 4 (Flow Accelerated Corrosion), June 5, 2007, at 3. *Italics added.*

The Applicant has asserted that it is in full compliance with its current licensing basis regarding its FAC program. The Applicant asserts that the plans for monitoring flow

accelerated corrosion, including the FAC Program goal of preclusion includes appropriate procedures or administrative controls to assure that the structural steel integrity of all steel lines containing high-energy fluids is maintained. *Id* at 6. The applicant is argues that since the VY FAC program is based on EPRI guidelines and has been in effect since 1990, one could therefore conclude the applicant has established methodology so as to preclude of negative design margin or forestall an actual pipe rupture, and Entergy infers that it is technically adequate and is compliant with its licensing basis requirements.

I draw a different conclusion. Based on the *implemented* program presently in place, and the historical inadequacies necessary for effective implementation (including evolution) of the FAC program, the oversights are substantial in program scope, application of modeling software, and finally necessary revisions to the program not implemented as was promised to support the power up-rate. I am not alone in this conclusion. Program weaknesses and failures have been identified by others and form the

basis of condition reports, the categorization as *unsatisfactory* in a Quality Assurance Audit dated November 11, 2004<sup>1</sup>, and noted as "yellow" in a cornerstone roll-up report circa 2006<sup>2</sup>. In addition, the NRC Project Manager made a recent inquiry into indications of an out-of-date program.<sup>3</sup> On Monday, April 21, 2008, I spoke by phone with NRC resident inspector Beth SieneI, and she confirmed that, even now, Entergy has not completed verification of the upgrade of the CHECWORKS model to EPU design conditions. This concern regarding deficiencies in implementation of the program brings

<sup>1</sup> Exhibit NEC-UW\_9, Audit No.: QA-8-2004-VY-1, "Engineering Programs", page 2, (NEC038514).

<sup>2</sup> Exhibit NEC-UW\_7, Cornerstone Rollup, Program: Flow Accelerated Corrosion, Quarter: 3<sup>rd</sup>, dated 10/03/2006, page NEC038424, Open Action Items, (includes All CR-CAs, ER post action items and LO-CAs, is shown as "yellow", however, 6 LO-CAs are shown as open. By definition, "Red" includes 2 or more CR-CAs and /or E/R post action items (excluding LOs action items) greater than one year.

<sup>3</sup> Exhibit NEC-UW\_14.

into question the results of FAC inspection during RFO 25 and RFO 26, in which power up-rate design data apparently is as yet not incorporated.

These program implementation delays are substantive, and based upon the information provided to NEC appear to remain unresolved. These deficient conditions raise questions as to the fidelity of the entire license renewal application, Entergy's commitments for license renewal, management oversight, and the efficacy of the regulatory-required Corrective Action Program.

If it is true that power up-rate parameters such as flow velocity were not incorporated into the FAC program model, these deficiencies appear to be substantive and without question warrant condition reports under the Entergy Corrective Action Program, in particular given that they appear to violate regulatory commitments regarding the Flow Accelerated Corrosion Program.

10 CFR Part 50 Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," provides that a condition that is deficient is *required* to be identified, investigated, and remediated expeditiously.<sup>4</sup> Promises to correct the deficient program at some point in the future are not sufficient, unless all reasonable alternative methods for remediation are exhausted and the condition is shown to be safe in the interim. Lack of oversight and a *single missed inspection point* that remained unnoticed

---

<sup>4</sup> 10CFR Part 50, Appendix B, XVI, "Corrective Action," states: "Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management."

for years<sup>5</sup> led the Japanese Mihama Plant FAC pipe rupture in 2004, causing five fatalities.<sup>6</sup> As discussed in detail below, Vermont Yankee missed dozens of points.

Identification of discrepancies and timely corrective action are the cornerstones of a well-managed plant. In my experience assisting problematic plants, change usually begins with a cultural shift toward proactive corrective action and away from a reactive mentality of *delaying needed corrective actions* to programs such as FAC that result in unresolved deficient conditions and unnecessarily narrowed safety margins for longer periods of time than are necessary.

A common metric used by the regulator (for example in ROP reviews) and management is the volume of the backlog of open corrective actions and the number of open corrective actions that date further back than one year, two years or even three or more years, to establish the fidelity of the licensee's compliance with the terms of its operating license and associated commitments. The metric is useful in evaluating Flow Accelerated Corrosion management at Vermont Yankee.

## II. Summary Assessment

~~Based on a detailed review of the record provided to NEC regarding the Flow-Accelerated Corrosion Program, my conclusion is that the FAC program appears to have been in non-compliance with its licensing basis from about 1999 through February 2008.~~

The failure to comply is evidenced by the licensee's own assessments, audits, and condition reports, roll-up of numerous cornerstone reports, and focused self-assessments. Corrective actions from approximately five Condition Reports ("CR") remained open for

<sup>5</sup> Exhibit UW\_20, Page 6 of 14 of VY FAC Inspection Program PP7028, 2005 refueling outage at NEC037109.

<sup>6</sup> *Keppo Ordered to Shut Down Mihama Reactor*. The Japan Times, September 28, 2004, available at <http://search.japantimes.co.jp/member/member.html?nn20040928a6.htm>.

as much as four years. The last condition report regarding FAC, CR 2006-2699, was written on August 30, 2006. Although noted in the cornerstone report dated October of 2006<sup>7</sup>, the condition report apparently was never provided to NEC. The condition report aggregated approximately six corrective actions to the program that had been ignored and the current status was then open and which is presently unknown to NEC.

In addition, the most recent FAC inspection was performed under superseded procedures and the results therefore are of potentially no programmatic value<sup>8</sup>. Procedure ENN-DC-315, was revised and in effect on March 1, 2006, yet superseded on December 1, 2006 by yet a new program level procedure. Close examination shows that the procedures prepared, approved and implemented by Entergy for implementing the FAC Program were substantially revised, yet were not used in the most recent flow-accelerated corrosion inspections after VY increased operating power by 20 percent in the March, 2006 EPU, nor were they available for RFO 25, the first outage after power up-rate. Required changes, including both a software upgrade and design parameters regarding the substantial plant modification to uprate the plant to 120% power, were not incorporated for either outage, and were in fact still being implemented in February 2008, when Staff inquired on this subject.

<sup>7</sup> Exhibit NEC-UW\_07 Cornerstone Rollup, Program: Flow Accelerated Corrosion, Program Infrastructure Cornerstone, Quarter: 3<sup>rd</sup>, dated 10/03/2006, page NEC038419 ("Corrective Action Plan to complete open LO-CA tasks developed 10/02/2006, (CR-2006-02699)"). See also pp. NEC038422, NEC038424, NEC038426-28—see also footnote 3.

Deleted: 1

<sup>8</sup> Exhibit NEC-JH\_42, VY Piping FAC Inspection Program PP 7028- 2007 Refueling Outage, Inspection Location Worksheets/ Methods and Reasons for Component Selection,<sup>7</sup> April 3, 2006, at 1, NEC017888.

Deleted: UW\_20



the rationale for selection of grid points relied on (1) length of time since the lapsed inspections had ceased to examine a particular inspection point, (2) CHECWORKS User Groups, (CHUG) suspects found at other plants, (3) exclusion of components that were intended to be replaced based upon another regime or degraded condition.

Had data from previous FAC inspections routinely been entered into CHECWORKS, the selection of grid points and ranking would have provided a better historical perspective on where to inspect in successive outages, including the most recent outage. With the exception of VY's strength in reactively replacing piping or components with FAC-resistant material during repairs or maintenance, the program itself was not effective as a predictive modeling tool. Simply stated, once something ruptured or was

found to be outside its design margin, it was replaced in a reactive management approach.

Proactive management of the program to *predict failures* has been inadequate in the FAC Program, as referenced above.

Even the most recent inspection completed for RFO 26 appears to have been structured around procedures that were superseded, scoping requirements to establish a new baseline of pipe geometry and as-found wall thickness were based on stale data, and the upper-tiered governing procedure that was used had not been revised since 2001 and was therefore void.<sup>12</sup>

---

showed an trend of increased frequency of reinspection . See NEC037106. Page 4 of 14 provides for negative margin, or no inspections for Feedwater System. Conclusions called for "assessing the need" for inspections in 2007 outage. See page NEC037107. The condensation system showed one component with negative time to Tmin. The Extraction Steam System indicated three components with negative time to code min wall. Page NEC037108.

<sup>12</sup> Exhibit NEC-UW-11, "Official Transcript of Proceedings ACRST-3397, Advisory Committee on Reactor Safeguards Subcommittee on Plant License Renewal, June 5, 2007, at page 43. Entergy's Mr. Dreyfuss stated: "... we did increase the number of FAC inspections by 50 percent from what we typically do in outages. We did 63 inspections overall." It is also noted that the average number of points examined by the domestic industry is 82—under a well managed program, without significant changes to the model—such as a power uprate.

