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In the Matter of:	Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3)
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**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	Docket Nos. 50-247-LR and
)	50-286-LR
ENTERGY NUCLEAR OPERATIONS, INC.)	
)	
(Indian Point Nuclear Generating Units 2 and 3))	
)	September 4, 2015

**ENTERGY’S STATEMENT OF POSITION REGARDING
CONTENTION NYS-25 (EMBRITTELEMENT)**



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Pursuant to 10 C.F.R. § 2.1207(a)(1) and the Atomic Safety and Licensing Board’s (“Board”) Revised Scheduling Order,¹ Entergy Nuclear Operations, Inc. (“Entergy”) submits this Statement of Position (“SOP”) regarding Contention NYS-25 proffered by New York State (“NYS” or “the State”). This Statement is supported by the Testimony of Nelson F. Azevedo, Robert J. Dolansky, Alan B. Cox, Jack R. Strosnider, Jr., Timothy J. Griesbach, Randy G. Lott, and Mark A. Gray Regarding Contention NYS-25 (Embrittlement) (“Entergy’s Testimony”) (ENT000616), and the exhibits thereto (ENT000617 through ENT000721). For the reasons discussed below, NYS-25 lacks merit and should be resolved in Entergy’s favor.

I. PRELIMINARY STATEMENT

NYS-25 is a safety contention, asserting that “Entergy’s License Renewal Application does not include an adequate plan to monitor and manage the effects of aging due to embrittlement of the reactor pressure vessels (“RPVs”) and the associated internals.”² The

¹ Licensing Board Revised Scheduling Order at 2 (Dec. 9, 2014) (unpublished) (“Revised Scheduling Order”).

² New York State, Notice of Intention to Participate and Petition to Intervene at 223 (Nov. 30, 2007) (“NYS Petition”).

[REDACTED]

testimony of the State’s sole witness—Dr. Richard T. Lahey—focuses on purported deficiencies in the aging management program (“AMP”) for reactor vessel internals (“RVIs”) at Indian Point Nuclear Generating Units 2 and 3 (“IP2” and “IP3,” collectively “Indian Point Energy Center” or “IPEC”).

The State’s claims and testimony in NYS-25 are cumulative and overlapping with other contentions, redundant in some areas and contradictory in others. Such an approach is not only undisciplined, but also contrary to the Commission’s intent in requiring intervenors to bring forward well-defined and adequately-supported contentions so that other parties to the proceeding are given full and fair notice of the intervenors’ actual claims.³

In NYS-25, the State claims that the license renewal application (“LRA”) is deficient for four reasons: (1) the RVI AMP is not based on an analysis that addresses “synergistic” degradation of RVIs caused by combinations of degradation mechanisms; (2) Entergy fails to consider the full range of transient shock loads to which RVIs may be subjected in the event of various postulated accidents; (3) the RVI AMP does not include a commitment to take preventative actions or to implement corrective actions, or provide specific enforceable acceptance criteria for some components; and (4) the AMP relies on fatigue predictions which are non-conservative and *may* not accurately predict fatigue-induced component failures.⁴

As demonstrated below, all four of these claims lack merit because Dr. Lahey and the State unfortunately have disregarded—rather than disputed—the substantial body of technical

³ *Pub. Serv. Co. of N.H.* (Seabrook Station, Units 1 & 2), ALAB-899, 28 NRC 93, 97 (1988), *aff’d sub nom. Massachusetts v. NRC*, 924 F.2d 311 (D.C. Cir. 1991), *cert. denied*, 502 U.S. 899 (1991).

⁴ *See* State of New York, Revised Statement of Position, Contention NYS-25 at 17 (June 9, 2015) (“NYS Revised SOP”) (NYS000481).

[REDACTED]

work that supports the IPEC RVI AMP. They have done so, despite the longstanding availability of the underlying technical work and supporting documentation, to the peril of their arguments.⁵

The IPEC RVI AMP is based on sound, state-of-the-art science and is fully compliant with the applicable criteria in NUREG-1801, as updated in the latest interim staff guidance. Dr. Lahey demands a “systematic safety evaluation” to support the RVI AMP.⁶ He ignores, however, the systematic evaluation that the Electric Power Research Institute (“EPRI”) has already performed, and that Entergy relies upon. This horse-blinder approach falls woefully short of the requisite specific and substantial support⁷ necessary to overcome the “special weight” the Board must accord to Nuclear Regulatory Commission (“NRC”) Staff guidance, which endorses the approach Entergy has taken at IPEC.⁸ Moreover, several aspects of contention NYS-25 impermissibly challenge the current licensing basis (“CLB”) for IPEC.⁹ In summary, the State has failed to meet its burden of moving forward with sufficient evidence to show a deficiency in the RVI AMP,¹⁰ and Entergy’s Testimony fully refutes the State’s claims.

⁵ As explained further below, NYS retains the burden of going forward with its contention, even at the hearing stage. *See AmerGen Energy Co., LLC* (Oyster Creek Nuclear Generating Station), CLI-09-07, 69 NRC 235, 268-70 (2009), *aff’d sub nom. N.J. Envtl. Fed’n v. NRC*, 645 F.3d 220 (2011).

⁶ Revised Pre-Filed Written Testimony of Dr. Richard T. Lahey, Jr., Regarding Contention NYS-25 at 51 (June 9, 2015) (NYS000482) (“Revised Lahey Testimony”).

⁷ *See Entergy Nuclear Vt. Yankee, L.L.C. & Entergy Nuclear Operations, Inc.* (Vt. Yankee Nuclear Power Station), CLI-10-17, 72 NRC 1, 33 n.185 (2010).

⁸ *See Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 & 3), CLI-15-6, 81 NRC ___, slip op. at 19 (Mar. 9, 2015); *NextEra Energy Seabrook, LLC* (Seabrook Station, Unit 1), CLI-12-5, 75 NRC 301, at 314 n.78 (2012).

⁹ *See Entergy Nuclear Generation Co. & Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), CLI-10-14, 71 NRC 449, 461 (2010); *Oyster Creek*, CLI-09-7, 69 NRC at 270.

¹⁰ *See Oyster Creek*, CLI-09-7, 69 NRC at 269.

[REDACTED]

Accordingly, Entergy has met its burden of showing, by a preponderance of the evidence,¹¹ that NYS-25 lacks merit and should be resolved in Entergy’s favor.

A. Dr. Lahey’s Claims Regarding “Synergistic” Effects Lack Merit

The State’s first claim is Dr. Lahey’s purported “discover[y]” that the IPEC RVI AMP fails to address potential “synergistic” degradation caused by combinations aging mechanisms.¹² The IPEC RVI AMP, however, is based on a decade-long systematic expert evaluation of known and potential degradation mechanisms, resulting aging effects, and consequences of those effects for RVIs.¹³ This evaluation considered the relevant aging mechanisms, including multiple aging mechanisms which can produce combined effects on RVI components.¹⁴ NYS and Dr. Lahey have largely ignored the substantial state-of-the-art engineering and technical basis for the RVI AMP contained in the EPRI Materials Reliability Program’s (“MRP”) MRP-227-A, “Pressurized Water Reactor Internal Inspection and Evaluation Guidelines,”¹⁵ its numerous supporting technical reports, and the plant-specific technical analyses submitted by Entergy for Indian Point and reviewed by the NRC Staff in SSER 2.¹⁶

¹¹ See *Pac. Gas & Elec. Co.* (Diablo Canyon Nuclear Power Plant, Units 1 & 2), ALAB-763, 19 NRC 571, 577 (1984); *Oyster Creek*, CLI-09-07, 69 NRC at 263.

¹² Revised Lahey Testimony at 78 (NYS000482).

¹³ See Testimony of Entergy Witnesses Nelson F. Azevedo, Robert J. Dolansky, Alan B. Cox, Jack R. Strosnider, Timothy J. Griesbach, Randy G. Lott, and Mark A. Gray Regarding Contention NYS-25 (Embrittlement) § VI.B (Aug. 10, 2015) (“Entergy’s Testimony”) (ENT000616).

¹⁴ See *id.*

¹⁵ MRP-227-A, EPRI Materials Reliability Program: Pressurized Water Reactor Internal Inspection and Evaluation Guidelines (Dec. 23, 2011) (“MRP-227-A”) (NRC000114A-F).

¹⁶ NUREG-1930, Supp. 2, Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3 (Nov. 6, 2014) (“SSER 2”), available at ADAMS Accession No. ML14310A803.

[REDACTED]

In their testimony, Entergy’s expert witnesses explain that the IPEC RVI AMP is consistent with MRP-227-A, which is endorsed in current NRC guidance¹⁷ and incorporated in AMP XI.M16A in NUREG-1801 (the “GALL Report”).¹⁸ As a matter of law, the Commission has held that:

[A] license renewal applicant who commits to implement an AMP that is consistent with the corresponding AMP in the GALL Report has demonstrated reasonable assurance under 10 C.F.R. § 54.29(a) that the aging effects will be adequately managed during the period of extended operation.¹⁹

Because the IPEC RVI AMP is consistent with the current GALL Report AMP,²⁰ it satisfies the regulatory requirements in 10 C.F.R. Part 54. Although an intervenor may challenge whether an applicant’s AMP is consistent with NRC Staff guidance,²¹ the State and Dr. Lahey do not make such an allegation. Instead, NYS and Dr. Lahey only proffer generic attacks against the NRC guidance and MRP-227-A on the topic of allegedly “synergistic” aging effects.²² But as explained further below, NYS must provide specific and substantial support²³ to overcome the “special weight” accorded to this guidance in this proceeding.²⁴ As Entergy’s testimony shows, NYS and Dr. Lahey have failed to clear that high hurdle.

