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

In the Matter of	)	
Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3)	)	Docket Nos. 50-247-LR and 50-286-LR

RIVERKEEPER REVISED STATEMENT OF POSITION REGARDING CONTENTION RK-TC-2 (FLOW ACCELERATED CORROSION)

June 29, 2012

TABLE OF CONTENTS

In accordance with 10 C.F.R. § 2.1207(a)(2), the Atomic Safety and Licensing Board's ("ASLB") July 1, 2010 Scheduling Order,[1] the ASLB's April 18, 2012 Order,[2] and the ASLB's May 16, 2012 Order,[3] Riverkeeper, Inc. ("Riverkeeper") hereby submits this Revised Statement of Position in response to (1) Entergy Nuclear Operations, Inc.'s ("Entergy") Statement of Position Regarding Contention RK-TC-2 (Flow-Accelerated Corrosion) (ENT000028), the Testimony of Entergy Witnesses Ian D. Mew, Alan B. Cox, Nelson F. Azevedo, Jeffrey S. Horowitz, and Robert M. Aleksick Regarding Contention RK-TC-2 (Flow-Accelerated Corrosion) (ENT000029), and exhibits thereto (ENT00015A-B, ENT000030 to ENT000089), filed in the above-captioned proceeding on March 28, 2012, and (2) the U.S. Nuclear Regulatory Commission ("NRC") Staff's Statement of Position Regarding RK-TC-2 (NRC000120), NRC Staff Testimony of Matthew G. Yoder and Allen L. Hiser, Jr. Concerning Riverkeeper Technical Contention RK-TC-2 Flow Accelerated Corrosion (NRC000121), and exhibits thereto (NRC000122 to NRC000131), filed in the above-captioned proceeding on March 31, 2012.

This revised Statement of Position is supported by the Prefiled Rebuttal Testimony of Dr. Joram Hopenfeld (RIV000108) (hereinafter cited as "Hopenfeld Rebuttal"), and several additional exhibits in support of Contention RK-TC-2 (RIV000109 to RIV000113). For the

[1] In the Matter of Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3), Docket Nos. 50-0247-LR and 50-286-LR, ASLBP No. 07-858-03-LR-BD01, Scheduling Order (July 1, 2010), at ¶ K.3.

[2] In the Matter of Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3), Docket Nos. 50-0247-LR and 50-286-LR, ASLBP No. 07-858-03-LR-BD01, Order (Memorializing Items Discussed at April 16, 2012 Pre-Hearing Conference) (April 18, 2012) at 1 (explaining that "Intervenors' revised statements of position filed pursuant to Paragraph K.3 of the Board's July 1, 2010,[] should only respond to the statements of position and evidentiary submissions of Entergy Nuclear Operations, Inc. (Entergy) and the NRC Staff. At this stage of this proceeding, Intervenors should not revise their entire original statements of position but rather present only responsive arguments").

[3] In the Matter of Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3), Docket Nos. 50-0247-LR and 50-286-LR, ASLBP No. 07-858-03-LR-BD01, Order (Granting Unopposed Extension of Time) (May 16, 2012) (granting Intervenors and Interested Governmental Entities "unopposed joint motion to alter the time within which they may file their responsive testimony and statements of position, from May 29, 2012, to June 29, 2012.").

reasons discussed below and in the rebuttal testimony filed herewith, as well as for the reasons stated in Riverkeeper's Initial Statement of Position (RIV000002), and the prefiled direct testimony (RIV000003) and expert report (RIV000005) filed therewith, Entergy does not have an adequate program to manage the aging effects of flow accelerated corrosion ("FAC") during the proposed period of extended operation ("PEO") for the Indian Point nuclear power plant, and the ASLB should resolve Contention RK-TC-2 in favor of Riverkeeper.

BACKGROUND

The procedural history of Contention RK-TC-2, which concerns Entergy's failure to demonstrate an effective program for managing FAC at Indian Point during proposed 20-year license renewal periods for Units 2 and 3, is described in Riverkeeper's Initial Statement of Position Regarding Contention RK-TC-2 ("Riverkeeper's Initial Statement of Position").[4] Riverkeeper's Initial Statement of Position, along with the testimony and report of Riverkeeper's expert, Dr. Joram Hopenfeld, as well as numerous exhibits, were filed in the proceeding on December 22, 2011 in support of Contention RK-TC-2.

Following Riverkeeper's extensive initial filings on RK-TC-2, on January 30, 2012, Entergy filed a motion *in limine*, seeking to exclude certain portions of Riverkeeper's testimony, exhibits and initial statement of position.[5] In particular, Entergy objected to Riverkeeper and Dr. Hopenfeld's discussions of Entergy's failure to consider the impact of FAC at Indian Point on loss-of-coolant accidents, probabilistic risk assessments, component integrity under seismic loads, component integrity during station blackout loads, and component susceptibility to metal

[4] Riverkeeper Initial Statement of Position Regarding Contention RK-TC-2 (Flow Accelerated Corrosion) (December 22, 2011), (hereinafter "Riverkeeper's Initial Statement of Position"), at 1-3 (RIV000002).

[5] Entergy's Motion *in Limine* to Exclude Portions of Pre-Filed Direct Testimony, Expert Report, Exhibits, and Statements of Position for Contention Riverkeeper TC-2 (Flow-Accelerated Corrosion) (January 30, 2012), ("Entergy's Motion *in Limine* on RK-TC-2").

fatigue.[6] Entergy alleged that such topics were not within the scope of RK-TC-2 and/or the proceedings generally, and that Dr. Hopenfeld did not have the expertise to discuss such matters.[7] Riverkeeper opposed Entergy's attempt to improperly limit the scope of Contention RK-TC-2, explaining the patent relevance of the issues in question to RK-TC-2, as it was admitted, as well as Dr. Hopenfeld's more-than-adequate qualifications to testify about such issues.[8] On March 6, 2012, the ASLB denied Entergy's motion *in limine* related to RK-TC-2, finding that the issues objected to by Entergy were "related and relevant to whether FAC will be adequately managed during the period of extended operations—a question that the Board will weigh on the merits during the evidentiary hearing in this proceeding."[9]

Thereafter, on March 28, 2012 and March 31, 2012, Entergy and NRC Staff submitted statements of position, testimony, and exhibits related to RK-TC-2, respectively.[10] On April 30, 2012, Riverkeeper filed a motion *in limine* to exclude certain testimony proffered by Entergy on RK-TC-2.[11] In particular, Riverkeeper's motion objected to Entergy's witnesses' reference to

---

[6] *See* Entergy's Motion *in Limine* on RK-TC-2 at 5-14.

[7] *See id.*

[8] Riverkeeper, Inc. Opposition to Entergy's Motion *in Limine* to Exclude Portions of Pre-Filed Testimony, Expert Report, Exhibits, and Statement of Position for Contention Riverkeeper TC-2 (Flow-Accelerated Corrosion) (February 17, 2012), ADAMS Accession No. ML12048B483, at 4-18 ("Riverkeeper Opposition to Entergy Motion *in Limine* on RK-TC-2").

[9] In the Matter of Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3), Docket Nos. 50-0247-LR and 50-286-LR, ASLBP No. 07-858-03-LR-BD01, Order (Granting in Part and Denying in Part Applicant's Motions *in Limine*) at 23 (March 6, 2012) ("ASLB Order Denying Entergy Motion *in Limine* on RK-TC-2").

[10] Entergy Statement of Position Regarding Contention RK-TC-2 (Flow-Accelerated Corrosion), March 28, 2012 (ENT000028) ("Entergy's Statement of Position"); Testimony of Entergy Witnesses Ian D. Mew, Alan B. Cox, Nelson F. Azevedo, Jeffrey S. Horowitz, and Robert M. Aleksick Regarding Contention RK-TC-2 (Flow-Accelerated Corrosion), March 28, 2012 (ENT000029) ("Entergy Testimony"); Entergy Exhibits ENT00015A-B, ENT000030 to ENT000089; NRC Staff's Statement of Position Regarding RK-TC-2 (NRC000120), March 31, 2012 ("NRC Staff's Statement of Position"); NRC Staff Testimony of Matthew G. Yoder and Allen L. Hiser, Jr. Concerning Riverkeeper Technical Contention RK-TC-2 Flow Accelerated Corrosion, March 31, 2012 (NRC000121) ("NRC Staff Testimony"); NRC Staff Exhibits NRC000122 to NRC000131.