Deleted: 7

The current program-level procedure had been in existence since March 2006. Scoping was performed in May of 2006 under the void procedure, and updating of CHECWORKS was not done until 3rd quarter 2006.<sup>13</sup> Grid points, scope selection, and small bore piping susceptibility do not appear to have been ranked under NSAC 202L guidance or in an orderly trending of data by CHECWORKS based upon repeated passes with new grid points and new rankings selected. Data input and passes by CHECWORKS were not accomplished on an outage-by-outage basis.<sup>14</sup>

With only 63 points examined in RFO 26<sup>15</sup>, the baseline for the power up-rate conditions appears not to have been established. I found it troubling that RFO 26 results were provided to the Advisory Committee on Reactor Safeguards (“ACRS”) on June 5, 2007, but apparently were not disclosed to NEC.

VY is the first plant modified to achieve Constant Pressure Power Up-rate to 120% power and only one other plant out of the fleet of 104 was licensed to 120% increase in power in one step. Given the uniqueness of the design of VY’s power up-rate, CHECWORKS has little industry benchmarking data, and is of marginal use.

The history of the one other up-rated power plant, Clinton Power Station, suggests the possibility of future problems at Vermont Yankee. The NRC inspected Clinton Power Station, including a review of the FAC program, after its up-rate in January 2003 and found the program to comply with its licensing basis, including NSAC 202L and the use

<sup>13</sup> Exhibit NEC-UW\_07 at NEC038424.

<sup>14</sup> Exhibit NEC-UW-20, VY Piping FAC Inspection Program PP 7028- 2005 FAC Inspection Program Records for 2005 Refueling Outage at NEC037112 -NEC037120.

<sup>15</sup> Exhibit NEC-UW-11, Official Transcript of Proceedings ACRST-3397, Advisory Committee on Reactor Safeguards Subcommittee on Plant License Renewal, June 5, 2007, at page 43. Entergy’s Mr. Dreyfuss stated: “...we did increase the number of FAC inspections by 50 percent from what we typically do in outages. We did 63 inspections overall.” It is also noted that the average number of points examined by the domestic industry is 82—under a well managed program, without significant changes to the model—such as a power uprate.

Deleted: 10  
 Deleted: UW-20  
 Deleted: 7  
 Deleted: 9,  
 Deleted: 017896

of CHECWORKS. Program inputs were fully incorporated from previous inspection data and heat balance up-rate data. Wear rates were predicted to increase 8% because of up-rated power conditions. Although the increase was a concern to the regulator, the program was found to be adequate. Yet only nine months later, Clinton experienced a FAC rupture<sup>16</sup>. It is relevant that this failure occurred approximately 16 years after Clinton received its operating license in 1987—while apparently complying with its CLB and the EPRI guidance.<sup>17</sup>

Plant Surry, where a rupture due to FAC killed four people, failed after 15 years of operation, and required 190 component replacements due to FAC. The accident led to unpredicted causal events outside the engineering design basis—including discharge of CO<sub>2</sub>, seepage of the heavier than air gas into the control room, requiring reactor operators to don Scott air packs and with some operators exhibiting symptoms such as dizziness because of control room habitability<sup>18</sup>. Pleasant Prairie, a fossil plant with similar conditions, endured a catastrophic FAC failure at 13 years, causing two fatalities<sup>19</sup>, and a Japanese plant failed without warning, killing five people, simply because of a failure to inspect one component section due to an administrative oversight, repeatedly missed by program owners.<sup>20</sup> The oversight was never noticed during quality control or quality assurance reviews, or spotted by the system engineers responsible for FAC at the plant.

<sup>16</sup> Exhibit NEC\_JH-42 at 7 (NEC017894).

Deleted: UW-20

<sup>17</sup> Exhibit NEC\_UW-04; Exhibit NEC\_UW-05 at \$XLM17.

Deleted: 0

<sup>18</sup> Exhibit NEC-UW\_22 U.S. NRC NUREG 0933; Issue 139: thinning of Carbon Steel Piping in LWRs (Rev. 1) at 1-4.

<sup>19</sup> Exhibit NEC\_UW-21, Milwaukee Sentinel, March 9, 1995.

<sup>20</sup> Exhibit NEC\_UW-20 at NEC037109.

Deleted: at 9, NEC017896

These plants were not specifically using aging management tools, where as others, such as Clinton, did—but each FAC failure occurred well before the plants reached their engineered end-of-life of 40 years. The event at Mihama occurred due to nothing more than an administrative failure to routinely inspect a known FAC-susceptible component.

I fully concur with NEC's consultant Dr. Joram Hopenfeld that comprehensive benchmarking will be required through the number of years when unmanaged FAC failures typically begin to emerge, such as the operational age of the Surry plant at the time of FAC failure, or the Clinton Plant failure.

**III. Licensing basis for management of flow-accelerated corrosion at VY and review of the program implementation**

I reviewed the FAC program in four parts: Part A, examining the current licensing basis; Part B, the *implementation* of the licensing basis; Part C, the Licensee's *own record* of problems with implementation; Part D, *my independent observations* based on the record provided to NEC, and the requirements for implementing an effective program under NRC-endorsed guidance, with which the Licensee has stated that it has complied.

**A. The current licensing Basis and the proposed licensing basis for the flow accelerated corrosion program:**

My review to establish the current licensing basis and the current status of application for license renewal includes the following documents:

1. NUREG 1801 Rev 1, §XI-M17, Flow Accelerated Corrosion

[REDACTED]

[REDACTED]

3. CHECWORKS EPRI procedures provided by the Applicant, including fleet procedure EN-DC-315, Rev. 0, "Flow-Accelerated Corrosion Program" effective December 1, 2006.
4. Commitments made by the licensee including the following:<sup>22</sup>
  - i. USNR generic letter 89-08, Erosion corrosion –induced pipe wall thinning;
  - ii. Vermont Yankee Letter to USNRC;
  - iii. Vermont Yankee letter to the USNRC, Vermont Yankee Response to NRC Bulletin No. 87-01: Thinning of Pipe Walls in Nuclear Power Plants, dated September 11, 1987;
  - iv. Vermont Yankee letter to the USNRC, Supplement to Vermont Yankee Response to NRC Bulletin No. 87-01: Thinning of Pipe Walls in Nuclear Power Plants, dated December 24, 1987;
  - v. USNRC Generic Letter 90-05, Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2 and 3 Piping, dated June 15, 1990;
  - vi. Vermont Yankee letter to the USNRC, request from code relief for use of ASME Code Case N-597, as an alternative to analytical evaluation of wall thinning;
  - vii. USNRC letter to Vermont Yankee, Vermont Yankee Nuclear Power Station—Relief request for use of ASME code case N-597 as an Alternative Analytical Evaluation of wall thinning (TAC No. MB1530) dated July 27, 2001. NVY 01-74;
  - viii. VY memo: J.F Calchera to OEC (R. McCullough), subject: response to commitment item: ER-990876\_01, Reevaluate Feedwater Heater Inspection Program to address Ownership, dated April 25, 2000.

Industry guidance and other records that were used for interpreting VY position regarding license renewal include:

- ix. Flow accelerated corrosion in power plants TR-106611-R1, published by EPRI in 1999;
- x. Official Transcript Advisory Committee on Reactor Safeguards subcommittee on Power Uprates November 30, 2005;
- xi. RAI SPLB-A-1 (LR001576);
- xii. Section 12-2 Wear rate analysis (Excerpt from an EPRI report);

---

<sup>22</sup> Items i., ii, iii, iv, and viii listed as commitments were not provided to NEC but were only referenced in Entergy's program level documents, and therefore were not directly reviewed. They do not appear on Entergy's Appendix A, licensee renewal list of commitments, but are listed in program level documents that were valid until March 15, 2006. No evidence of withdrawal, modification, or otherwise changes to these commitments was provided to NEC.

- xiii. VYNPS License renewal Project Aging Management Program Evaluation Results. (NEC00113191)

**B. Implementation of the Flow Accelerated Program in accordance with the CLB.**

I reviewed the following documents to ensure the implementation of the FAC program in accordance with the CLB:

- xiv. ENN-DC-315, Rev. 1, "Flow Accelerated Program;"
- xv. VY-PP7028, Piping Flow Accelerated Corrosion Inspection Program;
- xvi. VY-PP7028, FAC Inspection program PP 7028- 2007 Refueling outage;
- xvii. VY-PP7028, piping inspection program, FAC inspection records for 2005 refueling outage;
- xviii. ENN-CS-S-008, rev 0, effective 9/28/2005, pipe wall thinning structural evaluation;
- xix. DP-0072.