¹⁷ LR-ISG-2011-04, Updated Aging Management Criteria for Reactor Vessel Internal Components of Pressurized Water Reactors (Mar. 20, 2012) (“LR-ISG-2011-04”) (ENT000641).

¹⁸ See generally NUREG-1801, Generic Aging Lessons Learned Report, Revision 2 (Dec. 2010) (“NUREG-1801, Rev. 2”) (NYS00147A-D); NUREG-1801, Generic Aging Lessons Learned Report, Revision 1 (Sept. 2005) (“NUREG-1801, Rev. 1”) (NYS00146A-C).

¹⁹ *Seabrook*, CLI-12-5, 75 NRC at 315 see also *AmerGen Energy Co., LLC* (Oyster Creek Nuclear Generating Station), CLI-08-23, 68 NRC 461, 468 (2008).

²⁰ See Entergy’s Testimony § VII.A (ENT000616).

²¹ *Vt. Yankee*, CLI-10-17, 72 NRC at 37.

²² Revised Lahey Testimony at 39 (NYS000482) (“MRP-227-A is an inspection-based aging management plan, which I believe is inadequate”).

²³ See *Vt. Yankee*, CLI-10-17, 72 NRC at 33 n.185, 37.

²⁴ *Seabrook*, CLI-12-5, 75 NRC at 314 n.78.

[REDACTED]

B. The RVI AMP Appropriately Addresses “Shock Loads”

As to the State’s second claim, that Entergy has failed to consider potential “shock loads” that could impact RVI components, the inspection guidelines in MRP-227-A are designed to provide reasonable assurance that the RVIs will continue to perform their intended functions, consistent with the CLB.²⁵ This includes maintaining functionality under CLB accident and seismic loads (or “shock loads,” as Dr. Lahey describes them).²⁶ The design basis loads are established in accordance with the CLB and do not change because the units will operate during the period of extended operation (“PEO”).²⁷ The guidelines in MRP-227-A, however, include inspections to provide reasonable assurance that components are not degraded due to the effects of aging, and provide instructions to guide engineering evaluations to determine the functionality of RVI components—under CLB loads—if any degradation is discovered.²⁸

Accordingly, the IPEC RVI AMP fully accounts for CLB accident and transient loads. Dr. Lahey has not “discovered” anything new.²⁹ He instead impermissibly challenges the CLB. To the extent his concerns are with “shock loads” caused by beyond design-basis accidents, this is an impermissible challenge to the CLB.³⁰

C. The RVI AMP Is Fully Adequate as It Specifies Appropriate Preventive Actions, Corrective Actions, and Acceptance Criteria

Next, NYS argues that the IPEC RVI AMP does not include a commitment to take “preventative” actions or to implement corrective actions, or provide specific enforceable

²⁵ See Entergy’s Testimony § VII.A.6 (ENT000616).

²⁶ See *id.* As explained further below, the adequacy of the CLB is not subject to attack in this proceeding. See *Pilgrim*, CLI-10-14, 71 NRC at 461; *Oyster Creek*, CLI-09-7, 69 NRC at 270.

²⁷ See Entergy’s Testimony at A115 (ENT000616).

²⁸ See *id.* § VI.B.

²⁹ Revised Lahey Testimony at 78 (NYS000482).

³⁰ See *Pilgrim*, CLI-10-14, 71 NRC at 461; *Oyster Creek*, CLI-09-7, 69 NRC at 270.

acceptance criteria for some components.³¹ Entergy’s witnesses demonstrate that these claims also lack merit.³²

For example, Dr. Lahey and the State claim that the IPEC RVI AMP “manifestly ‘does not include preventative actions.’”³³ They base this claim, however, on a crabbed interpretation of a single phrase lifted from the IPEC RVI AMP and taken out of context. In actuality, the remainder of the section discusses the preventive actions Entergy is taking related to RVIs—some of which are being taken under the aegis of other AMPs at IPEC.³⁴ In response to NYS’ other claims, Entergy’s witnesses fully demonstrate the adequacy and specificity of the inspection schedules, corrective actions, and acceptance criteria in the RVI AMP.³⁵ As for Dr. Lahey’s and the State’s concerns about the scope of the program—the components they identify are either not RVIs, and are covered by other aging management programs,³⁶ or are active components outside the scope of aging management review (“AMR”) altogether.³⁷ So yet again, NYS has not shouldered its evidentiary burden with respect to its claims in NYS-25.

³¹ NYS Revised SOP at 17 (NYS000481).

³² See Entergy’s Testimony § VII.A.7-8 (ENT000616).

³³ NYS Revised SOP at 26 ¶ 21 (quoting NL-12-037, Letter from F. Dacimo, Vice President, Entergy, to NRC Document Control Desk, “License Renewal Application – Revised Reactor Vessel Internals Program and Inspection Plan Compliant with MRP-227-A,” Attach. 1 at 5 (Feb. 17, 2012) (“NL-12-037”) (NYS000496)); see also Revised Lahey Testimony at 53 (NYS000482).

³⁴ See NL-12-037, Attach. 1 at 5 (NYS000496).

³⁵ See Section V.C.1, *infra*.

³⁶ For example, Dr. Lahey’s concerns about the “j-groove welds,” Revised Lahey Testimony at 45 (NYS000482), are about a component that is managed under the Reactor Vessel Head Penetration Inspection AMP, not the RVI AMP. See Entergy’s Testimony at A101 (ENT000616).

³⁷ For example, as explained below, control rods are active, short-lived components. See *Indian Point*, CLI-15-6, slip op. at 8; 10 C.F.R. § 54.21(a)(1).

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D. The IPEC Fatigue Analyses Are Conservative and Support the Finding that the Effects of Fatigue Will Be Adequately Managed

Finally, the State's and Dr. Lahey's claim that the environmentally-assisted fatigue ("EAF") evaluations prepared in support of the IPEC LRA are not conservative and "may" be inaccurate lacks merit.³⁸ Entergy's EAF evaluations, including EAF evaluations of RVI components, are fully documented, conservative engineering analyses that support a finding that the effects of fatigue, including the effects of the reactor water environment, will be adequately managed.³⁹ There is no technical basis to conclude that an additional correction factor is necessary to account for the effects of irradiation embrittlement on fatigue life.⁴⁰ The RVI AMP, moreover, includes inspections intended to identify potential cracking caused by fatigue in susceptible RVI components, including irradiated RVI components.⁴¹ The inspection activities under the RVI AMP are in addition to, not in lieu of, the review of EAF for RVI components under the fatigue management program ("FMP").⁴²

E. NYS Does Not Challenge the Adequacy of the LRA with Respect to RPVs

In addition to these claims, Entergy notes that NYS-25, as stated, alleges that Entergy's LRA is inadequate with respect to the RPVs. Indeed, the original focus of NYS-25 in 2007 was on the RPVs themselves.⁴³ But since 2011, NYS has focused almost exclusively on Entergy's

³⁸ NYS Revised SOP at 17 (NYS000481).

³⁹ *See generally* Revised Testimony of Entergy Witnesses Nelson F. Azevedo, Alan B. Cox, Jack R. Strosnider, Randy G. Lott, Mark A. Gray and Barry M. Gordon Regarding Contention NYS-26B/RK-TC-1B (Aug. 10, 2015) ("Entergy's NYS-26B/RK-TC-1B Testimony") (ENT000679).

⁴⁰ *See id.* at A76.

⁴¹ *See* Entergy's Testimony § VII.A.7 (ENT000616).

⁴² *See id.* at A111.

⁴³ *See* NYS Petition at 224, 226.

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AMP for RVIs.⁴⁴ While Dr. Lahey’s current testimony briefly alludes to some of his prior claims regarding the RPVs, both Dr. Lahey and the State stop short of alleging any specific deficiency in Entergy’s LRA regarding the RPVs.⁴⁵ To ensure a complete record, however, Entergy’s expert witnesses demonstrate that the information regarding RPVs in the IPEC LRA complies fully with 10 C.F.R. Parts 50 and 54 and is consistent with NRC Staff guidance regarding the management of the effects of aging and the evaluation of time-limited aging analyses (“TLAAs”) for RPVs. The LRA therefore provides reasonable assurance that the effects of aging on the IPEC RPVs will be adequately managed, such that they will continue to perform their intended functions, consistent with the CLB.⁴⁶ Neither the State nor Dr. Lahey provides any specific challenge to this information.

II. PROCEDURAL HISTORY OF CONTENTION NYS-25

As noted above, the claims in NYS-25 are cumulative and overlapping with other contentions. Specifically, the claims in NYS-25 substantially overlap those in contentions NYS-26B/RK-TC-1B (the “metal fatigue” contention) and NYS-38/RK-TC-5 (the “safety commitments” contention).⁴⁷ Indeed, Dr. Lahey’s testimony regarding RVIs across the three

⁴⁴ NYS Revised SOP at 17 (NYS000481); *see also* State of New York, Initial Statement of Position, Contention NYS-25 at 10 (Dec. 22, 2011) (“NYS Initial SOP”) (NYS000293).