[11] Riverkeeper, Inc. Motion *in Limine* to Exclude Portions of Pre-Filed Testimony and Statement of Position Regarding RK-TC-2 (Flow Accelerated Corrosion) (April 30, 2012) ("Riverkeeper Motion *in Limine*").

historical data purportedly used to benchmark the CHECWORKS computer code, which is used by Entergy to manage FAC at Indian Point, in light of a discovery ruling from earlier in the proceeding in which the ASLB found that "Entergy does not have ready access to the data [] and thus has not, and *cannot, rely on it* to provide the track record for its AMP [aging management program]" or to "demonstrate that its use of CHECWORKS is adequately benchmarked."[12] On June 1, 2012, the ASLB ruled to hold Riverkeeper's Motion *in Limine* in abeyance, stating that "[b]ecause the relationship of the past use of CHECWORKS to Entergy's LRA's AMP for FAC is directly relevant to RK-TC-2, we will probe at the oral stage of the evidentiary hearing how this information was relied on by Entergy in preparing its LRA" and that after the "factual record is more fully developed, we will be better supplied with information to understand the history of Entergy's CHECWORKS benchmarking and to resolve Riverkeeper's Motion *in Limine*."[13]

Statements and arguments responsive to the statements, testimony, and evidence submitted by Entergy and NRC Staff relating to Riverkeeper Contention RK-TC-2 are described below.

SUMMARY OF REBUTTAL

Entergy's hearing submissions on RK-TC-2 fail to demonstrate that the aging effects of FAC will be adequately managed at Indian Point throughout the proposed periods of the extended operation, in accordance with 10 C.F.R. 54.21(a)(3). While relevant guidance in NUREG-1801, *Generic Aging Lessons Learned (GALL) Report* (hereinafter "*GALL Report*") envisions the use of a reliable, properly benchmarked, bounding predictive code to manage FAC,

[12] Riverkeeper Motion *in Limine* at 3-4 (quoting In the Matter of Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3), Docket Nos. 50-0247-LR and 50-286-LR, ASLBP No. 07-858-03-LR-BD01, Order (Ruling on Riverkeeper's Motion to Compel) (November 4, 2010), at 5 (emphasis added)).

[13] In the Matter of Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3), Docket Nos. 50-0247-LR and 50-286-LR, ASLBP No. 07-858-03-LR-BD01, Order (Denying New York's Motion *in Limine* and Holding Riverkeeper's Motion *in Limine* in Abeyance) (June 1, 2012) at 12.

Entergy employs the use of the CHECWORKS computer model for only a fraction of its FAC program, and to the extent it does, uses a grossly inaccurate model that consistently produces non-conservative results. This is completely inconsistent with the *GALL Report*, Revisions 1 and 2. Moreover, Entergy has failed to demonstrate that alleged "other tools" Entergy employs are adequate at managing FAC. Entergy has further failed to consider critical safety issues posed by the numerous deficiencies in Entergy's FAC program. In light of the difficulties in predicting component degradation from FAC without a reliable predictive tool, Entergy has not demonstrated that the CLB will be maintained during the proposed extended periods of operations.

NRC Staff's hearing submissions on RK-TC-2 proffer a position on the adequacy of Entergy's aging management program ("AMP") for FAC at Indian Point that is substantially similar to Entergy's. NRC Staff endorses Entergy's FAC program by essentially restating previous Entergy statements about the program at Indian Point. Thus, for similar reasons, NRC Staff's position is equally unconvincing. NRC Staff appears to base its position on incorrect information that Entergy uses CHECWORKS as a predictive tool for determining inspection locations, when, in fact, Entergy has now revealed that CHECWORKS plays a very minor role in Entergy's program, and merely as a screening tool. NRC Staff's conclusions about the adequacy of Entergy's program, thus, do not appear to be entirely justified. In addition, NRC Staff fails to recognize how Entergy's FAC program is fundamentally inconsistent with Revision 2 of the *GALL Report*, which requires that CHECWORKS be recalibrated if it produces non-conservative results, a circumstance that is impossible to achieve at Indian Point, and that NRC Staff's witnesses actually appear to approve.

APPLICABLE LEGAL AND REGULATORY REQUIREMENTS

Riverkeeper's Initial Statement of Position discussed in detail the legal and regulatory requirements relevant to Contention RK-TC-2.[14] Riverkeeper offers the following additional statements in response to Entergy and NRC Staff's articulation of applicable legal and regulatory standards in their respective statements of position.

Both Entergy and NRC Staff state that a license renewal applicant's use of the guidance in NRC's *GALL Report* satisfies the regulatory requirements of 10 C.F.R. Part 54.[15] In particular, Entergy and NRC Staff state that a finding that an AMP is consistent with the *GALL Report* is enough to satisfy applicable license renewal standards.[16] While an AMP that is consistent with the *GALL Report can* show compliance with NRC's regulatory standard in 10 C.F.R. § 54.21(a)(3), (that applicants "demonstrate that the effects of aging [on relevant structures and components] will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation"), Entergy and NRC Staff fail to make clear, and it is, thus, important to emphasize, that a license renewal applicant must conclusively show, by articulating plant-specific details, that its AMP actually addresses the guidance set forth in the *GALL Report.*[17]

Next, while neither Entergy nor NRC Staff appear to dispute the relevance of Revision 2 of the *GALL Report* to Contention RK-TC-2, Entergy asserts that the "primary difference"

---

[14] Riverkeeper's Initial Statement of Position at 3-7.

[15] Entergy's Statement of Position at 8-10; NRC Staff's Statement of Position at 6-8.

[16] Entergy's Statement of Position at 9-10; NRC Staff's Statement of Position at 6-8.

[17] *Entergy Nuclear Vermont Yankee* (Vermont Yankee Nuclear Power Station), LBP-08-25, 68 NRC 763, 870-71 (Nov. 24, 2008); *see id.* at 871 ("The fact that the Commission has stated that the use of an AMP identified in NUREG-1801 constitutes reasonable assurance, see Amergen Energy Company, LLC (Oyster Creek Nuclear Generating Station), CLI-08-23, 68 NRC 461, (slip op. at 6) (Oct. 6, 2008), does not mean that an AMP that consists solely of a bald statement that it is "comparable to," "based on," or "consistent with" NUREG-1801 provides such reasonable assurance or "demonstrates" that aging will be adequately managed.); *see also* Riverkeeper's Initial Statement of Position at 4-5.

between the *GALL Report*, Revisions 1 and 2 "is that Revision 2 permits an applicant to rely on either NSAC-202-L-R2 or –R3 as the basis for its FAC program, while Revision 1 only references NSAC-202L-R2."[18] However, this ignores and improperly minimizes a fundamental "difference" in the generic AMP concerning FAC contained in Revision 2 of the *GALL Report*: as explained in Riverkeeper's Initial Statement of Position, the most recent revision of the *GALL Report* clarifies that the use of the CHECWORKS computer code is acceptable when it provides bounding, i.e., conservative, measurements, and that when the code is not conservative, the model must be re-calibrated.[19]

Lastly, both Entergy and NRC Staff articulate standards relating to the applicable burden of proof for RK-TC-2.[20] In response to these statements, it is noteworthy to highlight that, while, as Entergy and NRC Staff point out, an intervenor must go forward with evidence to establish a *prima facie* case on an admitted contention,[21] "the agency's rules of practice . . . place the ultimate burden of proof of *any substantive matter at issue* (i.e., the admitted [] contention) on the applicant.[22]

THE PROPER SCOPE OF RIVERKEEPER CONTENTION RK-TC-2

Entergy's Statement of Position makes several assertions regarding the scope of Contention RK-TC-2. These assertions mischaracterize the actual scope of the contention, as

[18] Entergy's Statement of Position at 11.

[19] Riverkeeper's Initial Statement of Position at 6; *GALL Report*, Rev. 2 at XI M17-1 to XI M17-2 (emphasis added) (Exhibit NYS000147D).

[20] Entergy Statement of Position at 11-12, 37; NRC Staff Statement of Position at 8.

[21] Entergy Statement of Position at 11-12; NRC Staff Statement of Position at 8.

[22] In the Matter of Pacific Gas and Electric Co. (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation) Docket No. 72-26-ISFSI; ASLBP No. 02-801-01-ISFSI, 58 NRC 47, *12; 2003 (2003); *see also* In the Matter of Carolina Power & Light Company (Shearon Harris Nuclear Power Plant), Docket No. 50-400-LA; ASLBP No. 99-762-02-LA; LBP-00-12, 51 NRC 247 (2000) ("the agency's rules of practice . . . place the ultimate burden of proof on CP&L, as the license applicant, with respect to a merits disposition of any substantive matter at issue in this proceeding (i.e., the admitted BCOC contentions").

well as the relevance of portions of the testimony proffered by Dr. Hopenfeld. As such, these assertions warrant the following response.