**C. Review of Inspection Histories, EPRI Reviews, Quality Assurance Reports, Cornerstone Roll-ups, Focused Self assessments, Condition Reports, and Independent Assessments, and NRC Inspection Reports.**

In addition, I reviewed inspection histories, condition reports, quality assurance reports, and one cornerstone report rollup on trending in the FAC Program (2003)- through October, 2006), NRC Inspections, and various revisions to VYLRP subsections and revisions. The list included the following:

- xx. Focused Self Assessment Report, Vermont Yankee Piping Flow Accelerated Corrosion inspection report, Condition Report LO-VTYLO-2003-0327;
- xxi. Audit No. QA-8-2004-VY1, Engineering Programs, dated 11/22/2004;
- xxii. EPRI review of Vermont Yankee Nuclear Power Flow-accelerated corrosion, dated February 28, 2000;
- xxiii. CR-VTY-2005-02239;
- xxiv. Cornerstone Rollup update last dated 10/23/2006;

xxv. VYNPS License Renewal Project Aging management Program Evaluation Results.<sup>23</sup>

D. Current status of the FAC Program with respect to the licensing basis.

1. The current licensing basis goal is to preclude negative design margin or pipe rupture due to Flow-Accelerated Corrosion and is centered around use of EPRI document NSAC 202L. The guidance is specifically endorsed by the NRC under NUREG 1801, which calls for a three prong approach to minimize uncertainties:

- (1) Use of a model such as CHECWORKS [with precision in data collection, examination, and frequency];
- (2) Use of sound engineering judgment in selecting inspection points that are independent of CHECWORKS; and
- (3) Use of industry events that have potential relevance to VY in material condition, design parameters, and operating history.

There are numerous FAC-related failures throughout the industry. Examination of the OECD Pipe Failure Data Exchange Project (OPDE) database provides that information.<sup>24</sup>

2. To accomplish the licensing basis goal, the FAC Program needs explicitly to include each of the following ten elements under the specific Generic Aging Lessons Learned (GALL) Report:

1. Scope
2. Preventative actions
3. Parameters monitored or inspected

<sup>23</sup> These documents were typically provided to NEC in fragments, with no title page, no document date, no record of whether the documents were current and had superseded others, and no signature or references to the author.

<sup>24</sup> Exhibit NEC-UW\_15, NucE 597D-Project 1, Data Collection of Pipe Failures occurring in Stainless Steel and Carbon Steel Piping, provides industry wide data on FAC failure. Page 20 includes a failure rate for BWR plants. The probabilistic risk assessment for BWR plant FAC failures is reported as  $10E-5$  (higher than reactor accident threshold PRA for Design Basis Accidents).

Deleted: s

Deleted: and 30

4. Detection of aging effects
5. Trending
6. Acceptance criteria
7. Corrective actions
8. Confirmation processes
9. Administrative processes
10. Operating experience<sup>25</sup>

3. Implementation of these ten elements is accomplished under formal program-level procedures. Successful implementation requires actions in sequence that are constructive to yielding the highest predictability of wall thinning and the most certainty in ranking test points for inspection on a routine that collects wear data in a timely fashion, then adjusts the selection scope based upon multiple trending of data, along with incorporation of changes to the plant.<sup>26</sup>

4. [REDACTED]

[REDACTED]<sup>27</sup> The record indicates that the Vermont Yankee Nuclear Power Station ("VYNPS") FAC program only partially implemented its licensing basis requirements to achieve a successful FAC program and that Entergy was aware of the problematic state of the program for many years.<sup>28</sup>

<sup>25</sup> Exhibit NEC-UW\_06 at 152-157; Exhibit NEC-UW\_08 at 2.

<sup>26</sup> Exhibit NEC-UW\_15 at 20. This Exhibit provides industry-wide data on FAC failures. The high rate of failure in BWR plants underscores the need for precision in implementing an FAC program.

<sup>27</sup> Exhibit NEC-JH\_38 at 3-3, 4-1.

<sup>28</sup> Exhibits NEC-JH-42 at NEC017893-912; Exhibit NEC-UW-09 at NEC038514, NEC038515, NEC038529, NEC038531-038533; Exhibit NEC-UW\_07 at NEC038422.

Deleted: 18  
 Deleted: 30  
 Deleted: UW  
 Deleted: 16  
 Deleted: ; Exhibit NEC-UW\_16 at 4-1  
 Deleted: UW-05



[REDACTED]

[REDACTED]

[REDACTED]

In spite of Entergy's commitment, the required additional susceptibility scoping analysis is not apparent to NEC in information provided.

7. From 1999-2006, the plant was essentially operating in a state in which component wear was improperly trended and pipe conditions were actually unknown. Reliance on CHECWORKS for this time period for predicting grid points, ranking susceptible components, and inspecting new points was therefore virtually without technical or empirical value. Without proper trending, the predictability goal of CHECWORKS is lost; it essentially became a data collection repository.

8. During the years 2000-2006, the VYNPS FAC program apparently used an outdated version of the CHECWORKS software. [REDACTED]

Formatted: Highlight

[REDACTED]

Formatted: Highlight

~~Entergy's failure to~~

<sup>34</sup> [REDACTED]

<sup>35</sup> Exhibit NEC-UW-08 at 5-6; NEC-UW-20 at NEC037103.

Deleted: 10

update the CHECWORKS model in a timely fashion makes data comparison between operating cycles more difficult.

9. In 2004, at least four VYNPS components, including the condensate system and the extraction steam systems, were determined to have “negative time to Tmin,” meaning that wall thinning was being predicted as beyond operability limits and should be considered unsafe with potential rupture at anytime.<sup>36</sup> “Negative cycles of operations,” meaning wall thinning *beyond* acceptable code limits, were also predicted. The hours negative to the next inspection were substantial—predicting potential code violation or failure could have occurred 3000+ hours previously to October 23, 2006. It is surprising that the Licensee apparently did not write condition reports for this condition. I do not believe that NEC received any notice of Condition Reports relevant to this significant indication by CHECWORKS predicting substantial wall thinning beyond code limits to occur with negative margin of this magnitude. This issue is particularly troubling given that the equipment failure event is unpredictable, and catastrophic when wall thinning is beyond acceptable limits. Despite CHECWORKS’ prediction of wall thinning, the plant continued to operate. I have not seen any inspection or audit discussion of this situation. It does, however, appear on the RFO 24 Inspection Plan,<sup>37</sup> oddly with the same number of hours of negative time to Tmin, even with the plan including wear data observed of 30% increase at Quad Cities and Dresden after the up-rate.<sup>38</sup>

<sup>36</sup> Exhibit NEC-JH\_42 at NEC017893. See also NEC-UW-20 at NEC037108.

<sup>37</sup> Exhibit NEC-JH\_43 at NEC020189.

<sup>38</sup> Id. at NEC020197.

Deleted: UW
Deleted: 05
Deleted: 5
Deleted: 41

10. The VYNPS FAC program was deemed unsatisfactory under quality assurance review dated November 22, 2004, and two condition reports were written.<sup>39</sup> On page 5, the report notes the need for program management to ensure update of susceptible piping to be identified and modifications to be incorporated.<sup>40</sup> In addition, the report notes that cross-discipline review required by procedure had not been performed.<sup>41</sup>

Deleted: "

Deleted: "

11. The 2006 cornerstone report shows a number of indicators as yellow, with lists of open CR corrective actions, and a new CR written in August 30, 2006.<sup>42</sup> The report lists six corrective actions and four CRs that were written as early as 2003 that remain open.<sup>43</sup> These include references to a number of progress indicators, but authors of the report continue to express concern over the program and the slow progress to update the CHECWORKS model. I reviewed several of the listed condition reports, some more than four years old, and found no indication that corrective actions recommended in these reports were completed.

12. In addition, in 2005 a sixth CR was written, CR-VTY-2005-02239, stating "CHECWORKS predictive model for Piping FAC inspection program was not updated per appendix D of PP7028."<sup>44</sup> The first page of the CR includes a statement that this condition had no impact on the RFO 25 inspection scope – i.e., indicating that updating of CHECWORKS was not necessary for establishing scope of RFO 25. This assertion is

<sup>39</sup> Exhibit NEC-UW-09 at 2 (NEC038514).

Deleted: 11

<sup>40</sup> Exhibit NEC-UW-09 at 5 (NEC038517).

Deleted: 11

<sup>41</sup> Id.

Deleted: Exhibit NEC-UW-11

<sup>42</sup> Exhibit NEC-UW-07 at NEC038419, NEC038422.