⁴⁵ *See* Report of Dr. Richard T. Lahey, Jr. in Support of Contentions NYS-25 and NYS-26B/RK-TC-1B at 13 (Dec. 20, 2011) (“Report”) (NYS000296); *see also* Pre-Filed Written Testimony of Dr. Richard T. Lahey, Jr. Regarding Contention NYS-25 at 28-31 (Dec. 22, 2011) (“Lahey 2011 Testimony”) (NYS000294); Revised Lahey Testimony at 74 (NYS000482).

⁴⁶ *See* 10 C.F.R. §§ 54.21, 54.29.

⁴⁷ In objecting to the proposed amendments to NYS-25 and NYS-38/RK-TC-5 earlier this year, Entergy noted there was “no discernible distinction” between the two amended contentions, and asked the Board to separate the various claims in the interest of adjudicatory economy. Entergy’s Consolidated Answer Opposing Intervenor’s Motions to Amend Contentions NYS-25 and NYS-38/RK-TC-5 at 13 (Mar. 10, 2015), *available at* ADAMS Accession No. ML15069A677. The Board “acknowledged that there is significant overlap,” but found the State’s actions “permissible.” Memorandum and Order (Granting Motions for Leave to File Amendments to Contentions NYS-25 and NYS-38/RK-TC-5), at 14 (Mar. 31, 2015) (“Second Order Amending NYS-25”), *available at* ADAMS Accession No. ML15090A771.

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contentions is substantively identical.⁴⁸ Moreover, despite the significant developments and new information that has become available over the past three years or more, NYS has not replaced its 2011 SOP, testimony, or report with updated materials; it has merely added new information into the record in 2015 despite the fact that several prior positions and claims have been superseded by intervening events.⁴⁹

Accordingly, Entergy's Testimony and Statement of Position focus on the State's most recent statement of position, testimony, and exhibits, filed on June 9, 2015. To assist the Board's review of the record, Entergy addresses challenges related to RVI and RPV aging management in its testimony, here, on contention NYS-25. Where there is an irreconcilable inconsistency, we focus on the most recent filings. Entergy addresses challenges related to metal fatigue (including EAF evaluations of RVI components) in its testimony on contention NYS-26B/RK-TC-1B.⁵⁰ And it addresses specific challenges related to safety commitments (including RVI-related commitments) in its testimony on contentions NYS-38/RK-TC-5.⁵¹

A. Original Contention

NYS first proffered Contention NYS-25 in 2007, as part of its initial Petition to Intervene.⁵² The State's initial pleadings focused almost entirely on the RPV, rather than the RVIs, claiming that the information in the LRA on the TLAAAs associated with the RPVs did not

⁴⁸ Compare Revised Lahey Testimony (NYS00482) with Revised Pre-filed Written Testimony of Dr. Richard T. Lahey, Jr. Regarding Consolidated Contention NYS-26B/RK-TC-1B, (June 9, 2015) (NYS000530) and Revised Pre-filed Written Testimony of Dr. Richard T. Lahey, Jr. Regarding Joint Contention NYS-38/RK-TC-5, (June 9, 2015) (NYS000562).

⁴⁹ See Entergy's Testimony at A65 (ENT000616).

⁵⁰ See Entergy's NYS-26B/RK-TC-1B Testimony (ENT000679).

⁵¹ See Revised Testimony of Entergy Witnesses Nelson F. Azevedo, Robert J. Dolansky, Alan B. Cox, Jack R. Strosnider, Timothy J. Griesbach, Barry M. Gordon, Randy G. Lott, and Mark A. Gray Regarding Contention NYS-38/RK-TC-5 (Aug. 10, 2015) ("Entergy's NYS-38/RK-TC-5 Testimony") (ENT000699).

⁵² See NYS Petition at 223-27.

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include information on age-related accident analyses⁵³ and that an intermediate shell in IP2 will not meet the upper shelf energy acceptance criterion of 50ft-lb.⁵⁴ The original contention did not provide any basis for the State’s concerns about the “associated internals” of the RPVs, except to list the names of certain RVI components where Dr. Lahey’s “[c]oncerns over embrittlement” applied, and offer the unclear observation that “RPV internals in IP3 imply operational limits for extended life operations due to the high [nil ductility temperature] NDT associated with the predicted irradiation-induced embrittlement.”⁵⁵

Entergy and the NRC Staff opposed admission of NYS-25.⁵⁶ Entergy’s objections included that the proposed contention repeatedly confused the RPV and RVIs, was inadequately supported by the bare assertions in Dr. Lahey’s declaration, and failed to raise a genuine dispute with any information in the LRA.⁵⁷ The Board admitted NYS-25 in 2008.⁵⁸

B. First Amended Contention

Consistent with Commitment 30 in the original LRA,⁵⁹ Entergy submitted a detailed AMP for IP2 and IP3 RVIs on July 14, 2010.⁶⁰ This AMP fully described Entergy’s program to

⁵³ *Id.* at 224.

⁵⁴ *Id.* at 226.

⁵⁵ *Id.* at 224-226.

⁵⁶ See Answer of Entergy Nuclear Operations, Inc. Opposing New York State Notice of Intention to Participate and Petition to Intervene at 135-41 (Jan. 22, 2008), available at ADAMS Accession No. ML080300149 (“Entergy Answer”); NRC Staff’s Response to Petitions for Leave to Intervene Filed by [NYS] at 75-77 (Jan. 22, 2008), available at ADAMS Accession No. ML080230543.

⁵⁷ See Entergy Answer at 135-41.

⁵⁸ *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 & 3), LBP-08-13, 68 NRC 43, 131 (2008).

⁵⁹ In Commitment 30, consistent with the then-current NRC guidance in NUREG-1801, Revision 1, Entergy committed to participate in industry programs for investigating and managing aging effects on RVIs, to evaluate and implement industry programs applicable to RVIs, and to submit an RVI inspection plan not less than 24 months before entering the PEO. See IPEC License Renewal Application at 3.1-7 to 3.1-8, 3.1-9 to 3.1-10 (Apr. 2007) (“LRA”) (ENT000015A); see also NUREG-1801, Generic Aging Lessons Learned Report, Rev. 1 at 7-30, tbl. 1 (Sept. 2005) (“NUREG-1801”) (NYS00146A).

[REDACTED]

manage the effects of aging on RVIs using guidance developed from nearly a decade of extensive industry research and set forth in EPRI Materials Reliability Program documents MRP-227 and MRP-228.⁶¹

Following Entergy's submittal of its RVI AMP, NYS filed a motion to submit "additional bases" for NYS-25.⁶² The amended contention alleged, among other things, that the RVI AMP did not consider "synergistic" aging effects or potential "shock loads," did not provide sufficient details on baseline and periodic inspections, did not provide sufficient details on corrective actions, including repair or replacement, "disavow[ed]" preventive actions, and relied on vague future commitments.⁶³

Entergy and the NRC Staff objected on both timeliness and substantive grounds.⁶⁴ Entergy, among other things, argued that NYS failed to challenge directly-relevant information in the RVI AMP.⁶⁵ On July 6, 2011, the Board admitted the amended NYS-25.⁶⁶

⁶⁰ See NL-10-063, Letter from F. Dacimo to NRC Document Control Desk, "Amendment 9 to License Renewal Application (LRA) – Reactor Vessel Internals Program" (July 14, 2010) ("NL-10-063") (NYS000313).

⁶¹ See NL-10-063, Attach. 1 at 82-84 (NYS000313).

⁶² See State of New York's Motion for Leave to File Additional Bases for Previously-Admitted Contention NYS-25 in Response to Entergy's July 14, 2010 Proposed Aging Management Program for Reactor Pressure Vessels and Internal Components (Sept. 15, 2010), *available at* ADAMS Accession No. ML103050402.

⁶³ See *id.*; Decl. of Richard T. Lahey, Jr., ¶¶ 13-15 (Sept. 15, 2010) (attached to motion), *available at* ML12335A461.

⁶⁴ See Applicant's Answer to Amended Contention New York State 25 Concerning Aging Management of Embrittlement of Reactor Pressure Vessel Internals (Oct. 12, 2010), *available at* ADAMS Accession No. ML103010104 ("Entergy's 2010 Answer"); NRC Staff's Answer to State of New York's Motion for Leave to File Additional Bases for Previously-Admitted Contention NYS-25 (Oct. 12, 2010), *available at* ADAMS Accession No. ML102850764.

⁶⁵ See *generally* Entergy's 2010 Answer. As Entergy's witnesses show throughout their testimony, for the past five years Dr. Lahey and the State have continued to disregard, rather than dispute the technical basis for the RVI AMP.

⁶⁶ Licensing Board Order (Ruling on Pending Motions for Leave to File New and Amended Contentions) at 27 (July 6, 2011) (unpublished).