First, Entergy's Statement of Position attempts to improperly narrow the scope of Contention RK-TC-2 by characterizing it as being limited to "two basic criticisms" centered on Entergy's use of CHECWORKS.[23] NRC Staff's witnesses make a similar characterization.[24] Entergy and NRC Staff fail to acknowledge that Contention RK-TC-2 raised *broad* criticisms about the AMP for FAC at Indian Point. Specifically, in addition to identifying Entergy's completely inappropriate use of the CHECWORKS computer code, Contention RK-TC-2, as admitted by the ASLB, goes onto assert that "Entergy's program for management of FAC is deficient because it has not *demonstrated* that components in the Indian Point nuclear power plant that are within the scope of the license renewal rule and are vulnerable to FAC will be adequately inspected and maintained during the license renewal term."[25]

That is, the contention addresses the fact that the use of CHECWORKS at Indian Point is not appropriate, but also the inadequacy of Entergy's alleged "other tools" to independently address FAC at the plant, and Entergy's failure to otherwise demonstrate a program that "would sufficiently manage the aging effects of FAC at Indian Point" during the proposed license renewal period.[26] Contention RK-TC-2, as originally proffered, is a broad criticism of Entergy's inadequate program for managing FAC. It certainly does not solely consist of CHECWORKS-

[23]Entergy's Statement of Position at 2-3; *see id* at 13 ("Dr. Hopenfeld's testimony makes two main claims.")

[24] NRC Staff's Testimony at A8 ("Based upon our review of the totality of Riverkeeper's arguments and exhibits, we see Riverkeeper's argument as fundamentally a claim that CHECWORKS™ cannot be relied upon for adequate aging management under a renewed license).

[25] Riverkeeper, Inc.'s Request for Hearing and Petition to Intervene in the License Renewal Proceedings for the Indian Point Nuclear Power Plant (November 30, 2007), ADAMS Accession No. ML073410093, at 16 (emphasis added) (hereinafter "Riverkeeper Petition to Intervene").

[26] *See* Riverkeeper Opposition to Entergy's Motion for Summary Disposition of Riverkeeper Technical Contention 2 (Flow-Accelerated Corrosion) (August 16, 2010), *available at* ADAMS Accession No. ML102371214.

related bases, as mischaracterized by Entergy and NRC Staff.[27] This is evident from the ASLB's ruling of Entergy's Motion for Summary Disposition of Riverkeeper TC-2, in which the ASLB identified genuine issues of material fact relating not just to Entergy's reliance on CHECWORKS, but also, to whether Entergy's AMP for FAC was adequate "to demonstrate that the intended functions of the applicable components will be maintained during the extended period of operation."[28]

Secondly, Entergy maintains that various safety issues discussed by Dr. Hopenfeld in his initial testimony and expert report are outside the scope of Contention RK-TC-2. In particular, Entergy's Statement of Position states that "[c]onsistent with its Motion in Limine, Entergy asserts that Riverkeeper's assorted new challenges to the FAC Program . . . are outside the scope of the admitted contention."[29] In particular, Entergy believes that Dr. Hopenfeld's discussions of Entergy's failure to consider the impact of FAC at Indian Point on loss-of-coolant accidents, probabilistic risk assessments, component integrity under seismic loads, component integrity during station blackout loads, and component susceptibility to metal fatigue, are not within the scope of the contention.[30] Entergy is mistaken.

Consistent with the opposition filed in response to Entergy's Motion *in Limine*, Riverkeeper maintains that the safety concerns raised by Dr. Hopenfeld are well within the bounds of Contention RK-TC-2.[31] As Riverkeeper previously explained in its opposition to Entergy's Motion *in Limine*, Riverkeeper's originally proffered contention *explicitly* raised the

---

[27] Entergy's Statement of Position at 2-3, 13; NRC Staff's Testimony at A8.

[28] In the Matter of Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3), Docket Nos. 50-0247-LR and 50-286-LR, ASLBP No. 07-858-03-LR-BD01, Memorandum and Order (Ruling on Entergy's Motion for Summary Disposition of Riverkeeper TC-2 (Flow-Accelerated Corrosion)) (November 4, 2010), at 8.

[29] Entergy's Statement of Position at 35.

[30] *See* Entergy's Motion *in Limine* on RK-TC-2 at 5-14.

[31] Riverkeeper Opposition to Entergy Motion *in Limine* on RK-TC-2 at 4-16

safety implications posed by undetected FAC, and was entirely premised upon seeking to ensure that Indian Point will operate *safely* during the proposed period of extended operation.[32] The contention squarely referenced applicable guidance which explained that in order to demonstrate an AMP that is sufficient to manage the effects of FAC, Entergy must show that its program ensures component integrity *under all CLB conditions*.[33]

Riverkeeper's opposition to Entergy's Motion in Limine further explained that the CLB requires that safety-related components at Indian Point be able to withstand design basis loss of coolant accidents ("DBA-LOCA"),[34] and that this requirement extends to the license renewal period.[35] Thus, excessive wall thinning below minimum design thickness due to FAC that reduces component strength, and affects the plant's ability to withstand consequences of DBA-LOCA's under normal operations and under other transient loads, including earthquakes and station blackouts, is squarely relevant to the admitted contention, and not allegedly new issues. That is, to have an adequate FAC AMP, Entergy must demonstrate that components at Indian Point that have deteriorated due to FAC, and which will continue to do so, will be able to handle varying accident loads such that the intended functions of the component will be maintained.[36]

Moreover, raising such issues is not a direct challenge to the CLB in any way. As one licensing board has explained, "[w]hile a challenge to the CLB is outside the scope of a license

---

[32] *See* Riverkeeper Petition to Intervene at 17-18; *see id.* at 18-19 (citing NUREG-1800 at § A.1.2.3.4); *see id.* at 23 (citing NUREG-1800 at § A.1.2.3.6).

[33] *See* Riverkeeper Petition to Intervene at 23 (citing NUREG-1800 at § A.1.2.3.6).

[34] Riverkeeper Opposition to Entergy Motion *in Limine* on RK-TC-2 at 6 (citing 10 C.F.R. Part 50, Appendix A, General Design Criteria for Nuclear Power Plants, *Criterion 4—Environmental and dynamic effects design bases*).

[35] *See id.* (citing 10 C.F.R. § 54.29(a) (standards for issuing a renewed license include continuation of the CLB with respect to managing the effects of aging for SSCs); U.S. NRC, Continuation of CLB and Conditions of Renewed License, http://www.nrc.gov/reactors/operating/licensing/renewal/introduction/decision/decision2.html ("Each renewed license will include those conditions to protect the environment that were imposed pursuant to 10 CFR 50.36b and that are part of the CLB for the facility at the time of issuance of the renewed license")).

[36] *See* NUREG-1800 at § A.1.2.3.4; A.1.2.3.6(1).

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."[37] That licensing board was "not willing to exclude evidence merely because it touches upon Entergy's CLB."[38] Thus, the concern raised by Contention RK-TC-2 that Entergy has failed to demonstrate that Indian Point will operate safely under all CLB conditions (including LOCAs and non-plant transients) during the entire license renewal period in light of FAC-related degradation, is entirely permissible. Dr. Hopenfeld's testimony does not challenge the CLB at Indian Point. Instead, Dr. Hopenfeld merely makes reference to the CLB in the context of challenging the adequacy of Entergy's FAC AMP.

Furthermore, another logical consideration that stems from the bases cited in Contention RK-TC-2 is the failure of Entergy's FAC AMP to account for the synergistic effects of metal fatigue on relevant components. This is a reasonable inquiry because Entergy is obligated to demonstrate that all components subject and susceptible to FAC will maintain their intended functions during the entire proposed periods of extended operations.

Thus, overall, there is no credence to Entergy's position that the safety concerns raised by Dr. Hopenfeld are not within the scope of Contention RK-TC-2, or the proceeding. Such safety consideration are squarely relevant, since Contention RK-TC-2 raised a wide-range of issues centered around whether Entergy has demonstrated an adequate AMP for managing FAC throughout the proposed license renewal periods. This understanding of the scope of the contention is consistent with the ASLB's ruling on Entergy's Motion *in Limine*, which found that the issues objected to by Entergy were "related and relevant to whether FAC will be adequately

[37] In the Matter of Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (Vermont Yankee Nuclear Power Station), Docket Nos. 50-271-LR, ASLBP No. 06-849-03-LR, Order (Ruling on Motions to Strike and Motions in Limine), July 16, 2008, at 10.