Deleted: 9

<sup>43</sup> Exhibit NEC-UW-07 at NEC038424.

Deleted: 9

<sup>44</sup> Exhibit NEC-UW-10 at 1.

Deleted: 3

another indicator that the VY FAC program was *prima facie* in noncompliance with its CLB.

13. A review of a focused self-assessment was performed. This assessment was called for under one corrective action from a condition report LO-VTYLO-2003-00327. The report identifies numerous issues that required or require action to bring the FAC program into compliance with the CLB. For example, the program susceptibility review report for 2004 was not formal, and did not properly separate scope for ranking.<sup>45</sup> The report was not given an adequate review, nor placed in the document control system.

14. PP7028 notes plant modifications and inspection results as not updated since May 15, 2000.<sup>46</sup>

15. Ranking of small-bore piping was not done. With no ranking, the basis for selection of high susceptibility points for small-bore piping is not evident.<sup>47</sup> Procedural conflicts were identified with missing programmatic requirements.<sup>48</sup>

16. A flow-accelerated corrosion related pipe break associated with a 1" elbow, SSH (WO 06-6880), appears to have occurred in 3<sup>rd</sup> quarter 2006.<sup>49</sup>

17. Entergy apparently reduced the number of FAC inspection data points between the 2005 refueling outage and the 2006 refueling outage, in violation of its commitment to *increase* inspection data points by 50%. The 2005 refueling outage inspection called for

---

<sup>45</sup> Exhibit NEC-JH\_44 at 17.

<sup>46</sup> *Id.* at 18.

<sup>47</sup> *Id.* at 19.

<sup>48</sup> *Id.* at 27-29.

<sup>49</sup> Exhibit NEC-UW-07 at NEC038428.

Deleted: 9

137 large-bore inspection points. The 2006 refueling outage inspection, presented to the ACRS on June 5, 2007, covered only 63 points.<sup>50</sup>

18. The 2006 refueling outage FAC inspection scope, planning, documentation, and procedural analysis all appear to have been performed under a superseded program document. ENN-DC-315 Rev.1 was effective March 15, 2006, superseding the PP7028 Piping FAC Inspection Program.<sup>51</sup> Yet VY inspection plan for FAC Program PP7028 was approved on May 11, 2006, almost two months after the PP7028 program document was superseded.<sup>52</sup>

This error potentially invalidates the baseline requirement of CHECWORKS, in accordance with NRC-endorsed guidance, to establish the as-found condition of components and piping.<sup>53</sup> The fundamental step of updating inputs is required in the NSAC 202L approach for FAC, and is a required step in the CHECWORKS instructions. Essentially, working to a void procedure makes the results invalid.

Given the significant changes to the plant, a baseline pass with accurate inputs was necessary, and subsequent passes were necessary to establish the grid locations and high susceptibility inspection points.

Formatted: Highlight

<sup>50</sup> Exhibit NEC-UW-11 at 43.

<sup>51</sup> Exhibit NEC-UW-12 (ENN-DC-315) at 1; Exhibit NEC-UW-19 (PP7028).

<sup>52</sup> Exhibit NEC-JH-42 at NEC017888.

<sup>53</sup> Exhibit NEC-UW-06 at § XI.M17.

<sup>54</sup> Exhibit NEC-JH-38 at 4-5.

Deleted: 4

Deleted: 5

Deleted: 20

Deleted: UW

Deleted: 05

Deleted: UW-06

19. No indication is provided that plant isometrics were updated as required as of 10/22/04.<sup>55</sup>

**IV. Time needed to benchmark CHECWORKS for Post-EPU use at VYNPS**

I agree with the testimony of Dr. Joram Hopfenfeld that CHECWORKS is an empirical model that must be updated with plant-specific data. NUREG 1801 does not specify the number of years' data necessary to benchmark CHECWORKS, but does advise that a baseline must be established as noted above [REDACTED]

[REDACTED] This requirement is reasonable given that each plant has unique characteristics and operating history. Separate industry guidance supports five to ten years of data trending.<sup>57</sup> Trending to the high end of the range is appropriate where variables

affecting wear rate, such as flow velocity, have significantly changed, as at VYNPS following the 120% power up-rate.

Given the deficiencies in the current VYNPS FAC program discussed in this statement, trending under the program is of marginal value. In addition, substantial "negative margin" conditions were identified in scoping the 2005 FAC inspection—many of which were predicted because of the repeated missed inspections in previous outages (that, significantly, occurred prior to up-rate).

<sup>55</sup> Exhibit NEC-JH\_44 at 19.

<sup>56</sup> [REDACTED]

Deleted: [REDACTED]

Deleted: ;

<sup>57</sup> Exhibit NEC-UW-13 at 38 ("In order to establish a baseline for the plant's equipment performance and reliability, the operating history over the past 5 to 10 years is reviewed and trended.")

~~I do not agree that a prolonged period of data collection is not necessary to use CHECWORKS effectively at VYNPS after the 120% power up-rate because the predictive algorithms built into CHECWORKS are based on FAC data from many plants.~~

VYNPS is unique in its approach of Constant Pressure Power Up-rate to 120%. Clinton is the only other plant to accomplish a one-step up-rate to 120% power and is a very different plant from VY. To my knowledge, out of 104 operating plants only six have increased operating power by more than 15%.<sup>58</sup> Of this group, at least three – Clinton, Dresden, and Quad Cities – appear to have FAC-related issues.<sup>59</sup> The argument that CHECWORKS incorporates relevant industry data is difficult to accept when so few plants are operating under analogous conditions, and 50% of those have experienced FAC related problems.

~~The need to extend the period of data collection is further evidenced by the fact that the CHECWORKS model was not updated with plant-specific changes until after RFO 26. Furthermore, by inference from an inquiry by the Staff project manager to the resident inspectors office only two months ago, it appears the NRC was informed that the EPU up-rate conditions *were still being verified and the process was at this late date incomplete after two outages had passed* since EPU design was completed, licensed, and implemented. The apparent failure to update the program underscores the lack of benchmarking done to date regarding the CHECWORKS software, and demonstrates troubling failures by Entergy to adhere to their own procedural requirements and failure to honor commitments made to the regulator, for example, made to the ACRS in November~~

<sup>58</sup> Exhibit NEC-UW\_18, Union of Concerned Scientists, "Power Uprate History," July 12, 2007.

<sup>59</sup> Exhibit NEC-LJW\_20 at NEC037109, NEC037116; JH\_42 at NEC017894, NEC017897, NEC017898; JH\_43 at NEC020196.

Deleted: LJW-05

2005, regarding use of the tool and the applicant's intention to conduct benchmarking testing during RFO 25 and RFO 26.

Based on the foregoing, it is my opinion that seven or more cycles will be necessary to establish a credible benchmarking of CHECWORKS to VYNPS under up-rated operating conditions [REDACTED]

[REDACTED] It is also my opinion that benchmarking can only be accomplished after the current program deficiencies are corrected and a proper baseline is established.

<sup>60</sup> Exhibit NEC-UW-08, [Proprietary] [REDACTED]

**Attachment 3**

<b>NEC Materials Subject to Exclusion Pursuant to Entergy's Motion in Limine</b>	<b>Board Ruling on Entergy Motion</b>
1. Pre-Filed Direct Testimony of Ulrich Witte Regarding NEC Contention 4, dated April 23, 2008 (NEC Exhibit NEC-UW_01)	Grant in part, deny in part (Order at § II.H & Attachment 1)
2. Mr. Witte's curriculum vitae (NEC Exhibit NEC-UW_02)	Deny (Order at § II.H)
3. Mr. Witte's report "Evaluation of Vermont Yankee Nuclear Power Station License Extension: Proposed Aging Management Program for Flow Accelerated Corrosion (NEC Exhibit NEC-UW_03)	Grant in part, deny in part (Order at § II.H & Attachment 2)
4. Exhibits cited in Mr. Witte's testimony and report (NEC Exhibits NEC-UW_04 through NEC-UW_22)	Deny (Order at § II.H)
5. Exhibit NEC-JH_67	Grant (Order at § II.A)
6. Exhibit NEC-JH_68	Deny (Order at § II.C)
7a. Portions of Review of License Renewal Application for Vermont Yankee Nuclear Power Station: Program for Management of Flow-Accelerated Corrosion (NEC Exhibit NEC-JH_36)	Deny (Order at § II.E)
7b. Portions of New England Coalition, Inc. Rebuttal Statement of Position	Grant for objections on page 6. Deny for remainder. (Order at §§ II.A, II.C, & II.F)
7c. Portions of Pre-filed Rebuttal Testimony of Dr. Joram Hopenfeld Regarding NEC Contention 4 (NEC Exhibit NEC-JH_63)	Grant for objections on page 15. Deny for remainder. (Order at §§ II.A-G)
7d. Portions of Pre-filed Rebuttal Testimony of Dr. Rudolf Hausler Regarding NEC Contention 4 (NEC Exhibit NEC-RH_04)	Deny (Order at II.F)
7e. Portions of Flow Assisted Corrosion (FAC) and Flow Induced Localized Corrosion: Comparison and Discussion (NEC Exhibit NEC-RH_05)	Deny (Order at II.F)