[REDACTED]

C. Revised RVI AMP and Inspection Plan

Again, consistent with Commitment 30, Entergy submitted its RVI Inspection Plan on September 28, 2011, two years prior to entering the PEO for IP2.⁶⁷ The Inspection Plan was based on detailed inspection guidance in MRP-227, and fully addressed the NRC Staff's action items and conditions in the Safety Evaluation for MRP-227, Revision 0.⁶⁸ It also included a comprehensive schedule for inspections of RVI components at IPEC.⁶⁹ The RVI Inspection Plan governed both IP2 and IP3.⁷⁰

After EPRI issued the NRC-approved aging management guidance for RVIs in MRP-227-A (discussed further below), Entergy submitted a revised RVI AMP and Inspection Plan for both IP2 and IP3 based on MRP-227-A on February 17, 2012.⁷¹ IP2 and IP3 were among the first units in the U.S. fleet to prepare RVI AMPs based on the state-of-the-art NRC Staff-approved guidance in MRP-227-A and to have such an AMP reviewed by the NRC Staff as part of an LRA.⁷² From 2012 through 2014, the NRC Staff issued detailed requests for additional information ("RAI") to Entergy on this first-of-a-kind AMP.⁷³

Following Entergy's submission of significant additional technical information in response to these RAIs, the NRC Staff approved Entergy's revised RVI AMP and Inspection

⁶⁷ See NL-11-107, Letter from F. Dacimo, Vice President, Entergy, to NRC Document Control Desk, License Renewal Application – Completion of Commitment # 30 Regarding the Reactor Vessel Internals Inspection Plan (Sept. 28, 2011) (NYS000314).

⁶⁸ See *id.*

⁶⁹ See *id.*, Attach. 1 at 35-39, tbl.5-2.

⁷⁰ See Entergy's Testimony at A58 (ENT000616).

⁷¹ NL-12-037 (NYS000496).

⁷² See Entergy's Testimony at A60 (ENT000616).

⁷³ See NUREG-1930, Supp. 2, Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3 at B-2 to B-7 (Nov. 2014) ("SSER 2") (NYS000507).

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Plan as documented in SSER 2 issued on November 6, 2014.⁷⁴ NRC Staff concluded that Entergy’s LRA for IP2 and IP3 demonstrates that the effects of aging on RVI components will be adequately managed, as required under 10 C.F.R. §§ 54.21(a)(3) and (c)(1)(iii), and the RVI Inspection Plan “implements the elements of the RVI AMP in an acceptable manner.”⁷⁵

D. 2011 NYS Testimony

Along with the other Track 1 contentions, the State submitted its initial statement of position, prefiled testimony, and exhibits on NYS-25 in December 2011.⁷⁶ Before any further testimony was filed on NYS-25, however, the Board placed NYS-25 on the schedule for the second set of hearings in this proceeding (*i.e.*, “Track 2”).⁷⁷

E. Second Amended Contention

Following the publication of SSER 2,⁷⁸ the State filed a Motion for Leave to Supplement Previously-Admitted Contention NYS-25 focusing the IPEC RVIs AMP.⁷⁹ The State’s Second Amended Contention alleged that the RVI AMP remained deficient because it does not: (1) address or manage the combined “synergistic” aging effects of embrittlement, fatigue, and other aging mechanisms; (2) “maintain safety margins” during the PEO by, for example, repair or replacement of the RVIs, and does not account for the “full range of transient shock loads”; and

⁷⁴ See *id.* at 3-26, 3-59; see also *id.* at B-2 to B-7.

⁷⁵ SSER 2 at 3-26, 3-59 (NYS000507).

⁷⁶ See NYS Initial SOP at 10; Report at 13; see also Pre-Filed Written Testimony of Dr. Richard T. Lahey, Jr. Regarding Contention NYS-25 at 28-31 (Dec. 22, 2011) (“Lahey 2011 Testimony”) (NYS000294); Supplemental Report of Dr. Richard T. Lahey, Jr. in Support of Contention NYS-25 and NYS-26B/RK-TC-1B (“Supplemental Lahey Report”) (NYS000297).

⁷⁷ See Licensing Board Order (Granting NRC Staff’s Unopposed Time Extension Motion and Directing Filing of Status Updates) at 2 (Feb. 16, 2012) (unpublished).

⁷⁸ NUREG-1930, Supp. 2, Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3 (Nov. 6, 2014) (“SSER 2”), available at ADAMS Accession No. ML14310A803.

⁷⁹ State of New York’s Motion for Leave to Supplement Previously-Admitted Contention NYS-25 (Feb. 13, 2015) (“Second Motion to Amend”), available at ADAMS Accession No. ML15044A493.

[REDACTED]

(3) include required preventative or corrective actions or acceptance criteria for the baffle-former bolt inspections. The State further alleged that the Westinghouse EAF calculations prepared for Indian Point are allegedly inadequate.⁸⁰ The Second Amended NYS-25 did not allege any deficiencies in the IPEC LRA regarding the RPVs.⁸¹

Entergy objected on both timeliness and substantive grounds.⁸² Once again, Entergy objected on the grounds that the State continued to disregard, rather than dispute the technical basis for the RVI AMP.⁸³ In particular, Entergy showed that it had disclosed to the State a substantial body of technical documentation supporting MRP-27-A and, the IPEC RVI AMP,⁸⁴ yet the State did not even mention this information in its proposed amended contention.⁸⁵ On March 31, 2015, the Board granted the State's motion without altering or amending the contention.⁸⁶

Thereafter, under the Board's scheduling orders, NYS filed its revised statement of position, testimony, and additional exhibits on June 9, 2015.⁸⁷

⁸⁰ New York State February 2015 Supplement to Previously-Admitted Contention NYS-25 at 1-3 (Feb. 13, 2015) ("Second Supplement to NYS-25"), *available at* ADAMS Accession No. ML15044A491.

⁸¹ Although the State does not allege any deficiencies in the LRA related to RPVs, Dr. Lahey did note the suggestion of a potential non-conservatism in BTP 5-3, related to RPVs, which is discussed in further detail below.

⁸² Entergy's Consolidated Answer Opposing Intervenors' Motions to Amend Contention NYS-25 and NYS-38/RK-TC-5 (Mar. 10, 2015), *available at* ADAMS Accession No. ML15069A677.

⁸³ *See id.* at 18-23.

⁸⁴ *See id.* at 8 & n.30.

⁸⁵ *See id.* at 19.

⁸⁶ Second Order Amending NYS-25 at 10.

⁸⁷ *See generally* NYS Revised SOP (NYS000481); Revised Lahey Testimony (NYS000482); exhibits NYS000483 through NYS000528.

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III. APPLICABLE LEGAL AND REGULATORY STANDARDS

As demonstrated below, the IPEC RVI AMP fully meets the applicable legal and regulatory requirements in 10 C.F.R. Part 54. In addition to the lack of technical merit, the State's claims in NYS-25 are legally deficient in that they are contrary to the limited scope of the license renewal rule in 10 C.F.R. Part 54 as well as the NRC's reasonable assurance standard. NYS has, moreover, failed to carry its burden of going forward on its contention and overcoming the special weight accorded to NRC Staff guidance documents.

A. NYS Continues Its Attempts to Impermissibly Expand the Scope of this License Renewal Proceeding

1. The License Renewal Review Is a Limited One

The State continues to bring forward claims that attempt to expand the scope of this license renewal proceeding beyond the bounds that are clearly established by 10 C.F.P. Part 54 and Commission precedent. For example, the State's claims related to the consideration of "shock loads" involve concerns about "postulated" accidents or events that are beyond the design basis of IP2 and IP3⁸⁸ and which are clearly outside the limited scope of this license renewal proceeding. Similarly, the State's claims regarding alleged deficiencies in the seismic hazard curves for IP2 and IP3,⁸⁹ demands for wholesale repair or replacement of RVIs in lieu of an AMP,⁹⁰ and claims regarding active components such as control rods and control rod drive mechanisms,⁹¹ also fall beyond the bounds of this proceeding and must be rejected by the Board.

⁸⁸ *E.g.*, NYS Revised SOP at 17 (NYS000481).

⁸⁹ *See id.* at 41.

⁹⁰ *See id.* at 31.

⁹¹ *See id.* at 25 ("Entergy's 2011 AMP for RPVIs was inadequate with respect to the embrittlement of the control rod drives . . .").

[REDACTED]

Specifically, 10 C.F.R. Part 54 is focused on managing the effects of aging on passive, long-lived components. It does not include a review of the adequacy of a plant’s CLB, including its design basis. Nor does it include a review of ongoing regulatory matters that are fully addressed under 10 C.F.R. Part 50 and by NRC inspection and enforcement activities.⁹² The Commission’s license renewal regulations clearly reflect this distinction between 10 C.F.R. Part 54 aging management issues on the one hand, and ongoing 10 C.F.R. Part 50 regulatory process (e.g., the adequacy of the plant’s design basis) on the other.⁹³

The underlying adequacy of the CLB itself is outside the scope of license renewal and is not open to challenge in this proceeding.⁹⁴ The license renewal review is premised upon the determination that, with the exception of aging management issues, the NRC’s ongoing regulatory process is adequate to ensure that the CLB of an operating plant provides and maintains an acceptable level of safety.⁹⁵ Thus, the State’s challenges to the adequacy of design basis loads on plant components, including seismic loads, must be rejected on legal grounds alone—putting aside their factual inadequacies. Likewise, as further explained below, the Board must also reject the State’s concerns regarding control rods, which are active components and consumables, as beyond the scope of this proceeding.⁹⁶

The State further challenges the license renewal rule when it argues that, instead of implementing an AMP, Entergy should take “proactive steps to repair or replace aging RVI

⁹² See *Fla. Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 and 4), CLI-01-17, 54 NRC 3, 7-9 (2001); see also *Indian Point*, CLI-15-6, slip op. at 8; 10 C.F.R. § 54.21(a)(1).

⁹³ *Turkey Point*, CLI-01-17, 54 NRC at 7; see also *id.* at 9 (“The current licensing basis . . . includes the plant-specific design basis information documented in the plant’s most recent Final Safety Analysis Report . . . and any orders, exemptions, and licensee commitments that are part of the docket for the plant’s license . . .”).