[38] *Id.*

managed during the period of extended operations—a question that the Board will weigh on the merits during the evidentiary hearing in this proceeding."[39]

ARGUMENT

I. ENTERGY'S STATEMENT OF POSITION

A. Summary of Entergy's Statement of Position

Entergy disagrees with the position taken by Riverkeeper in Contention RK-TC-2, and maintains that Entergy has an adequate program to manage the aging effects of FAC during the proposed periods of extended operation of Indian Point Units 2 and 3. After making various unfounded claims in an attempt to cast doubt on the qualifications of Riverkeeper's expert witness, Entergy makes the following arguments in response to the various inadequacies with the FAC program at the plant that Dr. Hopenfeld identified in his initial testimony and expert report: (1) aside from CHECWORKS, the FAC program allegedly has "other tools" that play "significant roles" in the FAC program;[40] (2) CHECWORKS performs its "intended purpose" at Indian Point of "ranking" component wear rates;[41] (3) CHECWORKS at Indian Point does not require extended benchmarking;[42] (4) the decision in an entirely different proceeding, the *Vermont Yankee* license renewal proceeding, "rejected" intervenor objections similar to those raised by Dr. Hopenfeld in this proceeding;[43] (5) the many Indian Point plant leaks identified by Dr. Hopenfeld do not demonstrate a deficiency in the FAC program or Entergy's use of CHECWORKS at the plant;[44] (6) instances of FAC that have occurred at other plants discussed

[39] ASLB Order Denying Entergy Motion *in Limine* on RK-TC-2 at 23.

[40] Entergy Statement of Position at 21-26.

[41] *Id.* at 26-28.

[42] *Id.* at 29.

[43] *Id.* at 30-32.

[44] *Id.* at 32-33.

by Dr. Hopenfeld are not relevant;[45] (7) Entergy's FAC program is consistent with the *GALL Report*, revisions 1 *and 2*;[46] and (8) that the various safety concerns raised by Dr. Hopenfeld stemming from Entergy's inadequate FAC program (concerning the impact of FAC at Indian Point on the ability of plant components to handle varying transient loads or metal fatigue), lack merit, since, according to Entergy, the FAC program at Indian Point provides "reasonable assurance that IPEC components will continue to perform their intended functions throughout the PEO."[47] The Prefiled Rebuttal Testimony of Dr. Joram Hopenfeld[48] addresses and rebuts each of the assertions raised in Entergy's Statement of Position and witness testimony.

B. Dr. Hopenfeld is Well-Qualified to Provide an Expert Opinion Regarding the Management of Aging Due to FAC

Entergy's Statement of Position asserts that Dr. Hopenfeld's testimony should be accorded "little or no weight" because he allegedly has not "worked directly on FAC program issues" or issued publications on FAC related issues.[49] Such remarks are patently unfounded, as Dr. Hopenfeld has extensive education, training, and experience with FAC-related issues, all of which make him more than well-qualified to testify in relation to Contention RK-TC-2. This is clear from a review of Dr. Hopenfeld's *curriculum vitae*, as well as his initial testimony, which described his relevant qualifications.[50] In addition, Dr. Hopenfeld has provided lengthy rebuttal testimony explaining his relevant background, experience, and publications related to FAC

[45] *Id.* at 33-34.

[46] *Id.* at 34-35.

[47] *Id.* at 35-36.

[48] Hereinafter cited to as "Hopenfeld Rebuttal Testimony at __ (RIV000108)."

[49] Entergy's Statement of Position at 13.

[50] *Curriculum Vitae* of Dr. Joram Hopenfeld (RIV000004); Prefiled Written Testimony of Dr. Joram Hopenfeld Regarding Riverkeeper Contention TC-2 – Flow Accelerated Corrosion (December 21, 2011) (RIV000003) at 1-2.

issues.[51] Based on the detailed history of Dr. Hopenfeld's involvement in FAC-related issues, he undeniably has a specialized knowledge of the relevant issues. Entergy refers to a declaration filed in the *Vermont Yankee* proceeding, in which Dr. Hopenfeld stated that the issues in the case required particularized expertise, to somehow demonstrate that his testimony in this case is deficient;[52] to the contrary, Dr. Hopenfeld's previous declaration is entirely consistent with the testimony he has offered in this case, as he possesses the specific knowledge that he was referring to.[53]

Entergy attempts to discredit Dr. Hopenfeld by stating that his "only experience with FAC was appearing as a witness in *Vermont Yankee*," at which, Entergy claims, the board "uniformly rejected" Dr. Hopenfeld's theories, and Dr. Hopenfeld allegedly "admitted" that he was not an expert on the corrosion process.[54] Entergy is grossly distorting the truth. To begin with, based on Dr. Hopenfeld's extensive discussion of his experience with FAC issues, it is simply not true that his "only" experience with FAC was his involvement in the *Vermont Yankee* case.[55] Moreover, the board's ultimate conclusions in the *Vermont Yankee* proceeding were specific to that proceeding. In other words, the board only made a determination *after* a full evidentiary hearing. This is consistent with the requirement that a licensee "show[] that the *specific plant details* of its AMP have adequately addressed" the *GALL Report*.[56] Thus, the decision of the board in the *Vermont Yankee* proceeding should not dictate the outcome of

[51] Hopenfeld Rebuttal Testimony at 4-6 (RIV000108).

[52] Entergy's Statement of Position at 15.

[53] Hopenfeld Rebuttal Testimony at 8 (RIV000108).

[54] Entergy's Statement of Position at 14.

[55] Hopenfeld Rebuttal Testimony at 4-6 (RIV000108).

[56] *Entergy Nuclear Vermont Yankee*, 68 NRC 763, 871 (emphasis added).

similar issues in this proceeding. Indeed, there are numerous differences between the two cases that make generalizing the conclusions from one to the other entirely inappropriate.[57]

Furthermore, Entergy's position that Dr. Hopenfeld's allegedly proclaimed that he is "not an expert on the corrosion process" is incorrect. Entergy has taken a sentence from the licensing board's decision in *Vermont Yankee* completely out of context. Indeed, Entergy cites to the licensing board paraphrasing positions taken at the adjudicatory hearing in the case, and *not* to a direct quote from Dr. Hopenfeld. Dr. Hopenfeld provides the appropriate context for the quoted statement, and explains Entergy's highly misleading interpretation of what actually happened: in reality, Dr. Hopenfeld stated that he was not an expert on "oxide layer characteristics," that is, one aspect of the expansive field of corrosion.[58] Dr. Hopenfeld explains that the field of corrosion encompasses many disciplines, and it is unlikely a person will have expertise in *every aspect* of corrosion, and further, that his lack of expertise on oxide layer characteristics does not render him unqualified to provide an expert opinion on FAC-related issues.[59]

In sum, Entergy's attempt to cast aspersions on the Dr. Hopenfeld's qualifications is unfounded, and should be ignored. Dr. Hopenfeld's testimony can be accorded substantial weight in light of his ample ability to testify on the relevant issues.

C. Entergy's Witnesses Lack Objectivity and/or Relevant Expertise in Relation to the Management of Aging Due to FAC

Entergy's Statement of Position and testimony include background information on the alleged qualifications and competency of Entergy's witnesses to testify on Contention RK-TC-2.[60] Dr. Hopenfeld reviewed Entergy's witnesses' *curricula vitæa* and testimony, and based on

[57] *See* Hopenfeld Rebuttal Testimony at 35-39 (RIV000108).

[58] *Id.* at 6-8.

[59] *Id.*

[60] Entergy's Statement of Position at 15-20; Entergy's Testimony at pp.1-15.

his understanding of the kind of expertise necessary to provide a competent opinion about FAC and CHECWORKS, he has made several observations which call into question the ability of the witnesses to do so. In particular, he has observed that Mr. Mew, Mr. Cox, Mr. Azevedo, *and* Mr. Aleksick, do not appear to have expertise in relevant fields, including mass transfer, nuclear safety analysis, electrochemistry, materials, thermal-hydraulics, and/or nuclear safety risk assessment.[61]

In addition, as the co-developer of the CHECWORKS computer model and a consultant to the Electric Power Research Institute ("EPRI"), it is apparent that Dr. Jeffrey S. Horowitz has a direct financial interest providing testimony in defense of the success and use of CHECWORKS.[62] Similarly, Mr. Aleksick, as the President and founder of CSI Technologies, Inc., which markets CHECWORKS and is affiliated with EPRI, also has a financial interest in providing testimony defending the use of CHECWORKS at nuclear power plants.[63]

D. Entergy Has Failed to Demonstrate that its "Other Tools" aside from CHECWORKS for Managing FAC at Indian Point are Adequate

Entergy and Entergy's witnesses refute Dr. Hopenfeld's position that CHECWORKS is a predominant feature of Entergy's FAC program at Indian Point, and cite to various alleged other methods used at the plant to manage FAC, including (1) trending, (2) industry experience, (3) results from other plant inspection programs, (4) engineering judgment, and (5) non-modeled rankings.[64] Entergy has revealed that CHECWORKS only accounts for a fraction of the overall program at Indian Point.[65] However, Dr. Hopenfeld's rebuttal testimony makes it clear that

[61] Hopenfeld Rebuttal Testimony at 8-9 (RIV000108).