Attachment 4

UNITED STATES  
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
ENTERGY NUCLEAR VERMONT YANKEE, LLC	)	Docket No. 50-271-LR
and ENTERGY NUCLEAR OPERATIONS, INC.	)	ASLB No. 06-849-03-LR
	)	
Vermont Yankee Nuclear Power Station	)	

**PRE-FILED REBUTTAL TESTIMONY OF ULRICH WITTE**  
**REGARDING NEW ENGLAND COALITION, INC.'S CONTENTIONS 2A, 2B AND 4**

**Q1. Please state your name.**

**A1. My name is Ulrich Witte.**

**Q2. Have you previously provided testimony in this proceeding?**

**A2. Yes. I provided direct testimony in support of New England Coalition, Inc.'s (NEC) Initial Statement of Position, filed April 28, 2008.**

**Q3. Have you reviewed the initial statements of position, direct testimony and exhibits concerning NEC's Contentions 2A and 2B filed by Entergy and the NRC Staff?**

**A3. Yes. I have reviewed Entergy's Initial Statement of Position on New England Coalition Contentions (May 13, 2008), and the Joint Declaration of James C. Fitzpatrick and Gary L. Stevens on NEC Contention 2A/2B – Environmentally-Assisted Fatigue (May 12, 2008) and exhibits thereto. I have also reviewed the NRC Staff Initial Statement of Position on NEC Contentions 2A, 2B, 3, and 4, the Affidavit of John R. Fair**

Concerning NEC Contentions 2A & 2B (Metal Fatigue) (May 13, 2008) and exhibits thereto, the Affidavit of Kenneth Chang Concerning NEC Contentions 2A & 2B (Metal Fatigue) (May 12, 2008) and exhibits thereto, and the revised Affidavit of Dr. Chang provided on May 22, 2008.

**I. NEC's Contentions 2A and 2B -- Environmental Assisted Metal Fatigue Analysis**

**Q4. Please describe your qualifications to provide testimony concerning NEC's Contentions 2A and 2B.**

A4. I have extensive experience in original stress analysis in qualifying Class 1 and Class 2 pipe and components, and applicable ASME codes as well as ANSI B31.1 codes, in particular in the design, analysis, construction, and qualification of Class 1 and 2 systems within the domestic nuclear industry. This experience includes, for example, original stress analysis for McGuire, Catawba, and V.C. Summers Power Plants. In addition, I have performed non-linear finite element analysis for a number of components and I am familiar with Swanson's computer algorithms such as ANSYS., RELAP, and other commercial analytical computer programs. Under contract to EPRI, I conducted detailed correlation studies of non-linear finite element analysis code predictions against actual in situ testing of piping and components at the Indian Point 1 Nuclear facility after the plant was closed. The results are published in EPRI Report Number 8480, — Seismic Piping Test and Analysis, 1980.

**Q5. Do you agree that Entergy's "confirmatory"  $CUF_{en}$  analysis of the feedwater nozzle fully incorporates thermal fatigue history for the feedwater nozzles?**

A5. No. The NRC questioned the Applicant's "simplified analysis" with respect to the Feedwater nozzle as part of Request for Additional Information (RAI) dated October 9, 2007, during NRC LR Audit. The Staff was unsatisfied with the responses by Entergy, dated October 19, 2007 and November 14, 2007. During a meeting with Staff on January 8, 2008, the Applicant committed to performing refined analysis on the Feedwater nozzle including the use of actual operational thermal fatigue histories, as opposed to derived histories from the GE Specification. Incorporation of operational histories of the Feedwater nozzle was made a formal commitment in BVY 08-008, dated February 5, 2008.

An operational event that results in an unanalyzed thermal transient to the reactor vessel is relevant and cannot simply be set aside as licensees did for some period of time. The event at Vermont Yankee (VY) was no exception. The causal relationship between the event as found in historical records and the consequences in terms of thermal shock is key. During the early years of plant start-up and operation there were many unplanned forced shutdowns. I found 42 for VY: Not exactly a silky smooth running reactor. Three were downright dangerous.

GE and the Licensee did not fully predict all of the events in their shutdown estimates. Hence, those that were outliers needed detailed analysis. During the mid-1980s and into the 1990s this fact came to light starting with NUREG 0599 and others. Operational events led to the need for careful and refined transient analysis. The simplified method was shown to be overly dependent on skillful and experienced engineering. New methods removed the uncertainties and doubts of accuracy in CUF and

CUF<sub>en</sub>. Not just cycle counting but examination of derivative temperature changes forced on the reactor vessel, the associated safe end, and on, of course, the feedwater nozzle as well. I know, because I was required immediately to notify the Technical Support Center (the emergency response area assembling management to provide technical support) for just such an event occurred on December 26<sup>th</sup>, 1986, at 6am, which brought down another plant for many months, placing the plant under its emergency plan. There was a concern that the plant would never operate again.

Based upon my examination of Vermont Yankee's historical records and my own experience of the challenge of maintaining nuclear plant operational history beginning with plant start-up, it appears to me that major thermal transients have likely not been incorporated into the operational history, as referenced in the SER. This deficiency is particularly significant where the reactor vessel has experienced an unplanned and unanalyzed transient that was outside the engineered design basis. Occurrence of these events throughout the industry was not as uncommon as one might presume.

Assessment of transient impact to specific component life is required following such an event to reestablish fidelity with the plant's design basis and is accompanied by additional fatigue analysis. The outcome of the engineering analysis holds one of three possibilities: (1) severe damage has occurred to the nozzle or vessel (less likely), (2) no additional fatigue usage outside the GE Specifications has occurred (also not likely), or (3) some additional usage outside the GE Specifications has occurred and therefore the component life is shortened (likely). Assessment and incorporation of the assessment of these impacts into plant operating records is essential to providing a basis for effective aging management programs.

An example of an historical Vermont Yankee event with the potential to impact the useful life of a number of systems, structures, and components occurred on December 1, 1972. On that date, the reactor automatically scrammed when an internal fault on a startup transformer resulted in a loss of offsite power. The emergency diesel generators automatically started and connected to their electrical buses. The high pressure coolant injection (HPCI) system got an automatic start signal on high drywell pressure, but failed to start. The operators manually started HPCI. Three relief valves opened when reactor pressure increased to 1,130 pounds per square inch gauge. A fourth relief valve should have opened, but failed to do so. One of the three relief valves that opened chattered on its seat about 100 psig below its set point. The transient was significant as reflected by the fact that odds of a core melt from this single event were  $1.4E-3$ . See, Exhibit UW-24. More significant to the issue of fully recovering the record of all transients and accurately incorporating them in assessing remaining fatigue life is the assessment of wear, damage, and stress on each relevant component during each significant transient event.

There are other examples of transients that appear to have not been incorporated as input in the refined fatigue analysis. During the period from 1973 through 1977, Vermont Yankee experienced 42 unplanned forced shutdowns. This is a significant number, and expended much of the fatigue life of the reactor vessel and feedwater nozzle. See Exhibit UW-25.

Of these 42 forced shutdowns, in 1976 Vermont Yankee experienced 10 unplanned reactor scrams. Exhibit UW-24. One of these, on July 6, 1976, occurred during surveillance testing when the air operator plunger on a relief valve did not move when air was applied. Two of the other three relief valves failed. The failures were traced to air

operator diaphragms damaged during excessive heating. The damage was attributed to improper insulation in the proximity of the diaphragms and an extended operating cycle. Core melt frequency for this event was an astoundingly high number 6.25 E-2. Exhibit UW-24. Again, the event stressed a number of systems and impacted the fatigue life of numerous components.

I made a comparison of the Engineering Design Input document, EN-DC-141, Rev. 3 provided to NEC by Entergy, to available records contained in the following documents and as compared to the responses provided to Dr. Chang's questions contained in Exhibit UW-26, "NRC Audit 10/09/07, with responses provided 10/18/07."

It appears that, in Entergy's calculation of 60-year CUFs in its CUFen reanalyses, operational histories were not properly or accurately compiled and that instead of documented transients, *estimated* thermal transient histories were used to predict the number of Reactor Thermal Cycles for 60 years. Purported added conservatisms remain unqualified and unjustified. The estimates of thermal transients are provided on Attachment 1, Page 1 of 6, EN-DC-141, Rev. 3. See Exhibit UW-27 "Design Input Record, Environmental Fatigue Analysis for Vermont Yankee Nuclear Power Station."