⁹⁴ See *Pilgrim*, CLI-10-14, 71 NRC at 461; *Oyster Creek*, CLI-09-7, 69 NRC at 270.

⁹⁵ See Final Rule, Nuclear Power Plant License Renewal; Revisions, 56 Fed. Reg. 64,943, 64,946 (Dec. 13, 1991).

⁹⁶ See *Indian Point*, CLI-15-6, 81 NRC at ___, slip op. at 8; 10 C.F.R. § 54.21(a)(1).

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components.”⁹⁷ The license renewal rule requires the applicant to show that there is reasonable assurance that the effects of aging will be adequately *managed*—not that aging effects will be *precluded*.⁹⁸

The review of TLAAAs for license renewal is also well-defined in Part 54 and not subject to challenge in this proceeding. Certain in-scope components are subject to time-limited calculations or analyses that are part of the CLB, known as TLAAAs. TLAAAs must be evaluated for the PEO.⁹⁹ In doing so, an applicant must: (i) show that the original TLAAAs will remain valid for the PEO; (ii) revise and extend the TLAAAs to be valid for a longer term, such as 60 years; *or* (iii) otherwise demonstrate that the effects of aging will be adequately managed during the renewal term.¹⁰⁰ As they relate to this contention, the EAF evaluations prepared by Westinghouse for IPEC address all components with a CLB cumulative usage factor (“CUF”) analysis.¹⁰¹ The EAF evaluations are part of the Fatigue Management Program (“FMP”)—the program that Entergy is using to resolve the CUF TLAAAs under 10 C.F.R. § 54.21(c)(iii).¹⁰² But the CLB CUF analysis is a fatigue analysis, not a general analysis of all aging effects.¹⁰³ Thus, to the extent the State and Dr. Lahey argue that irradiation embrittlement or other degradation mechanisms be considered in EAF evaluations,¹⁰⁴ their claims are a challenge to the CLB and the license renewal rule. As further explained below, Entergy uses the RVI AMP to manage the

⁹⁷ NYS Revised SOP at 31 (NYS000481).

⁹⁸ *See Seabrook*, CLI-12-5, 75 NRC at 314-15.

⁹⁹ *See* 10 C.F.R. § 54.21(c)(1).

¹⁰⁰ *See id.*

¹⁰¹ *See* Entergy’s NYS-26B/RK-TC-1B Testimony § V.C (ENT000679).

¹⁰² *See id.* at A97.

¹⁰³ *See id.* § IV.A.

¹⁰⁴ *See* NYS Revised SOP at 41 (NYS000481); Revised Lahey Testimony at 19-20 (NYS000482).

effects of aging on RVI components caused by all pertinent aging mechanisms, including the effects of fatigue, embrittlement, and stress corrosion cracking.

2. The Reasonable Assurance Standard

Pursuant to Section 54.29(a), the NRC will issue a renewed license if it finds that the applicant has identified actions that have been taken or *will be taken* such that there is *reasonable assurance* that the activities authorized by the renewed license will continue to be conducted in accordance with the CLB.¹⁰⁵ In addition to the limitations on the scope of this proceeding set forth in 10 C.F.R. § 54.21(a)(1), the reasonable assurance standard does not require Entergy to show protection against speculative, “postulated” events that are beyond the design basis of the plant,¹⁰⁶ or to preclude all potential aging effects by replacing the RVIs.¹⁰⁷ It also requires Dr. Lahey to provide more than the speculation he repeatedly presents in support of his claims.¹⁰⁸

Longstanding precedent makes clear that the reasonable assurance standard does not require an applicant to meet an “absolute” or “beyond a reasonable doubt” standard.¹⁰⁹ Rather, the Commission takes a case-by-case approach, applying sound technical judgment and verifying the applicant’s compliance with Commission regulations.¹¹⁰ Branch Technical Position RLSB-1, in the Standard Review Plan for Review of License Renewal (“SRP-LR”), explains that the

¹⁰⁵ 10 C.F.R. § 54.29(a).

¹⁰⁶ NYS Revised SOP at 17 (NYS000481).

¹⁰⁷ *Id.* at 31.

¹⁰⁸ *See, e.g.*, Revised Lahey Testimony at 16 (“seriously embrittled and fatigued RPV internals *may* not be able to survive the shock loads”), 16-17 (“multiple aging mechanisms that occur in a reactor core (including fatigue, irradiation embrittlement, and corrosion) *may* result in cumulative material degradation”), 40 (“highly embrittled and fatigued RVI components *may* not have signs of degradation that can be detected by an inspection, but such weakened components could nonetheless fail”) (emphasis added) (NYS000482).

¹⁰⁹ *Oyster Creek*, CLI-09-7, 69 NRC at 262 n.142; *Commonwealth Edison Co.* (Zion Station, Units 1 & 2), ALAB-616, 12 NRC 419, 421 (1980); *N. Anna Envtl. Coal. v. NRC*, 533 F.2d 655, 667-68 (D.C. Cir. 1976) (rejecting the argument that reasonable assurance requires proof beyond a reasonable doubt and noting that the licensing board equated “reasonable assurance” with “a clear preponderance of the evidence”).

¹¹⁰ *See Oyster Creek*, CLI-09-7, 69 NRC at 262, n.143, 263; *Pilgrim*, CLI-10-14, 71 NRC at 465-66.

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license renewal process “is not intended to demonstrate absolute assurance that structures and components will not fail, but rather that there is reasonable assurance” that they will continue to perform their intended functions consistent with the CLB during the PEO.¹¹¹ Indeed, the plain language of the regulations, and Commission decisions interpreting those regulations, state that the central question for a license renewal applicant is whether aging management activities have been identified and actions have been or *will be taken* to provide reasonable assurance of continued safety.¹¹² Importantly, these regulations do not require the applicant to demonstrate that aging effects be precluded,¹¹³ but are oriented in large part toward identifying actions that will be taken in the future.¹¹⁴

B. License Renewal Guidance

As previously noted, nowhere in their filings do the State or Dr. Lahey allege that IPEC RVI AMP is inconsistent with NRC Staff guidance. Instead, they attack the NRC guidance itself, which endorses the industry’s detailed guidelines in MRP-227-A.¹¹⁵ While the Commission has not forbidden such arguments, the State and Dr. Lahey face a high bar to overcome the special weight accorded to the NRC Staff’s guidance on license renewal.¹¹⁶ As

¹¹¹ SRP-LR, Revision 1, Appx. A, at A.1-1 (NYS000195); NUREG-1800, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, Rev. 2 (Dec. 2010) (“SRP-LR, Revision 2”) (NYS000161).

¹¹² See 10 C.F.R. §§ 54.21(a)(3), 54.29(a)(1).

¹¹³ See *Seabrook*, CLI-12-5, 75 NRC at 314-15.

¹¹⁴ See *Vt. Yankee*, CLI-10-17, 72 NRC at 36.

¹¹⁵ Revised Lahey Testimony, at 39 (NYS000482) (“MRP-227-A is an inspection-based aging management plan, which I believe is inadequate”).

¹¹⁶ See, e.g., *Indian Point*, CLI-15-6, slip op. at 19; *Seabrook*, CLI-12-5, 75 NRC 314 n.78 (quoting *Private Fuel Storage, L.L.C.* (Indep. Spent Fuel Storage Installation), CLI-01-22, 54 NRC 255, 264 (2001)); see also *id.* (“We recognize, of course, that guidance documents do not have the force and effect of law. Nonetheless, guidance is at least implicitly endorsed by the Commission and therefore is entitled to correspondingly special weight”) (quoting *Yankee Atomic Elec. Co.* (Yankee Nuclear Power Station), CLI-05-15, 61 NRC 365, 375 n.26 (2005)).

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explained throughout this Statement of Position, and as Entergy’s witnesses have demonstrated, the State and Dr. Lahey have not cleared that bar.

The two primary license renewal guidance documents issued by the NRC Staff are NUREG-1801, the “Generic Aging Lessons Learned Report” or “GALL Report,”¹¹⁷ and NUREG-1800, the “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” or “SRP-LR.”¹¹⁸ The SRP-LR provides guidance to NRC staff for conducting their review of LRAs and provides acceptance criteria for determining whether the applicant has met the regulatory requirements for license renewal.¹¹⁹

NUREG-1801 provides the technical basis for the SRP-LR and contains the NRC Staff’s generic evaluation of programs that manage the effects of aging during the PEO, and meet the requirements of 10 C.F.R. Part 54.¹²⁰ NUREG-1801 indicates that many existing, current-term programs are also adequate to manage the aging effects for particular structures or components for license renewal. Thus, programs that are consistent with NUREG-1801 are accepted by the Staff as adequate to meet the requirements of the license renewal rule.¹²¹ The Commission has endorsed NUREG-1801 because it is based on extensive research and evaluation of operating

¹¹⁷ See generally NUREG-1801, Rev. 1 (NYS00146A-C); NUREG-1801, Rev. 2 (NYS00147A-D).

¹¹⁸ See generally Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, Rev. 1 (Sept. 2005) (“SRP-LR, Rev. 1”) (NYS000195); NUREG-1800, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, Rev. 2 (Dec. 2010) (“SRP-LR, Rev. 2”) (NYS000161).

¹¹⁹ See SRP-LR, Rev. 2 at 1-3 (NYS00146A).

¹²⁰ See NUREG-1801, Rev 1, at 3-4 (NYS00146A).