[62] *See id.* at 9.

[63] *See id.*

[64] Entergy's Statement of Position at 21-22.

[65] *Id.* at 22, 25-26.

Entergy's witnesses' discussion of these "other tools" is not adequate to demonstrate the FAC will be adequately managed during the proposed periods of extended operation at Indian Point.

Dr. Hopenfeld first explains that the heart of the guidelines in the *GALL Report* and in EPRI's Recommendations for an Effective Flow-Accelerated Corrosion Program, NSAC-202L, is that a licensees FAC program will be based on a quantitative, analytical predictive code; as a result, he points out that Entergy's disclosure that CHECWORKS has been relegated to a minor role, is not consistent with applicable regulatory guidance.[66] Notably, the extent of Entergy's reliance on non-CHECWORKS "tools" was not fully known until Entergy filed its testimony.[67]

Dr. Hopenfeld further explains his disagreement that all of the "other tools" discussed by Entergy and Entergy's witnesses are truly "independent" of CHECWORKS.[68] Based on Dr. Hopenfeld's explanation, it is apparent that in various respects, Entergy's "other tools" do rely upon the use of CHECWORKS.[69] Further, Dr. Hopenfeld expresses his well-founded doubts that the use of trending, which Energy indicates accounts for almost *half* of its program, as a stand-alone tool, and not in conjunction with CHECWORKS, has limited effectiveness unless a very large portion of the susceptible components are inspected, which Entergy has not demonstrated is this case.[70]

Dr. Hopenfeld goes on to explain that, generally, to the extent Entergy is relying on its "other tools" to manage FAC at Indian Point, Entergy and its witnesses have failed to provide a sufficient amount of details to demonstrate the validity and success of such other tools.[71] For

[66] Hopenfeld Rebuttal Testimony at 9-11 (RIV000108).

[67] *See id.*

[68] *Id.* at 11-17.

[69] *Id.*

[70] *Id.* at 11-14.

[71] *Id.* at 16-17.

example, Dr. Hopenfeld provides a detailed list of the kind of information necessary to be able to evaluate the performance of Entergy's "other tools," which Entergy has not provided, including, *inter alia*: the size of the inspection areas relative to all of the FAC susceptible locations, inspection frequency, comparisons of predictions with actual measurements in relation to each "other tool," the method is used to verify the validity of the measurements, and the accuracy of the results for each "other tool."[72]

Thus, despite Entergy's explanation that it uses other tools in the FAC program at Indian Point, Entergy's witnesses fail to demonstrate that, in the absence of a quantitative analytical model, such other tools are individually adequate to manage FAC at Indian Point during the proposed periods of extended operation.

E. Entergy has Failed to Demonstrate that CHECWORKS Performs Adequately at Indian Point

Entergy asserts that "for those components modeled by CHECWORKS, the software adequately performs its intended purpose" of "provid[ing] a best-estimate of wear rates at IPEC, rather than a bounding prediction."[73] Entergy explains that "in using CHECWORKS FAC engineers focus on the rankings of relative wear rates for components, not on absolute wear rates,"[74] and that CHECWORKS is not used to "determine inspection locations based on CHECWORKS' predictions of time to critical thickness" but rather to "*rank* components."[75] However, Dr. Hopenfeld's rebuttal testimony demonstrates that the use of CHECWORKS in this manner at Indian Point is inadequate.

---

[72] *Id.*

[73] Entergy's Statement of Position at 26-27.

[74] *Id.* at 27.

[75] *Id.* at 28 (emphasis in original).

To begin with, Entergy's use of CHECWORKS is starkly inconsistent with the guidance contained in the *GALL Report*, which indicates that CHECWORKS "is used to *predict* component degradation in the systems conducive to FAC" and that CHECWORKS is acceptable "*because it provides a bounding analysis for FAC.*"[76] In addition, the *GALL Report* indicates that "[i]nspection results are input for a predictive computer code, such as CHECWORKS, to calculate the number of refueling or operating cycles remaining before the component reaches the minimum allowable wall thickness"[77] and that CHECWORKS should be used to provide an inspection schedule, which Dr. Hopenfeld explains, depends integrally on *absolute* wear rate predictions.[78] Thus, Entergy's use of CHECWORKS as simply a screening tool is not appropriate.[79]

Dr. Hopenfeld further refutes Entergy's witnesses' position about the accuracy of CHECWORKS at Indian Point, and continues to opine that the model produces highly inaccurate results. Entergy's witnesses take the position that CHECWORKS produces an adequate degree of correlation, that "CHECWORKS is logically expected to overpredict the wear rate 50% of the time and underpredict the wear rate 50% of the time," and that any lack of correlation does not constitute a "deficiency" in the model.[80] As Dr. Hopenfeld explains, this position is problematic and/or incorrect. Entergy's acknowledgment that CHECWORKS will underpredict wear about 50% of the time is completely inconsistent with the *GALL Report*, Revision 2, which explains:

---

[76] *GALL Report*, Rev. 1 at § XI.M17 ¶ 5; *GALL Report*, Rev. 2 at § XI.M17 ¶ 5 (emphasis added); Hopenfeld Rebuttal Testimony at 17-19 (RIV000108).

[77] *GALL Report*, Rev. 1 at § XI.M17 ¶ 6; *GALL Report*, Rev. 2 at § XI.M17 ¶ 6.

[78] *GALL Report*, Rev. 1 at § XI.M17 ¶ 5; *GALL Report*, Rev. 2 at § XI.M17 ¶¶ 5, 6; Hopenfeld Rebuttal Testimony at 18 (RIV000108).

[79] Hopenfeld Rebuttal Testimony at 17-19 (RIV000108).

[80] *See* Entergy's Testimony at A102, A106, A109, A114

> CHECWORKS is acceptable because it provides a bounding analysis for FAC. The *analysis is bounding* because in general the predicted wear rates and component thicknesses are ***conservative*** when compared to actual field measurements. *It is recognized that CHECWORKS is not always conservative in predicting component thickness; therefore, when measurements show the predictions to be non-conservative, the model must be re-calibrated using the latest field data.*[81]

Entergy's acknowledgment, and actual acceptance of, the non-conservative nature of the CHECWORKS model at Indian Point is not consistent with this guidance, and actually tends to indicate that the required recalibration of the code is unattainable, since Entergy fully expects non-conservative predictions to continue about half the time.[82] Dr. Hopenfeld explains his continuing opinion that further recalibration of the model at Indian Point is not likely to generate the required conservative predictions, since Entergy's attempts to recalibrate the model, which has been generating highly non-conservative results for over the past 10 years, have been unsuccessful.[83]

Dr. Hopenfeld also continues to disagree that the CHECWORKS code produces an adequate degree of correlation. Dr. Hopenfeld's review of Entergy's extensive data revealed a large percentage of under-predictions by as much as a factor of 10.[84] Unlike Entergy's witnesses, Dr. Hopenfeld explains why this lack of accuracy is undeniably a "deficiency," in the FAC program at Indian Point.[85] For example, the inaccuracy of the model severely limits the ability of the model to correctly identify inspection locations and assist the FAC engineers in developing an adequate inspection schedule, and could cause components to operate below their

---

[81] *GALL Report*, Rev. 2 at § XI.M17 ¶ 5 (emphasis added) (Exhibit NYS000147D); Hopenfeld Rebuttal Testimony at 19 (RIV000108).

[82] Hopenfeld Rebuttal Testimony at 19 (RIV000108).

[83] *Id.*

[84] *Id.* at 19-20

[85] *Id.* at 20-21.

designed wall thicknesses.[86] As such a circumstance is not contemplated by the *GALL Report*, it is a deficiency in the program.

Dr. Hopenfeld further responds to Entergy's witnesses various objections to his interpretation of the CHECWORKS data Entergy provided.[87] Dr. Hopenfeld defends his initial testimony relating to the extent of his review of CHECWORKS data graphs, Entergy's unjustified use of line correction factors, the failure of the code to provide a single measured value for every predicted data point, the meaning of the +/-50% lines on Entergy's data graphs, and the high degree of inaccuracy of the CHECWORKS predictions.[88] Dr. Hopenfeld also disputes Entergy's witnesses' position that CHECWORKS is allegedly the "best available analytical tool prioritizing inspections for a FAC program."[89]

Lastly, Dr. Hopenfeld explains various other problems with Entergy's continued reliance on CHECWORKS at Indian Point: that critical risk-significant components inside the steam generators that are highly vulnerable to FAC are not monitored by the model; and the fact that CHECWORKS does not ensure that all forms of FAC will be adequately managed due to the arbitrarily restrictive definition of FAC used by Entergy.[90]

Overall, Dr. Hopenfeld's rebuttal testimony demonstrates that, contrary to Entergy's assertion, CHECWORKS is *not* performing adequately at Indian Point, or in a manner that is consistent with applicable regulatory guidance.