**Q6. Why is this of concern in assessing the validity of Entergy's CUFen reanalysis?**

**A6.** Refined fatigue analysis fidelity largely turns on correct design inputs. The simplified Green's-Function method challenged by Staff on January 8, 2008 and in other records, was essentially about uncertainty in assumptions and estimates. My observation is that this particular design input is an ungrounded estimate, an *assumption*, and not an actual historical number; any conclusion stemming from it, therefore, cannot be relied on without corroboration. Clearly, to proceed with estimates based on a flawed record of all

transient events is not appropriate. The rationale provided for not using actual transient operational cycles as found in Exhibit UW-26 at sequential page no. 8 (Bates number NEC069994), is not valid in the event of a thermal transient event that was outside the original design basis. Entergy, has not shown that those events were incorporated.

Second, the estimated transient history – *assumption* – may or may not be conservative. As noted above, the plant experienced certain transients during its operational life from initial plant start up and testing, commercial operation, then uprate to 120% power beginning in 2004. Actual excursions, in particular those that appear to be outside the GE design specifications, should have been accounted for in the refined analysis. From the analysis provided, at least in the first example, they were not.

Third, considering Extended Power Uprate contributing factors such as increased flow, component modification, increased vibration, and increased core heat and neutron flux, the transients experienced by the plant beginning with power escalation to 120% should be given more weight in forecasting thermal transient cycles. There is no credible basis provided in the Applicant's analysis that justifies thermal cycle projections to 60 years.

In summary, by using estimated histories as opposed to actual history, specific transients that shorten the component fatigue life appear not to be acknowledged or included in the Applicants fatigue analysis, making the results including  $CUF_{en}$  unsubstantiated.

## II. NEC's Contention 4: Flow Accelerated Corrosion Plan

**Q7. Have you reviewed the initial statements of position, direct testimony and exhibits concerning NEC's Contention 4 filed by Entergy and the NRC Staff?**

A7. Yes. I have reviewed Entergy's Initial Statement of Position on New England Coalition Contentions (May 13, 2008), and the Joint Declaration of James C. Fitzpatrick and Dr. Jeffrey Horowitz on NEC Contention 4 – Flow Accelerated Corrosion (May 12, 2008) and exhibits thereto. I have also reviewed the NRC Staff Initial Statement of Position on NEC Contentions 4, and the Affidavit of Kaihwa R. Hsu and Jonathan G. Rowley Concerning NEC Contention 4 (Flow-Accelerated Corrosion) (May 13, 2008), and exhibits thereto.

**Q8. Entergy contends that you have no experience or expertise relevant to the testimony you have provided concerning NEC's Contention 4. How do you respond?**

A8. I have extensive experience in development of engineering programs including controls for design change processes, configuration management programs and comprehensive initiatives in affecting operating nuclear power stations. These processes typically involve complex multifunction and multi-organization challenges. These programs are often mandated under federal regulations, or committed programs for a licensee to re-establish fidelity with its current design basis and license conditions. I have substantial experience in, for example, implementation and validation of NUREG 0737, "Clarification of TMI Action Plan Requirements," and was a principal manager in the successful restoration of Indian Point 3 from the NRC's Watch list, as well as Millstone Units 2 and 3. For the Tennessee Valley Authority, specifically the completion of the Watts Bar Nuclear Plant, I developed a program entitled "Program to Assure Completion and Quality." For Georgia Power's Plant Hatch, I developed and implemented a

Configuration Management Program, led in-house Safety System Functional Inspections, and an Electrical Distribution Function Inspection so as to prevent Plant Hatch from going on the NRC's watch list. For Northeast Utilities, I developed a multiple department and multi-function program to reestablish the fidelity of the design basis and licensing basis, including identifying, dispositioning and either eliminating or implementing over 30,000 regulatory commitments. My leadership in establishing and implementing these programs – successful initiatives – was well-received by the Licensee and well-received by the regulator. By their transparency to the community, they were generally accepted as improvements by the Licensee in protecting the health and safety of the public and minimizing risk to public assets.

As a seasoned engineer, manager, and problem solver, my expertise and track record demonstrate successfully implemented solutions to complex organizational, technical, or regulatory challenges in nuclear plant operations.

Applying my expertise in Engineering Design Control Programs, I note that Entergy's proposed Flow Accelerated Corrosion management program is based on use of a predictive modeling tool derived from an empirically based program with heavy reliance on engineering judgment, coupled with experience, oversight, and effective monitoring of FAC-related wear to certain vulnerable plant systems. My expertise in program management focuses on correct and effective implementation of the program and finding a record that is auditable, defensible against program requirements and transparent. To quote the NRC Staff's position regarding flow accelerated corrosion, "Corrosion is not an exact science. Due to epistemic and aleatory uncertainty, absolute wear rates cannot be determined...." NRC Staff Initial Statement of Position at 20. Thus the burden in

~~constructing and maintaining an effective FAC program must emphasize reliance on engineering judgment, coupled with experience, oversight, and effective monitoring of FAC-related wear.~~

While I do not purport to be intimately familiar with the empirically based CHECWORKS algorithm, I can attest to sufficient expertise in evaluating the fidelity of a comprehensive FAC program. I believe that the parties and witnesses are not in dispute that an effective flow accelerated program is highly dependent on sound engineering judgment and precise implementation, including the program goal of effective management of the predictive results, so as to preclude wall thinning beyond acceptance criteria during the license renewal period.

---

**A. Summary Rebuttal**

~~Q9. Do you believe that Entergy's Flow Accelerated Corrosion Management Program as implemented to date will be adequate for purposes of aging management during the period of extended operation, as Entergy and the NRC Staff assert in their initial statements of position and direct testimony?~~

~~A9. No. Entergy asserts on page 34, 35, and 37 of their Initial Statement of Position to New England Coalition Contentions, that their intention to credit the existing program as demonstrated to be adequate with no changes planned. Staff underwrites this assertion as well on page 20 of the NRC Staff's Initial Statement of Position on New England Coalition Contentions. I do not agree the program as implemented to date is adequate.~~

~~NEC raised significant concerns regarding the Flow-Accelerated Corrosion Program and asserted that the application for License Renewal submitted by Entergy for Vermont Yankee does not include an adequate plan to monitor and manage aging of plant~~

equipment due to flow-accelerated corrosion during extended plant operation. The responses provided in summary disposition as well as Entergy's Reply and Staff's Reply do not address NEC's concerns and in fact raise troubling new concerns beyond simply the sufficiency of the Vermont Yankee flow-accelerated corrosion program as presently credited for license renewal.

The Applicant's response summarized during motion for summary disposition is that its *present* FAC program is consistent with industry guidance including EPRI NSAC 202L R.3 and that the use of the CHECWORKS model is a central element in the FAC program implementation. The Applicant stated that it is relying on its current program for FAC management for the license renewal period, and "furthermore, the FAC program that will be implemented by Entergy is the *same program* being carried out today... [and] will meet all regulatory guidance." See Entergy Reply at 34.

Entergy represents that it will rely on its current FAC management program for purposes of FAC management during the license renewal period, that no changes to this program are planned, and that this program complies with EPRI guidelines. See, Entergy's Initial Statement of Position on New England Coalition Contentions at 34 ("The current FAC program, which will be used during the license renewal period, meets industry *practice as reflected in NSAC-202L...*"). My review provided in pre-filed testimony shows that Entergy's current program is not in compliance with EPRI guidelines.

---

**Q10. Entergy asserts on page 34 of its Initial Statement of Position that "the program has been reviewed, audited, and inspected with only minor, mostly**

**administrative issues identified,” and discounts its own Quality Assurance audit, which declared the program “unsatisfactory.” How do you respond?**

**A10.** I believe that these statements indicate that Entergy may have ignored or misconstrued the fundamental requirements of 10CFR Part 50, Appendix B, “Quality Assurance Requirements for Nuclear Power Plants.” It appears that federal requirements for Quality Assurance (QA) are being set aside. Quality Assurance Division Audit No. QA-8-2004-VY-1 declared the Flow Accelerated Program “unsatisfactory,” submitted two Condition Reports, and found five findings and seven areas of improvement. *See*, Exhibit NEC-UW\_09 at 2. Yet Entergy’s Initial Statement of Position interprets the 38-page document as containing “only minor, mostly administrative issue[s].” Entergy Initial Statement of Position at 34.

Furthermore, the Entergy asserts this single analytical tool for predicting unacceptable wall thinning should, as policy, be set aside as it was for four components, *See* Exhibit NEC-UW\_20 at 5 of 14. Thus the Entergy provides a second indicator where the Licensee obliquely waived Appendix B requirements for Quality Assurance. *See* Entergy Statement of Initial Position at 48.