¹²¹ See *id.* at 3.

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experience derived from a comprehensive set of sources.¹²² NUREG-1801 is also subject to stakeholder review and comment.¹²³

1. NUREG-1801 Is Entitled to Special Weight in This Proceeding

The Commission has held that a license renewal applicant’s use of the guidance in NUREG-1801 satisfies regulatory requirements under 10 C.F.R. Part 54.¹²⁴ Also, where the NRC develops a guidance document—such as NUREG-1801—to assist in compliance with applicable regulations, that document “is entitled to special weight” in NRC proceedings.¹²⁵ In particular, for license renewal safety issues, an applicant’s use of an AMP identified in NUREG-1801 “constitutes reasonable assurance that it will manage the targeted aging effect during the renewal period.”¹²⁶

The Commission has reiterated this principle, holding that a commitment to implement an AMP that the NRC finds is consistent with NUREG-1801 constitutes an “acceptable method for compliance with 10 C.F.R. § 54.21(c)(1)(iii).”¹²⁷ Accordingly, to challenge the adequacy of an NRC-approved guidance document, an intervenor must provide specificity and substantial support¹²⁸ to overcome the “special weight” accorded to a guidance document that has been

¹²² See NUREG-1801, Rev. 2, at 2 (NYS00147A).

¹²³ See *id.* Neither NYS nor Riverkeeper, however, submitted comments to the NRC for consideration in NUREG-1801, Rev. 2. See NUREG-1950, Disposition of Public Comments and Technical Bases for Changes in the License Renewal Guidance Documents NUREG-1801 and NUREG-1800, at IV-1 to IV-21 (Apr. 2011) (ENT000528) (listing public comments on changes to NUREG-1801 and NUREG-1800).

¹²⁴ See, e.g., *Oyster Creek*, CLI-08-23, 68 NRC at 468.

¹²⁵ *Indian Point*, CLI-15-6, slip op. at 19; *Seabrook*, CLI-12-5, 75 NRC 314 n.78.

¹²⁶ See *Oyster Creek*, CLI-08-23, 68 NRC at 468 (emphasis added); see also *Seabrook*, CLI-12-05, 75 NRC at 304 (“If the NRC concludes that an aging management program (AMP) is consistent with the GALL Report, then it accepts the applicant’s commitment to implement that AMP, finding the commitment itself to be an adequate demonstration of reasonable assurance under section 54.29(a).”).

¹²⁷ *Vt. Yankee*, CLI-10-17, 72 NRC at 36.

¹²⁸ See *id.* at 33 n.185, 37.

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implicitly endorsed by the Commission.¹²⁹ As demonstrated by Entergy’s testimony, the State has not done so here.

In light of the foregoing, a finding that an applicant’s AMP is consistent with NUREG-1801 carries special weight¹³⁰ and constitutes a finding of reasonable assurance under 10 C.F.R. §§ 54.21(a), 54.21(c)(1)(iii), and 54.29(a).¹³¹

2. Revisions to NUREG-1801

a. NUREG-1801, Revision 1

The IPEC LRA was prepared using the guidance of NUREG-1801, Revision 1. In 2010, more than three years after the LRA was submitted, and more than a year after the NRC Staff’s original SER was published, the Staff issued NUREG-1801, Revision 2.¹³² Subsequently, in 2013, the NRC Staff published interim staff guidance to revise and update NUREG-1801, Rev. 2 based on the NRC’s approval of industry guidance on the aging management of RVIs—MRP-227-A.¹³³ As discussed further below, the RVI AMP fully meets this most recent guidance.

b. NUREG-1801, Revision 2 and MRP-227

The NRC Staff issued NUREG-1801, Rev. 2 in December 2010.¹³⁴ As explained in Section V.B. of Entergy’s Testimony, NUREG-1801, Rev. 2 contained a new AMP (XLM16A) addressing pressurized water reactor (“PWR”) RVIs. The new AMP relied on the

¹²⁹ *Seabrook*, CLI-12-5, 75 NRC at 314 n.78.

¹³⁰ *Id.*

¹³¹ *Vt. Yankee*, CLI-10-17, 72 NRC at 36.

¹³² *See generally* NUREG-1801, Rev. 2 (NYS00147A-D).

¹³³ Final License Renewal Interim Staff Guidance LR-ISG-2011-04, Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized Water Reactors at 1 (May 28, 2013) (“LR-ISG-2011-04”) (ENT000641).

¹³⁴ *See generally* NUREG-1801, Rev. 2 (NYS00147A-D).

implementation of industry guidance from EPRI MRP in MRP-227, Revision 0, “Pressurized Water Reactor Internals Inspection and Evaluation Guidelines.”¹³⁵ As discussed in Sections II.B and C above, in 2010 Entergy submitted its original RVI AMP, and in 2011 submitted its RVI Inspection Plan, both of which were based on MRP-227, Revision 0.

c. Interim Staff Guidance and Endorsement of MRP-227-A

As explained further below, in 2011, the NRC Staff issued its safety evaluation (“SE”) on MRP-227, Revision 0.¹³⁶ The SE contained specific topical report conditions and applicant/licensee action items (“A/LAIs”) that were to be addressed by applicants or licensees utilizing the report. MRP-227-A, the NRC-endorsed version of MRP-227, Revision 0, was published in January 2012 to incorporate the Staff’s topical report conditions and A/LAIs.¹³⁷ Thereafter, the NRC Staff issued interim staff guidance, LR-ISG-2011-04, to amended AMP XI.M16A to reflect its endorsement of MRP-227-A.¹³⁸

As discussed in Section II.C, above, Entergy submitted a revised RVI AMP and Inspection Plan based on the NRC-endorsed MRP-227-A guidelines. Thus, the IPEC RVI AMP meets the intent of the latest Staff guidance on management of the effects of aging on PWR RVIs. Again, NYS and Dr. Lahey do not challenge that fact, but rather challenge the guidance itself. To challenge the adequacy of the underlying guidance, NYS must to overcome the special weight with specificity and substantial support¹³⁹ for its arguments. As the Commission has held

¹³⁵ *Id.* at XI M16A-1.

¹³⁶ Letter from R. Nelson, NRC, to N. Wilmschurst, EPRI, Revision 1 to the Safety Evaluation of Electric Power Research Institute (EPRI) Report, Materials Reliability Prog[ra]m (MRP) Report 1016596 (MRP-227), Revision 0, Pressurized Water Reactor (PWR) Internals Inspection and Evaluation Guidelines (Dec. 16, 2011) (“SE for MRP-227-A”) (ENT000230).

¹³⁷ *See generally* MRP-227-A (NRC0014A-F).

¹³⁸ LR-ISG-2011-04 at 2-3 (ENT000641).

¹³⁹ *See Vt. Yankee*, CLI-10-17, 72 NRC at 33 n.185, 37.

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in this proceeding, the State must show there are “unusual circumstances” in this case that would justify setting aside the applicable guidance.¹⁴⁰ The State has made no such showing.

C. Burden of Proof

At the hearing stage, an intervenor has the initial “burden of going forward”; that is, it must provide sufficient, probative evidence to establish a *prima facie* case for the claims made in the admitted contention.¹⁴¹ The mere admission of a contention does not satisfy this burden.¹⁴² If the Intervenor do establish a *prima facie* case on a particular claim, then the burden shifts to Applicant to provide sufficient evidence to rebut the intervenor’s contention.¹⁴³

At the admissibility stage, the petitioner has the ironclad obligation to examine the available documentation with sufficient care to support the foundation for a contention.¹⁴⁴ This obligation applies with equal, if not greater, force at the hearing stage.¹⁴⁵ As will be further explained below, the State and its witness, Dr. Lahey, disregard, rather than dispute, the technical

¹⁴⁰ *Indian Point*, CLI-15-6, slip op. at 21-22.

¹⁴¹ *Oyster Creek*, CLI-09-07, 69 NRC at 269 (quoting *Consumers Power Co.* (Midland Plant, Units 1 & 2), ALAB-123, 6 AEC 331, 345 (1973) (“The ultimate burden of proof on the question of whether the permit or license should be issued is . . . upon the applicant. But where . . . one of the other parties contends that, for a specific reason . . . the permit or license should be denied, that party has the *burden of going forward* with evidence to buttress that contention. Once he has introduced sufficient evidence to establish a *prima facie* case, the burden then shifts to the applicant who, as part of his overall burden of proof, must provide a sufficient rebuttal to satisfy the Board that it should reject the contention as a basis for denial of the permit or license.”) (emphasis in original)); see also *Vt. Yankee Nuclear Power Corp. v. Natural Res. Def. Council*, 435 U.S. 519, 554 (1978) (upholding this threshold test for intervenor participation in licensing proceedings); *Phila. Elec. Co.* (Limerick Generating Station, Units 1 & 2), ALAB-262, 1 NRC 163, 191 (1975) (holding that the intervenors had the burden of introducing evidence to demonstrate that the basis for their contention was more than theoretical).

¹⁴² See *Oyster Creek*, CLI-09-07, 69 NRC at 268-70.

¹⁴³ See, e.g., *id.* at 269; *La. Power & Light Co.* (Waterford Steam Electric Station, Unit 3), ALAB-732, 17 NRC 1076, 1093 (1983) (citing *Midland*, ALAB-123, 6 AEC at 345); see also 10 C.F.R. § 2.325.