---

[86] *Id.*

[87] *See* Entergy's Testimony at A104, A105, A106, A108, A110, A111, A112, A114,

[88] Hopenfeld Rebuttal Testimony at 21-28 (RIV000108).

[89] Entergy's Testimony at 114; Hopenfeld Rebuttal Testimony at 27-28 (RIV000108).

[90] Entergy's Testimony at A64, A51; Hopenfeld Rebuttal Testimony at 28-30 (RIV000108).

F. Entergy has Failed to Demonstrate that CHECWORKS is Adequately Benchmarked at Indian Point

Entergy asserts that "further benchmarking of CHECWORKS is not necessary following the 2004 and 2005 SPUs [stretch power uprates] at IPEC."[91] In response, Dr. Hopenfeld explains that the only way to demonstrate that the code has been sufficiently benchmarked, and that it is therefore consistent with the guidance contained in the *GALL Report*, is to compare CHECWORKS predictions against actual measured component thickness measurements: accurate, conservative predictions indicate that the code has been sufficiently benchmarked.[92] Based on Dr. Hopenfeld's review of years of comparison data reveals that the code is *not* sufficiently benchmarked, both before, and after the SPUs.[93] Dr. Hopenfeld explains how the CHECWORKS model at the plant has experienced a near constant lack of correlation, with no signs of improving, and, thus, has and continues to lack adequate benchmarking.[94] Dr. Hopenfeld continues to express his doubt that the model will improve sufficiently in the future, and certainly not before the commencement of the proposed period of extended operation.[95] This now appears to be confirmed by Entergy's witnesses' admission that non-conservative results about 50% of the time are expected to continue.

In addition, Dr. Hopenfeld's review of several additional CHECWORKS reports, which contained additional data, provided by Entergy after Riverkeeper's initial hearing submissions on Contention RK-TC-2,[96] adds further support to Dr. Hopenfeld's conclusions. These reports

---

[91] Entergy's Statement of Position at 29.

[92] Hopenfeld Rebuttal Testimony at 30-31 (RIV000108).

[93] *Id.* 28, 30-33.

[94] *Id.* at 30-31.

[95] *Id.* at 30.

[96] The data from these additional reports has been excerpted and provided in support of this revised Statement of Position, as RIV000112.

range in dates from 1999 to 2004, so do not date back to the inception of the use of CHECWORKS at Indian Point; rather, they appear to be "stragglers" that were simply not provided earlier in the proceeding, despite their relevance to the contention, as well as Entergy's commitment to do so.[97] In any event, the additional data exhibits the same lack of correlation as the previous data reviewed by Dr. Hopenfeld and supports the position that the CHECWORKS model at Indian Point produces highly unreliable and non-conservative component wear predictions, and that the code has never been properly benchmarked.[98]

Entergy and Entergy's witnesses point to a recent EPRI study which examined the impact of SPUs on FAC programs at nuclear power plants, as evidence that the CHECWORKS model accommodates changes in plant parameters, and produces calibrated results after power uprates.[99] However, Dr. Hopenfeld clarifies that the referenced EPRI study did not include Indian Point, and that, since the CHECWORKS analysis is plant specific, a site-specific assessment of CHECWORKS at Indian Point indicates a result that does not agree with EPRI's observations.[100]

Dr. Hopenfeld further disputes Entergy's witnesses' reliance on NRC Staff's findings related to the adequacy of the CHECWORKS model at Indian Point.[101]

Entergy cites to the licensing board in the *Vermont Yankee* relicensing proceeding indicating that 10-15 years of benchmarking is "not defensible in light of the goal of CHECWORKS to merely identify locations for plant inspections."[102] In light of the

[97] *See* Ruling on Riverkeeper's Motion to Compel at 3-4.

[98] Hopenfeld Rebuttal Testimony at 33-34 (RIV000108).

[99] *See* Entergy's Statement of Position at 29; Entergy's Testimony at A116.

[100] Hopenfeld Rebuttal Testimony at 32 (RIV000108).

[101] *Id.* at 32-33.

[102] Entergy's Statement of Position at 29.

overwhelming evidence indicating how poorly CHECWORKS performs at Indian Point, a conclusion that CHECWORKS is adequately benchmarked is simply not justified in this case. Moreover, as discussed above, this use of CHECWORKS is not consistent with applicable guidance, and so, questioning the adequacy of the benchmarking is entirely appropriate.

Overall, Dr. Hopenfeld's rebuttal testimony demonstrates that Entergy's position that the CHECWORKS code at Indian Point is adequately benchmarked, is unsupported.

G. Entergy Inappropriately Relies Upon Findings Made in the *Vermont Yankee* Relicensing Proceeding

Entergy purports to demonstrate that a licensing board decision in the *Vermont Yankee* license renewal proceeding relating to a FAC contention is applicable and relevant to the instant Indian Point case.[103] However, applying the findings from an entirely separate license renewal proceeding to "resolve" the plant-specific FAC-related contention in this proceeding is not appropriate for several reasons.

First, as explained above, the adequacy of Entergy's AMP *at Indian Point* for managing FAC during the proposed periods of extended operation for Units 2 and 3, is a site-specific inquiry.[104] For example, Dr. Hopenfeld explains EPRI's guidance that a CHECWORKS analysis is plant-specific.[105] Moreover, it would be misguided to simply rely on findings made by a licensing board *prior to* the issuance of the *GALL Report*, Revision 2 was issued, which specifically requires recalibration of the CHECWORKS code if it produces non-conservative results.[106] There was a different understanding of applicable guidance at the time of the *Vermont*

[103] Entergy's Statement of Position at 30-32.

[104] Hopenfeld Rebuttal Testimony at 35 (RIV000108); *Entergy Nuclear Vermont Yankee*, 68 NRC 763, 871; *see also* Riverkeeper's Initial Statement of Position at 4-6.

[105] EPRI, Plant Engineering: Impact of Electric Power Uprates on Flow-Accelerated Corrosion (July 2011) (ENT000081) at p.1-3.

[106] Hopenfeld Rebuttal Testimony at 37 (RIV000108).

Yankee proceeding; as such, it is clearly inappropriate to rely on findings from that proceeding.[107] For example, while Entergy cites to the *Vermont Yankee* licensing board's statement that the intervenors there "may be misunderstanding the purpose of CHECWORKS in the FAC program in their attempt to use continuous benchmarking of the model to predict absolute wear,"[108] this finding does not appear consistent with Revision 2 of the *GALL Report*, which contemplates CHECWORKS as a quantitative *predictive* tool (not simply a ranking tool), and which requires recalibration of the model when results are non-conservative.[109]

Moreover, Dr. Hopenfeld reiterates the various key differences between Vermont Yankee and Indian Point, which make the board's findings in the former proceeding unhelpful for resolving Riverkeeper's contention in this proceeding.[110] So, while Entergy maintains that the substantial size difference between the plants is not relevant,[111] Dr. Hopenfeld explains that the relative sizes of the plants is a differentiating factor, and points to an admission by Entergy's own witness during the *Vermont Yankee* proceeding that the small size of the Vermont Yankee plant does affect FAC wear rates.[112]

Entergy's witnesses further disagree that the Indian Point case is different from *Vermont Yankee* because in this case there is ample post-SPU data that demonstrates the CHECWORKS code has still not been properly adjusted to power uprate conditions, whereas at Vermont

---

[107] *Id.*

[108] *See* Entergy's Testimony at A115 (citing *Entergy Nuclear Vermont Yankee*, 68 NRC at 891); Entergy's Statement of Position at 14, fn.57.

[109] *GALL Report*, Rev. 2 at § XI.M17 ¶ 5 (Exhibit NYS000147D); Hopenfeld Rebuttal Testimony at 19, 37 (RIV000108).

[110] Hopenfeld Rebuttal Testimony at 36-39 (RIV000108).

[111] Entergy's Statement of Position at 31.

[112] Hopenfeld Rebuttal Testimony at 36-37 (RIV000108) (citing In the Matter of Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (Vermont Yankee Nuclear Power Station), Docket No. 50-271 –LR, ASLBP No. 06-849-03-LR, Testimony of Jeffrey S. Horowitz and James C. Fitzpatrick on NEC Contention 4 – Flow-Accelerated Corrosion (May 12, 2008), at 12-13(RIV000113).