That again is misapplication of the requirements of Appendix B, which is particular to the Flow Accelerated Program, where the Applicant’s only defense to its failure to prepare condition reports associated with unacceptable wall thinning, a prediction derived from its own analysis, is somehow that this component shown not to be meeting quality standards is deemed acceptable “as is” until the next outage. Therefore, there are two indications of a troubling and clearly deep-seated failure to properly implement the requirements of a compliant Quality Assurance Program. Appendix B to

10 CFR Part 50 requires among other things, Section III, "Design Control; and Section XVI, "Corrective Action" The latter section of the rule includes the following:

Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to the appropriate levels of management.

Quality Assurance requirements are not a *practice* that may or may not be voluntarily implemented by the Licensee, but are in fact are regulatory requirements promulgated under federal rules. The Applicant incorrectly asserts that a failure theoretically predicted by the CHECWORKS model is somehow treated differently than a failure predicted by actual inspection data. The Applicant is incorrect in assuming that a failure predicted by CHECWORKS does not meet the threshold for a condition report, with timely follow-up or corrective action, as fundamentally required under Appendix B. The Licensee has no regulatory grounds to escape a determination of potential failure by reason of its assertion that "if a planning tool such as CHECWORKS .....determines a *theoretical* conclusion... as such no condition reports are required." See Entergy Statement of Initial position at 48. This improper rationale is essentially analogous to a Licensee *ignoring* a Technical Specification requirement calling for declaration of a component or system to be classified as inoperable and a Limiting Condition of Operation started if a surveillance is missed. In the analogous situation, a component is administratively (theoretically) declared inoperable, although its actual functionality is unknown.

The consequences of the Licensee's apparent policy regarding Appendix B requirements, for Vermont Yankee's Flow Accelerated Corrosion Program are significant and have broad implications to multiple programs relied upon for renewal. Essentially, following the Licensee's logic every program can be viewed as theoretical when it is intended to be a predictive tool. The implications of Entergy's statements are profound and raise questions regarding credibility of all the Aging Related Management Programs proposed and Entergy's actual intentions for monitoring, and maintaining the plant if the license is extended.

**QH. Has applicant provided in its response any reasonable assurance that pipe thinning beyond code limits will not occur in the period between outages?**

**A11.** No. Quite to the contrary, the applicant has stated at page 48 of its Initial Statement of Position, in reference to page 5 of 14 of PP7028 Piping Inspection Program, Exhibit NEC-UW\_20, that wear rates predicted to exceed code limits will not be acted upon until the next outage. Based on statements made by the Applicant regarding pipe thinning predictions including negative time to inspect (described as negative  $T_{min}$  in the document) and predictions of unacceptable wear rates leading to thinning beyond code limits prior to the next outage, coupled with the decision to not prepare condition reports (or an analogous report consistent with requirements of a corrective action program as part of Appendix B), it is my opinion that reasonable assurance is not provided, and that the NRC Staff erroneously concluded that the program is complete, correct and adequate.

Therefore, my opinion is that the staff erroneously concluded that the program is complete, correct and adequate.

**Q. 12 Does Entergy's Initial Statement of Position resolve the programmatic weaknesses you identified in your direct testimony, including open corrective actions, stale open action items from condition reports, and the negative assessment of the program stated in the 2006 cornerstone roll up report?**

A12. No. Entergy characterizes the issues I have identified as shortcomings in the documentation paperwork with no substantive implications. I disagree. Any one of the Quality Assurance findings are significant. For example, a classic indicator of a problematic program is age of open corrective actions. A second indicator is number of Condition Reports, and number of extensions planned and then postponed to implement necessary actions to maintain the program current. Data drawn was sometimes more than fifteen years old:

Entergy expends much discussion, largely on a generic basis, on what ought to constitute a good FAC program. Entergy Statement of Initial Position at 36. However, Entergy does not respond to or take into consideration the VY's actual repeated historical failures to implement the FAC program from 1999 to the present day, which I have identified in my report, filed in this proceeding as Exhibit NEC-UW-03. With few exceptions, these numerous programmatic failures go unchallenged by Entergy.

Most significantly, successive implementation of CHECWORKS to current plant design inputs is undisputed as a mandatory element of the program, as required under NSAC 202L rev. 2 and rev. 3. Entergy makes no claim that this was consistently done.

~~Successive data passes at appropriate intervals, with scope selection, current operating conditions etc, taken into consideration are a fundamental element to identifying appropriate grid selection points, and trending of wear items. However, this obligation~~

was consistently ignored for many years and at best done in fragments for many outages. See Exhibit NEC-UW\_03, "Evaluation of Vermont Yankee Nuclear Power Station License Extension." This approach places the reviewer in the untenable position of having to look a look at wear data for trends with only very limited data points and then speculate as to whether the data set is sufficient. ~~[This approach is invalid.]~~

#### Detailed Review of Entergy and Staff Reply

**Q13. Do you take issue with the general merits of the approach to FAC management recommended in NSAC 202L?**

A13. No. My focus is strictly on the adequacy of the implementation of NSAC 202L at VY.

**Q14. On Page 38 of its Initial Statement of Position, Entergy makes the following assertion regarding FAC Susceptibility review: "the only CHECWORKS inputs affecting FAC wear rate that need to be changed to model uprate conditions were the flow rate and the temperature. These were updated at VY upon implementation of the EPU." Do you agree that flow rate and temperature are the only inputs that were necessary to incorporate into the model?**

~~A14. No. I disagree. Identification of the added inputs should be made, incorporating the results of all pertinent susceptibility analyses. Apparently, this has not been done. First, Exhibit E4-32 is a copy of a susceptibility analysis performed by Entergy in 2005. This analysis was performed fully five years after the previous analysis was completed in 2000. This five year gap is found by examining the dates associated with the 2005 Susceptibility analysis. Numerous changes to the plant occurred between 2000 and 2005. For example, in 2003, the reactor recirculation and residual heat removal piping was replaced. See, Exhibit NEC-UW\_27 at 6, Attachment 1. ~~Second, operational factors (such as TECH~~~~

~~SPEC changes, configuration changes, and material changes) should have triggered a new susceptibility analysis well before the analysis performed in 2005.~~

In brief, beginning in 2004, substantial plant modifications were performed, including system modifications etc, yet a current Susceptibility Analysis was not performed until 2005. ~~The premise that only flow rate and temperature input changes were needed is not properly supported and incorrect.~~

~~It is apparent that Vermont Yankee's FAC program management was broken from February 28, 2000 through October 25, 2005 based upon lack of Susceptibility Analysis alone. A comparison of program scope for piping inclusion, exclusion, small bore, large bore, fluid type etc, should have been incorporated into the FAC Program under the station Engineering Design Controls program on an ongoing basis—essentially any time a plant modification, system function change, or operational change was contemplated. Based upon the Applicant's information provided on page 38 of Entergy's Statement of Initial Position, as well as the Table 2 of Exhibit E4-32, the susceptibility analysis was set aside for more than five years, losing both continuity and assurance that all modifications have been evaluated and taken into consideration.~~

~~Proper grid point selection, proper sampling, proper frequency and the consistent integration of new data all serve to remove speculation and uncertainty in the accuracy of CHECWORKS. This fact by itself provides the impetus for a "new baseline," especially in light of the fact that a current baseline is, for all practical purposes, lacking. In conjunction with the relative uniqueness of the CPPU power uprate—chemistry changes, geometry changes, and of course velocity changes, the need for a "new baseline" is compelling. The strength of the CHECWORKS and the NSAC 202L methodology~~

~~endorsed in the GALL Report, is in its successive passes with tight control of changes in requisite input variables. These core elements have yet to be implemented.~~

In 2005, Entergy relied on ancient susceptibility data for component selection points, such as small bore piping from data circa 1993. See Exhibit NEC-UW\_20 at page 12 of 14. Five small bore points were selected that had never been inspected previously, indicating loss of control of the program. Entergy's defense of this methodology raises

significant doubt as to the efficacy of the current program, and therefore the FAC program for the license renewal period.

A lack of a timely susceptible review can only serve to skew the results appropriate selection of specific wear points. An updated and inclusive Susceptibility Review should definitely have been required by NRC Staff in their review. It apparently was not.

The Susceptibility review did not appear to address wear points associated with plant modifications, and based upon the descoping of the inspection, even after recommending by engineering judgment, to include certain points they were not. See Exhibit E4-38 referenced in Entergy's Statement of Initial Position at page 39.