¹⁴⁴ See *Duke Power Co.* (Catawba Nuclear Station, Units 1 & 2), ALAB-687, 16 NRC 460, 468 (1982), *vacated in part on other grounds*, CLI-83-19, 17 NRC 1041 (1983).

¹⁴⁵ See *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 & 3), LBP-13-13, 78 NRC 246, 301 n.308 (2013) (rejecting an expert’s claims based on “some averages” and a “gut feeling,” rather than a thorough a review of available documentation).

[REDACTED]

basis for the RVI AMP. The State, therefore, has failed to meet its burden of going forward with evidence to support NYS-25. Considering the State's and Dr. Lahey's disregard of the substantial available documentation in direct testimony, Entergy reserves its right to object and to seek to strike any new critique of these studies that Dr. Lahey or NYS may offer in rebuttal, or, in the alternative, to seek to file sur-rebuttal testimony.

To prevail, the Applicant's position must be supported by a preponderance of the evidence.¹⁴⁶

IV. ENTERGY'S WITNESSES

Entergy's testimony on NYS-25 is sponsored by the witnesses identified below. The testimony, opinions, and evidence presented by these witnesses are based on their substantial technical and regulatory expertise, professional experience, and personal knowledge of the issues raised in NYS-25. Collectively, these witnesses will demonstrate that NYS-25 lacks merit.

A. Mr. Nelson F. Azevedo

Nelson Azevedo's professional and educational qualifications are summarized in his *curriculum vitae*¹⁴⁷ and in Section I.A of Entergy's testimony. Mr. Azevedo is employed by Entergy as the Supervisor of Code Programs at IPEC. He holds a Bachelor of Science degree in Mechanical and Materials Engineering from the University of Connecticut, and a Master of Science in Mechanical Engineering and Master of Business Administration (M.B.A.) degrees from the Rensselaer Polytechnic Institute ("RPI") in Troy, New York. Mr. Azevedo has more than 30 years of professional experience in the nuclear power industry. In his current position, he oversees the IPEC engineering section responsible for implementing American Society of

¹⁴⁶ See *Pac. Gas & Elec. Co.*, ALAB-763, 19 NRC at 577; *Oyster Creek*, CLI-09-07, 69 NRC at 263.

¹⁴⁷ See *Curriculum Vitae* for Nelson F. Azevedo (ENT000032).

[REDACTED]

Mechanical Engineers (“ASME”) Code programs, including the fatigue monitoring, inservice inspection, inservice testing, boric acid corrosion control, non-destructive examination, steam generators, alloy 600 cracking, RPV embrittlement, and RVI programs. In addition to those duties he is responsible for ensuring compliance with the ASME Code, Section XI requirements for repair and replacement activities at IPEC and represents IPEC before industry organizations, including the PWR Owners Group Management Committee. Accordingly, Mr. Azevedo is qualified through knowledge, skill, directly-relevant experience, training, and education to provide expert witness testimony on the Entergy RVI AMP, and Entergy’s aging management activities and TLAAs for RPVs.

B. Mr. Robert J. Dolansky

Bob Dolansky’s professional and educational qualifications are summarized in his *curriculum vitae*¹⁴⁸ and in Section I.B of Entergy’s testimony. Mr. Dolansky is employed by Entergy as a Code Programs Engineer at IPEC. He holds a Bachelor of Science degree in Aeronautical Engineering from RPI in Troy, New York. Mr. Dolansky has more than 25 years of professional experience as an ASME Code Programs Engineer at IPEC. He has been the program owner for, among other programs, the RVI, inservice inspection (“ISI”), inservice testing, steam generator, and alloy 600 cracking programs. In his current position, he is the program owner of the IPEC RVI AMPs for both units. He is also a member of the PWR Owners Group materials subcommittee.

Accordingly, Mr. Dolansky is qualified through knowledge, skill, directly-relevant experience, training, and education to provide expert witness testimony on the Entergy RVI AMP.

¹⁴⁸ See *Curriculum Vitae* for Robert J. Dolansky (ENT000522).

[REDACTED]

C. Mr. Alan B. Cox

Alan Cox's professional and educational qualifications are summarized in his *curriculum vitae*¹⁴⁹ and in Section I.C of Entergy's testimony. In brief, he holds a Bachelor of Science degree in Nuclear Engineering from the University of Oklahoma and a Master of Business Administration (M.B.A.) from the University of Arkansas at Little Rock. Prior to his retirement from Entergy in 2015, he was the Technical Manager of License Renewal. Presently, he continues to work with Entergy as an independent consultant. Mr. Cox has more than 37 years of experience in the nuclear power industry, having served in various positions related to engineering and operations of nuclear power plants, including several years as a licensed reactor operator and a senior reactor operator. From 2001 to 2015, he worked full-time on license renewal matters, supporting the integrated plant assessment and LRA development for Entergy license renewal projects, as well as projects for other utilities.

Mr. Cox was directly involved in preparing the LRA and developing or reviewing AMP descriptions for IP2 and IP3, including the IPEC RVI AMPs. He has also been directly involved in developing or reviewing Entergy responses to NRC Staff RAIs concerning the LRA and necessary amendments or revisions to the application. Accordingly, he has extensive knowledge of IPEC aging management activities, including the descriptions in the LRA and other related documentation discussed below. Thus, Mr. Cox is qualified through knowledge, skill, directly-relevant experience, training, and education to provide expert witness testimony on the Entergy RVI AMP, and Entergy's aging management activities and TLAAs for RPVs.

¹⁴⁹ See *Curriculum Vitae* for Alan B. Cox (ENTR00031).

[REDACTED]

D. Mr. Jack R. Strosnider, Jr.

Jack Strosnider's professional and educational qualifications are summarized in his *curriculum vitae*¹⁵⁰ and in Section I.D of Entergy's testimony. Mr. Strosnider holds a Bachelor of Science degree and a Master of Science degree, both in Engineering Mechanics from the University of Missouri at Rolla, and an M.B.A. degree from the University of Maryland. Mr. Strosnider is a Senior Nuclear Safety Consultant with Talisman International, LLC. Prior to April 2007, he was employed for 31 years by the NRC. During that time, he held numerous senior management positions at the NRC, including Director of the Office of Nuclear Material Safety and Safeguards, Deputy Director of the Office of Nuclear Regulatory Research, and Director of the Division of Engineering in the Office of Nuclear Reactor Regulation ("NRR"). On technical matters, he was, for example, involved in the development of the technical bases for 10 C.F.R. § 50.61, which provides fracture toughness requirements for protection against pressurized thermal shock ("PTS") events, and was responsible for licensing reviews associated with the integrity of the RPV and monitoring of RVIs.

Mr. Strosnider has extensive experience in developing and applying NRC regulations and programs addressing the aging of nuclear power plant structures and components. He has directed engineering reviews and the preparation of SERs for license renewal. With respect to aging effects on RPVs, Mr. Strosnider was involved in the development of the technical bases for the requirements in 10 C.F.R. § 50.61. Thus, Mr. Strosnider is qualified through knowledge, skill, directly-relevant experience, training, and education to provide expert witness testimony on the NRC regulatory requirements relating to RVI AMPs, aging management activities, and TLAAs for RPVs, and criteria necessary to satisfy those requirements.

¹⁵⁰ See *Curriculum Vitae* for Jack R. Strosnider, Jr. (ENTR00184).

[REDACTED]

E. Mr. Timothy J. Griesbach

Tim Griesbach's professional and educational qualifications are summarized in his *curriculum vitae*¹⁵¹ and in Section I.E of Entergy's testimony. In brief, he holds Bachelor of Science and Master of Science degrees in Metallurgy and Materials Science from Case Western Reserve University. Currently, he is a Senior Associate at Structural Integrity Associates, Inc. Mr. Griesbach has more than 40 years of experience in metallurgy and materials engineering, primarily in the nuclear field.

He is a member of the American Nuclear Society and the American Society of Mechanical Engineers ("ASME"), where he has served on various ASME Boiler and Pressure Vessel Code committees for over 33 years, chairs the ASME Section XI Working Group on Operating Plant Criteria, and is currently a member of the ASME Section XI Standards Committee. He has worked closely with the EPRI Materials Reliability Program to develop and implement the MRP-227 inspection and evaluation guidelines for the safety and long-term operation of PWR vessel internals. Thus, Mr. Griesbach is qualified through knowledge, skill, directly-relevant experience, training, and education to provide expert witness testimony on the Entergy RVI AMP, and Entergy's aging management activities and TLAAAs for RPVs.

F. Dr. Randy G. Lott

Dr. Randy Lott's professional and educational qualifications are summarized in his *curriculum vitae*¹⁵² and in Section I.F of Entergy's testimony. Dr. Lott holds a Bachelor of Science in Engineering degree in nuclear engineering from the University of Michigan, and Master of Science and Doctor of Philosophy degrees in nuclear engineering from the University

¹⁵¹ See *Curriculum Vitae* for Timothy J. Griesbach (ENT000617).

¹⁵² See *Curriculum Vitae* for Randy G. Lott (ENT000618).

[REDACTED]

of Wisconsin. Currently, he is a Consulting Engineer at Westinghouse and has more than 35 years of experience in nuclear materials and radiation effects.