Yankee, the board made its decision *before any post-SPU data was available.*[113] Dr. Hopenfeld continues to believe that the availability of several rounds of post-SPU CHECWORKS data is a key difference between the Indian Point and Vermont Yankee cases, and makes the findings in the latter inapplicable.[114]

Lastly, Entergy objects to Riverkeeper's explanation that the Vermont Yankee proceeding differs from the Indian Point proceeding because, in the former, the board found that CHECWORKS data dating back to 1989 assisted in calibrating the model, while in the latter, instant, proceeding, data dating back to the inception of the use of CHECWORKS at the plant was not available and/or not provided.[115] While Entergy now claims that the older historical data has been "incorporated" into the model,[116] Riverkeeper continues to maintain that Entergy cannot rely on such data to demonstrate that the CHECWORKS model at Indian Point has been adequately calibrated, since Riverkeeper and its expert have not had the opportunity to actually review such data to determine the veracity of such claims.[117] This is consistent with Riverkeeper's understanding of the ASLB's ruling on a motion to compel discovery of *all* Indian Point CHECWORKS data dating back to the time the program was first instituted at the plant, which was filed by Riverkeeper earlier in the proceeding; this ruling found that because Entergy did "not have ready access to the data requested" they "cannot, rely on it to provide the track record for its AMP that Riverkeeper claims is lacking" or to "demonstrate that its use of

[113] Hopenfeld Rebuttal Testimony at 37 (RIV000108).

[114] *Id.*

[115] *See* Riverkeeper's Initial Statement of Position at 29-30; *see also See* Ruling on Riverkeeper's Motion to Compel at 3-4.

[116] Entergy's Statement of Position at 31.

[117] Hopenfeld Rebuttal Testimony at 37-39 (RIV000108).

CHECWORKS is adequately benchmarked."[118] Though Entergy did provide certain additional CHECWORKS reports after the filing of Riverkeeper's initial hearing submissions, these reports were not the older, historical data in dispute that Entergy now claims is "part of the IPEC CHECWORKS model."[119] Dr. Hopenfeld explains that, in any event, the approximately 12 years worth of CHECWORKS data that he did have the benefit of reviewing revealed that the code produces consistently inaccurate, highly non-conservative results, and has not improved over time.[120] As such, it is his opinion that the historical data would not materially change his opinions and conclusions, and that, based on the behavior of the code, the historical data would likely bolster his findings.[121]

H. Entergy Failure to Recognize that FAC-Related Leaks Constitute a Deficiency in Energy's FAC Program at Indian Point

Entergy attempts to minimize the significance of various plant leaks that have occurred at Indian Point due to FAC.[122] Dr. Hopenfeld explains how the main purpose of a well-executed program is to prevent failures by wall thinning for all components susceptible to FAC.[123] Dr. Hopenfeld further refutes Entergy's witnesses' explanation that leaks and thinning events do not constitute FAC program deficiencies when they are of "negligible safety significance,"[124] since even small leaks can become a safety risk.[125] Dr. Hopenfeld disagrees that the implementation of corrective action makes leaking and thinning events automatically acceptable and consistent

[118] *See* Ruling on Riverkeeper's Motion to Compel at 5.

[119] Entergy's Statement of Position at 31-32.

[120] Hopenfeld Rebuttal Testimony at 38-39 (RIV000108).

[121] *Id.*

[122] Entergy's Statement of Position at 32-33.

[123] Hopenfeld Rebuttal Testimony at 39-40 (RIV000108).

[124] Entergy's Testimony at A132.

[125] *Id.*

with applicable standards.[126] Dr. Hopenfeld's testimony demonstrates that instances of FAC indeed constitute deficiencies in Entergy's FAC program.[127]

I. Entergy Fails to Recognize the Relevance of FAC Events at Other Nuclear Plants

Entergy disputes the relevance and implications of FAC events that have occurred throughout the nuclear industry.[128] However, as Dr. Hopenfeld explains, occurrences of FAC at other nuclear power plants do in fact demonstrate that the FAC program at Indian Point is deficient.[129] For example, events that have occurred at San Onofre and Mihama plants demonstrate glaring issues with Entergy's continued reliance on the CHECWORKS model to manage FAC at Indian Point.[130]

J. Entergy's FAC Program Patently Fails to Comply with the *GALL Report*

Entergy claims that its FAC program complies with all relevant guidance, including the *GALL Report*.[131] However, Entergy ignores several critical and glaring inconsistencies between its program for managing FAC at Indian Point and the guidance for an FAC AMP contained in the *GALL Report*, Revisions 1 and 2.[132] As explained above, as well as in Dr. Hopenfeld's initial testimony and expert report, and his rebuttal testimony, the *GALL Report* indicate that the use of CHECWORKS is appropriate because it provides a bounding, that is, conservative, analysis; Revision 2 of the *GALL Report* further requires that CHECWORKS be recalibrated when the

---

[126] *Id.*

[127] *Id.*

[128] Entergy's Statement of Position at 33-34.

[129] Hopenfeld Rebuttal Testimony at 40-41 (RIV000108).

[130] *Id.*

[131] Entergy's Statement of Position at 34-35.

[132] Hopenfeld Rebuttal Testimony at 41-42 (RIV000108).

results are non-conservative.[133] Because CHECWORKS at Indian Point does *not* produce conservative results, and Entergy *cannot* recalibrate the code to produce the necessary conservative results, Entergy's FAC program fails to comply with the guidance in the *GALL Report*.[134]

Dr. Hopenfeld further reiterates his explanation that Entergy has yet to provide sufficiently detailed information about the alleged "other tools" it employs to ensure that the critical wall thickness of all susceptible components will be maintained between inspections.[135] Dr. Hopenfeld's testimony clearly demonstrates that Entergy's FAC program at Indian Point *does not* comply with applicable guidance.[136]

Furthermore, while Entergy's witnesses rely on NRC Staff conclusions contained in the Indian Point SER about whether the FAC program at Indian Point complies with the ten program elements in the *GALL Report*,[137] it remains unclear whether NRC Staff fully understood how Entergy actually employs CHECWORKS at Indian Point. That is, it appears that NRC Staff, at the time of drafting the SER, understood CHECWORKS to be the main tool to predict component wall thickness for scheduling inspection intervals at Indian Point.[138] Surely if NRC Staff understood that Entergy relegates CHECWORKS to a minor role and uses the model despite how inaccurate and non-conservative its results are, they would have recognized that this

[133] *See GALL Report*, Rev. 1 at § XI.M17 ¶ 5; *GALL Report*, Rev. 2 at § XI.M17 ¶ 5.

[134] Hopenfeld Rebuttal Testimony at 42 (RIV000108).

[135] *Id.* at 42-43.

[136] *Id.* at 41-43.

[137] Entergy's Testimony at A58.

[138] *See* SER at 3-21 to 3-31.

is wholly inconsistent with the guidance in the *GALL Report.*[139] As a result, it does not appear appropriate for Entergy to rely on conclusions made in the NRC Staff's SER.[140]

K. Entergy's Failure to Address Critical Safety Issues Posed by Unacceptable FAC at Indian Point

Lastly, Entergy asserts that various safety concerns raised by Dr. Hopenfeld stemming from Entergy's inadequate FAC program (concerning the impact of FAC at Indian Point on the ability of plant components to handle varying transient loads or metal fatigue), lack merit, since, according to Entergy, the FAC program at Indian Point provides "reasonable assurance that IPEC components will continue to perform their intended functions throughout the PEO."[141] Dr. Hopenfeld successfully demonstrates that the safety issues raised in his initial testimony and expert report constitute valid concerns.

In particular, Dr. Hopenfeld explains how the risk of an accident at Indian Point due to the improper management of FAC is very real.[142] He explains that after forty years of operation, some critical components may be operating with wall thicknesses below the minimum allowable limits, unknown to Entergy, and, therefore, would be vulnerable to failure when exposed to loads from design basis accidents, including main steam line breaks.[143] Entergy must address these foreseeable circumstances since the CLB requires that the plant be able to accommodate such accidents.[144] Dr. Hopenfeld explains that Entergy's position that critical safety issues are not a

---

[139] Hopenfeld Rebuttal Testimony at 43 (RIV000108).

[140] *Id.*

[141] Entergy's Statement of Position at 35-36. As discussed above, Entergy also makes a general assertion that the safety concerns at issue "are outside the scope of the admitted contention." Entergy's Statement of Position at 35. For the reasons discussed above, this position is without merit. *See supra* pp. 9-12.

[142] Hopenfeld Rebuttal Testimony at 43-46 (RIV000108).