**Q15. On page 39 of its Initial Statement of Position, Entergy states that in 2007, RFO 26, the first outage since the EPU, the inspection scope was a total of 63 inspections performed, including 49 large bore inspections. Do you believe that Entergy met its commitment to increase the scope of inspection by 50%?**

**A15. No. It is apparent on reviewing the record that Entergy first reduced the effective inspection scope and then enlarged it, in the process offsetting any "increase." A mirror**

analogy would be the retail store that raises its prices on certain goods, prior to offering them at a sale discount.

Entergy's commitment to increase the number of inspection points by 50% was made in response to an RAI, acknowledged in Entergy's Statement of Initial Position at 39, but this commitment was tacitly fulfilled by increasing the number of inspection points for RFO 26 only after decreasing the number of inspection points (by descoping) for RFO 25. The Scoping document for RFO 25 contained significantly more inspection points. See, Exhibit NEC-UW\_20, "PP7028 Piping FAC Inspection Program FAC INSPECTION PROGRAM RECORDS FOR 2005 REFUELING OUTAGE." On page 20, it states "The planned 2005 RFO inspection scope consists of 0137 large bore components at 16 locations...[a]lso, any industry or plant events that occur in the interim may necessitate an increase in the planned scope." In addition, criteria for inspection of components outside of CHECWORKS grid selection is articulated to include points simply because of the lengthy intervals since previous inspections. These include Feedwater piping, and Mainsteam piping. Id. at 3.

However, the number called for in the above scoping document is considerably more than the actual number of large bore components reported to be inspected during RFO 25, as in Exhibit E4-38, where the Applicant notes that it limited its inspection to 27 large bore points. The actual inspection of 63 large bore points for RFO 26 is about 1/2 of the number of planned inspection points for RFO 25, not 50% more.

**Q16. Entergy disagrees with your statement in direct testimony that "trending to the high end of the range [for bench marking] is appropriate where variables**

affecting wear rate, such as flow velocity, have significantly changed, as at VYNPS following the 120% power up-rate...". How do you respond?

A16. Entergy questions the relevance of the report brought forward in my direct testimony in support of this statement. The report in question is "Aging Management and Life Extension in the U.S. Nuclear Power Industry," Exhibit NEC-UW\_13, or the "Chockie Report." Entergy asserts that this report does not support trending to the high end of the range where variables such as flow velocity etc have significantly changed, because it is not industry guidance, but a report produced at the behest of the Petroleum Safety Authority of Norway regarding aging management and life extension in the U.S. nuclear power industry.

The Chockie Report most certainly assimilates industry guidance, including regulatory rules and implementation of those rules, and compiles aging programs strictly with respect to the United States domestic nuclear power plants. On page 38, it answers exactly what is required if there is no pre-existing baseline, as is the case for Vermont Yankee. The use of the report by the Norway Petroleum Safety Authority has no bearing on its content. The report is on point to Contention 4.

The Chockie Report is applicable to the question of what constitutes an adequate baseline. Entergy assumes that its present baseline is adequate. I believe after

examination of the failure to adequately implement the program, that VY does not have an adequate baseline. The Chockie Report is a concise primer on the effective

implementation of NSAC 202L, including CHECWORKS, and by inference impeaches

Entergy's Application as well as the adequacy of NRC Staff Review.

**Q17 Do you agree with Entergy's statement contained in a single paragraph on page 45 of Entergy's Initial Statement of Position that the following eight claims you made in your direct testimony have no merit?**

- a. "that data from previous FAC inspections (prior to the EPU) were not entered into the CHECWORKS database (NEC-UW\_03 at 2, 3, 6, 7-8, 15, 16, 17);"
- b. "that CHECWORKS was not updated with the uprate parameters (id. at 5, 23);"
- c. that, for the period 2000-2006, VY failed to use a current version of CHECWORKS (id. at 6, 17);"
- d. "that four components were predicted in 2004 to have wall thinning beyond operability limits (id. at 17-18, 22);"
- e. "that open corrective actions identified in condition reports may not have been completed (id. at 3-4, 18-19);"
- f. "that ranking of small bore piping was not done (id. at 8, 20);"
- g. "that the number of inspection points were reduced after the 2005 outage (id. at 7, 8, 20); and"
- h. "that the 2006<sup>1</sup> refueling outage inspection "scope, planning, documentation, and procedural analysis appear to have been performed under a superseded program document" (id. at 5, 7, 20-21)."

A17. No. I disagree. Entergy states that these claims have no merit but does not actually refute them, or specifically address the majority of the documents I cite in support of my direct testimony. Entergy's reply to my direct testimony consists primarily of conclusory denials.

**Q18. Does this conclude your rebuttal testimony?**

A18. Yes

I declare under penalty of perjury that the foregoing is true and correct.

*Ulrich Witte*  
Ulrich Witte

At Westville, Connecticut, this 14th day of June, 2008 personally appeared Ulrich Witte, and having subscribed his name acknowledges his signature to be his free act and deed.

Before me:

\_\_\_\_\_  
Notary Public

My Commission Expires \_\_\_\_\_

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the Matter of )  
 )  
ENTERGY NUCLEAR VERMONT YANKEE, LLC, )  
 )  
and )  
 )  
ENTERGY NUCLEAR OPERATIONS, INC. ) Docket No. 50-271-LR  
 )  
(Vermont Yankee Nuclear Power Station) )

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing LB ORDER (RULINGS ON MOTIONS TO STRIKE AND MOTIONS IN LIMINE) have been served upon the following persons by U.S. mail, first class, or through NRC internal distribution.

Office of Commission Appellate  
Adjudication  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Administrative Judge  
Alex S. Karlin, Chair  
Atomic Safety and Licensing Board Panel  
Mail Stop - T-3 F23  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Administrative Judge  
Richard E. Wardwell  
Atomic Safety and Licensing Board Panel  
Mail Stop - T-3 F23  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Administrative Judge  
William H. Reed  
Atomic Safety and Licensing Board Panel  
1819 Edgewood Lane  
Charlottesville, VA 22902

Lloyd B. Subin, Esq.  
David E. Roth, Esq.  
Mary C. Baty, Esq.  
Jessica A. Bielecki, Esq.  
Susan L. Uttal, Esq.  
Brian Newell, Paralegal  
Office of the General Counsel  
Mail Stop - O-15D21  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Sarah Hofmann, Esq.  
Director for Public Advocacy  
Department of Public Service  
112 State Street - Drawer 20  
Montpelier, VT 05620-2601

Docket No. 50-271-LR  
 LB ORDER (RULINGS ON MOTIONS TO STRIKE AND MOTIONS IN LIMINE)

Matthew Brock  
 Assistant Attorney General  
 Environmental Protection Division  
 Office of the Attorney General  
 One Ashburton Place, 18<sup>th</sup> Floor  
 Boston, MA 02108

Diane Curran, Esq.  
 Harmon, Curran, Spielberg,  
 & Eisenberg, L.L.P.  
 1726 M Street, NW, Suite 600  
 Washington, DC 20036

Callie B. Newton, Chair  
 Gail MacArthur  
 Lucy Gratwick  
 Town of Marlboro  
 SelectBoard  
 P.O. Box 518  
 Marlboro, VT 05344

Dan MacArthur, Director  
 Town of Marlboro  
 Emergency Management  
 P.O. Box 30  
 Marlboro, VT 05344

David R. Lewis, Esq.  
 Matias F. Travieso-Diaz, Esq.  
 Elina Teplinsky, Esq.  
 Blake J. Nelson, Esq.  
 Pillsbury Winthrop Shaw Pittman LLP  
 2300 N Street, NW  
 Washington, DC 20037-1128

Peter C. L. Roth, Esq.  
 Senior Assistant Attorney General  
 State of New Hampshire  
 Office of the New Hampshire  
 Attorney General  
 33 Capitol Street  
 Concord, NH 03301

Robert L. Stewart  
 New England Coalition  
 229 Kibbee Ext.  
 Brookfield, Vermont 05036

Alan A. Pemberton, Esq.  
 Derron J. Blakely, Esq.  
 Covington & Burling L.L.P.  
 Counsel for Electric Power Research Institute  
 (EPRI)  
 1201 Pennsylvania Avenue, NW  
 Washington, DC 20004-2401

Anthony Z. Roisman, Esq.  
 National Legal Scholars Law Firm  
 84 East Thetford Rd.  
 Lyme, NH 03768

Ronald A. Shems, Esq.  
 Karen Tyler, Esq.  
 Andrew Raubvogel, Esq.  
 Shems Dunkiel Kassel & Saunders, PLLC  
 91 College Street  
 Burlington, VT 05401

  
 Office of the Secretary of the Commission

Dated at Rockville, Maryland,  
 this 16<sup>th</sup> day of July 2008