[143] *Id.*

[144] *Id.*; *see also* NUREG-1800 at § A.1.2.3.4; A.1.2.3.6(1); 10 C.F.R. Part 50, Appendix A, General Design Criteria for Nuclear Power Plants, *Criterion 4—Environmental and dynamic effects design bases.*

concern presupposes that the FAC program will not miss detection of excessive wall thinning, a position that is unfounded, in light of the ample testimony from Dr. Hopenfeld. Dr. Hopenfeld further dispels Entergy's belief that undetected and unmanaged FAC will not interact, exacerbate, and/or cause components to succumb to the aging effects of metal fatigue.[145]

Overall, Dr. Hopenfeld's rebuttal testimony successfully refutes that various positions taken by Entergy with respect to the adequacy of its FAC program at Indian Point. Dr. Hopenfeld's testimony amply demonstrates that aging effects of FAC on susceptible components at Indian Point will not be adequately managed throughout the proposed periods of the extended operation, such that the intended component functions will be maintained consistent with the Indian Point CLB, as required by 10 C.F.R. § 54.21(a)(3), contrary to Entergy's claims.

II. NRC STAFF'S STATEMENT OF POSITION

A. Summary of NRC Staff's Statement of Position

NRC Staff's position with respect to Contention RK-TC-2 closely parallels the various positions taken by Entergy. In particular, NRC Staff maintains that Entergy's program for managing FAC at Indian Point is consistent with Revisions 1 *and* 2 of the *GALL Report.*[146] NRC Staff further expresses its acceptance of Entergy's use of the CHECWORKS computer model, and belief that CHECWORKS accurately predicts FAC behavior and accounts for changes in plant parameters due to power uprates.[147] NRC Staff also takes the position that Entergy's use of CHECWORKS is already part of the CLB and that nothing unique precludes the use of

[145] Hopenfeld Rebuttal Testimony at 45-46 (RIV000108).

[146] NRC Staff's Statement of Position at 10.

[147] *Id.* at 11.

CHECWORKS during license renewal.[148] Generally, NRC Staff believes that Entergy's FAC program is "robust."[149] NRC Staff points to the fact that Entergy relies on tools other than CHECWORKS, as well as to the findings in the *Vermont Yankee* license renewal proceeding, to support this position.[150] Lastly, NRC disagrees that an inadequate FAC management program at Indian Point has critical safety implications.[151]

B. NRC Staff Fails to Sufficiently Address the Myriad Concerns Raised by Dr. Hopenfeld about the Inadequacies of Entergy's FAC AMP at Indian Point

For many of the same reasons why Entergy's various assertions about the alleged adequacy of its FAC program at Indian Point are incorrect, NRC Staff's position is unconvincing.

Dr. Hopenfeld explains how NRC Staff's position on Entergy's use of CHECWORKS is flawed for several reasons. First, it appears that NRC Staff approved Entergy's use of CHECWORKS under a misapprehension as to the role it is ascribed at Indian Point.[152] Nowhere in NRC Staff's testimony is there a discussion of the understanding or acceptance of CHECWORKS as only a fraction of Entergy's FAC program, and as purely a ranking/screening tool, a position that is now clear from Entergy's testimony.[153] Thus, NRC Staff's conclusions about CHECWORKS do not appear well-founded.[154]

Dr. Hopenfeld further corrects NRC Staff's apparent misunderstanding that the CHECWORKS code is calibrated at Indian Point: Dr. Hopenfeld once again reiterates the results

---

[148] *Id.* at 14.

[149] *Id.* at 13.

[150] *Id.* at 13-14.

[151] *Id.* at 14.

[152] Hopenfeld Rebuttal Testimony at 47 (RIV000108).

[153] *Id.*

[154] *Id.*

of his indisputable analysis of Entergy's own data, which demonstrates that code predictions at the plant are highly inaccurate and non-conservative, and can vary from actual wear by a factor of 10.[155] Contrary to NRC Staff's claims, the code is not "self-benchmarking" and is not properly calibrated; further, by NRC Staff's own admission, similar to Entergy's, the code will never be properly calibrated, since the code is expected to produce non-conservative results about half the time, a fact that NRC Staff acknowledges and accepts.[156] Dr. Hopenfeld also addresses NRC Staff's incorrect understanding that CHECWORKS has an adequate "track record" at Indian Point, and that leak and thinning events are acceptable so long as they do not result in "structural failure."[157] These conclusions are simply unfounded.

Dr. Hopenfeld also points out that NRC Staff has never commissioned an independent peer review group to evaluate the applicability and efficacy of CHECWORKS at Indian Point.[158] While NRC Staff's apparent justification for accepting CHECWORKS is because the "NRC has long accepted" it, Dr. Hopenfeld clarifies that the *actual* reason it is acceptable, as explained in the *GALL Report*, is that it provides a bounding, conservative analysis.[159] Since this is not the case at Indian Point, there is simply no basis for the NRC Staff's position about the acceptability of its use.[160] Overall, Dr. Hopenfeld's rebuttal testimony successfully refutes the incorrect position taken by NRC Staff with respect to the effectiveness and appropriateness of using CHECWORKS at Indian Point.[161]

---

[155] *Id.* at 48.

[156] *Id.* at 48-49

[157] *Id.* at 50.

[158] *Id.* at 50.

[159] *Id.*

[160] *Id.*

[161] *Id.* at 47-51.

Furthermore, NRC Staff's position that "CHECWORKS™ is part of the CLB already, and that Riverkeeper does not identify any factor unique to license renewal that would preclude using CHECWORKS"[162] is unfounded. It is entirely appropriate to challenge Entergy's use of CHECWORKS to manage FAC *during the proposed periods of extended operation.* As explained earlier, raising issues with practices that carry forward into license renewal are challengeable: "[w]hile 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."[163] That licensing board was "not willing to exclude evidence merely because it touches upon Entergy's CLB."[164] And contrary to NRC Staff's claim, Riverkeeper has identified numerous factors that should absolutely preclude the use of CHECWORKS to manage FAC at Indian Point.

NRC Staff make various other unpersuasive arguments. Like Entergy, NRC Staff believe that findings from the *Vermont Yankee* relicensing proceeding are applicable to the instant proceeding and resolve Contention RK-TC-2. For the same reasons discussed in response to Entergy's same position, reference to the findings in the *Vermont Yankee* case is inappropriate.[165] Also like Entergy, NRC Staff takes the position that Entergy's FAC program is acceptable because it employs tools other than CHECWORKS. Dr. Hopenfeld points out that it not clear that NRC Staff understands the extent to which Entergy's "other tools" make up its

[162] NRC Staff's Statement of Position at 14.

[163] In the Matter of Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (Vermont Yankee Nuclear Power Station), Docket Nos. 50-271-LR, ASLBP No. 06-849-03-LR, Order (Ruling on Motions to Strike and Motions in Limine), July 16, 2008, at 10.

[164] *Id.*

[165] Hopenfeld Rebuttal Testimony at 51 (RIV000108).

FAC program, and, in any event, demonstrates how NRC Staff's position with regard to the efficacy of such "other tools" is flawed.[166]

Dr. Hopenfeld further expresses his shock in relation to NRC Staff's conclusion that Entergy's FAC program is allegedly consistent with the guidance in the *GALL Report*.[167] Dr. Hopenfeld explains at length, once again, the glaring inconsistencies between Entergy's FAC program at Indian Point and the critical guidance in the *GALL Report*, as discussed above in relation to Entergy's same invalid position.[168]

Overall, Dr. Hopenfeld successfully rebuts the position of NRC Staff relating to the adequacy of Entergy's program for managing FAC at Indian Point during the proposed periods of extended operation.[169]

CONCLUSION

As set forth above and in Riverkeeper's Initial Statement of Position, the testimony and exhibits Riverkeeper has proffered on Contention RK-TC-2 provide very strong and substantial evidence that Entergy's AMP for FAC is inadequate. The testimony submitted by Entergy and NRC Staff's witnesses fails to meaningfully address the various concerns raised in Riverkeeper's initial hearing submissions on the contention. Dr. Hopenfeld has demonstrated, and Entergy and NRC Staff have failed to refute, that Entergy's program for managing the aging effects of FAC at Indian Point during the proposed periods of extended operation fails to comply with 10 C.F.R. §54.21(a)(3), and applicable NRC guidance. Accordingly, Entergy's LRA to renew the operating licenses for Indian Point Units 2 and 3 should be denied.

---

[166] *Id.* at 51-52.

[167] *Id.* at 52-54.

[168] *Id.*

[169] *Id.* at 47-54.

Respectfully submitted this 29th day of June 2012.

Signed (electronically) by Deborah Brancato
Deborah Brancato, Esq.
Phillip Musegaas, Esq.
Riverkeeper, Inc.
20 Secor Road
Ossining, NY 10562
(914) 478-4501
dbrancato@riverkeeper.org
phillip@riverkeeper.org