Dr. Lott has extensive experience with post-irradiation evaluation of reactor components, and has been directly involved in the design and implementation of aging management programs for reactor internals. He has supervised testing of RPV surveillance capsules and conducted research programs on irradiation embrittlement and annealing of RPV steels, and he has conducted numerous test programs on highly irradiated stainless steels, including measurement of tensile, fracture toughness and irradiation-assisted stress corrosion cracking (“IASCC”) properties. As a member of the MRP Reactor Internals Inspection and Evaluation Guidelines Core Group, he was a contributor to the U.S. industry Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227). Specifically, he worked on aging management strategies for the Westinghouse and Combustion Engineering plants to provide the basis for the RVI inspection guidelines in MRP-227. Thus, Dr. Lott is qualified through knowledge, skill, directly-relevant experience, training, and education to provide expert witness testimony on the Entergy RVI AMP.

G. Mr. Mark A. Gray

Mark Gray’s professional and educational qualifications are summarized in his *curriculum vitae*¹⁵³ and in Section I.G of Entergy’s testimony. Mr. Gray is a Principal Engineer in the Primary Systems Design and Repair group at Westinghouse. He holds Master of Science and Bachelor of Science degrees in Mechanical Engineering from the University of Pittsburgh and has over 34 years of experience in the nuclear power industry. His principal work activities include the evaluation of the structural integrity of primary system piping and components,

¹⁵³ See *Curriculum Vitae* for Mark A. Gray (ENTR00186).

[REDACTED]

including the development of plant life extension and monitoring programs and analysis. He participated in the development and application of transient and fatigue monitoring algorithms and software for the WESTEMS™ Transient and Fatigue Monitoring System, and collaborated with vendors outside Westinghouse in the development of transient and fatigue monitoring systems.

During the preparation of the EAF analyses for IPEC license renewal, Mr. Gray provided general technical direction for the engineers performing the EAF analyses, and either co-authored or reviewed the resulting Westinghouse environmental fatigue reports, referred to as “WCAP” reports. For these reasons, Mr. Gray is qualified through knowledge, skill, directly-relevant experience, training, and education to provide expert witness testimony on fatigue analysis of RVIs.

V. ENERGY’S EVIDENCE AND ARGUMENTS

In their testimony, Entergy’s experts explain why Entergy’s IPEC RVI AMP—together with substantial supporting information—provides reasonable assurance that the effects of aging will be adequately managed throughout the PEO as required by 10 C.F.R. §§ 54.21(a)(3), 54.21(c)(1)(iii), and 54.29(a). In so doing, Entergy’s experts refute the State’s and Dr. Lahey’s assertions point-by-point, thereby demonstrating that the issues raised in NYS-25 lack merit from regulatory and technical perspectives.

A. Technical Background on the Aging Management of RVIs and RPVs

In Section V of Entergy’s testimony, Entergy’s expert witnesses describe the layout and functions of the RVIs and RPVs, the scope of components covered by the RVI AMP, the materials used in the RVIs and RPVs at IPEC, and the design basis loads those materials are subjected to.

[REDACTED]

Entergy’s witnesses first explain that the RPV contains the reactor core and RVIs, and is a key part of the reactor coolant pressure boundary.¹⁵⁴ The RVIs, located inside the RPV, direct the coolant flow, support the reactor core, and guide the control rods, but do not form part of the reactor coolant pressure boundary.¹⁵⁵

The RVI AMP provides a complete and correct list of the PWR RVI sub-assemblies and components at IPEC.¹⁵⁶ Contrary to Dr. Lahey’s belief,¹⁵⁷ the RVIs do not include control rods. Further, the control rods are active components that perform their intended function with moving parts or a change in configuration.¹⁵⁸ They also are consumables, “subject to replacement based on a qualified life or specified time period” under 10 C.F.R. § 54.21(a)(1).¹⁵⁹ They are therefore excluded from AMR pursuant to Part 54.¹⁶⁰

Dr. Lahey also incorrectly asserts that Entergy has not addressed other control rod-related components,¹⁶¹ but they are in fact included in AMR and the RVI AMP.¹⁶² And while Dr. Lahey raises concerns about the control rod “stub tube welds” or “J-groove welds,” and about RPV head penetrations, the effects of aging on those components are managed under the Reactor Vessel Head Penetration Inspection AMP, not the RVI AMP.¹⁶³ Accordingly, several of Dr. Lahey’s complaints are at odds with accepted industry definitions of RVIs and Part 54, or are

¹⁵⁴ See Entergy’s Testimony at A90 (ENT000616).

¹⁵⁵ See *id.* at A94.

¹⁵⁶ See *id.* at A98 (citing NL-12-037 (NYS000496)).

¹⁵⁷ See Revised Lahey Testimony at 13 (NYS000482).

¹⁵⁸ See *Indian Point*, CLI-15-6, 81 NRC at ___, slip op. at 8.

¹⁵⁹ See Entergy’s Testimony at A99 (ENT000616); see also 10 C.F.R. § 54.21(a)(1).

¹⁶⁰ See Entergy’s Testimony at A99 (ENT000616).

¹⁶¹ See Revised Lahey Testimony at 12-13 (incorrectly asserting that the “guide tubes, plates, pins, and welds” associated with the control rods are omitted from the RVI AMP) (NYS000482).

¹⁶² See Entergy’s Testimony at A100 (ENT000616).

¹⁶³ See *id.* at A101.

adequately addressed by other aging management programs that he either ignored or chose not to review.

With respect to materials, Entergy's witnesses explain that, contrary to Dr. Lahey's testimony, the materials used in the IPEC RVIs and RPVs are fundamentally different, and have very different mechanical properties and behavior under irradiation.¹⁶⁴ Therefore, many of his arguments and assertions regarding the behavior of RVI materials under irradiation and the potential for RVIs to undergo a transition from ductile to brittle behavior and are both incorrect and unsupported. Specifically, IP2 and IP3 RPVs are constructed primarily of low-alloy (carbon) steel, with stainless steel cladding, while the RVIs are made of wrought austenitic stainless steel, other stainless steels including Cast Austenitic Stainless Steel ("CASS"), or nickel-based alloys.¹⁶⁵ As a result, the IPEC RVI materials exhibit less temperature-dependent changes in unirradiated mechanical properties than the RPV materials.¹⁶⁶ Also, the mechanical properties of the IPEC RVI beltline materials, including the cast austenitic stainless steel ("CASS") lower support column caps ("LSCCs"), do not change with irradiation to the same extent as low-alloy RPV materials do; *i.e.*, they do not exhibit a shift in the ductile-to-brittle transition temperature.¹⁶⁷ Overall, the RVI materials are far less susceptible to irradiation effects than the RPV.¹⁶⁸

¹⁶⁴ *See id.* § V.C.

¹⁶⁵ *See id.* at A104.

¹⁶⁶ *See id.*

¹⁶⁷ *See id.* at A107.

¹⁶⁸ *See id.* at A117.

[REDACTED]

Dr. Lahey also asserts that RVIs could be subject to “pressure and/or thermal shock loads.”¹⁶⁹ It is not entirely clear what Dr. Lahey’s concerns are, however, to the extent his concern is that RVI components could fail due to PTS, it lacks basis.¹⁷⁰ The RVIs have no pressure retaining function.¹⁷¹ For this reason, a PTS transient does not subject the RVI components to the stresses characteristic of the effects of a PTS event on an RPV.¹⁷² The design basis transients and loads on the RVIs are defined in the CLB for IPEC, and identified on a plant-specific basis in Chapter 4 of the Updated Final Safety Analysis Reports (“UFSAR”) for IP2 and IP3.¹⁷³ As fully explained in Entergy’s testimony, the RVI AMP considers the full range of design basis loads, which are established in accordance with the CLB.¹⁷⁴

B. Regulatory Guidance Addressing Aging Management of RVIs

In Section VI, Entergy’s expert witnesses summarize Entergy’s full compliance with the specific regulatory guidance addressing the management of the effects of aging on RVIs. In particular, MRP-227-A is the current, NRC-approved version of EPRI’s guidance on the aging management of RVIs.¹⁷⁵ The NRC Staff thoroughly reviewed this guidance, approved it in a safety evaluation,¹⁷⁶ and issued interim staff guidance updating the NUREG-1801, Revision 2

¹⁶⁹ Revised Lahey Testimony at 16 (NYS000482).

¹⁷⁰ See Entergy’s Testimony § V.C.3 (ENT000616).

¹⁷¹ See *id.* at A114.

¹⁷² See *id.*

¹⁷³ See *id.* at A115.

¹⁷⁴ See *id.* § V.C.3.

¹⁷⁵ See *id.* §§ VI.B-C.

¹⁷⁶ See *id.* § VI.C; see also NRC Staff Safety Evaluation for MRP-227-A (Letter from R. Nelson, NRC, to N. Wilmshurst, EPRI, Revision 1 to the Safety Evaluation of Electric Power Research Institute (EPRI) Report, Materials Reliability Program (MRP) Report 1016596 (MRP-227), Revision 0, Pressurized Water Reactor (PWR) Internals Inspection and Evaluation Guidelines (Dec. 16, 2011) (“SE for MRP-227-A”) (ENT000230).

AMP (XI.M16A) to incorporate MRP-227-A.¹⁷⁷ While Dr. Lahey “believe[s]” that the NRC-approved industry guidance is “inadequate,”¹⁷⁸ Entergy’s witnesses show that he has largely disregarded and failed to challenge the substantial technical basis supporting that guidance.¹⁷⁹

MRP-227-A is the result of a decade-long systematic evaluation of the effects of aging on RVIs.¹⁸⁰ MRP-227-A was developed in four steps: (1) development of screening criteria for the applicable aging mechanisms; (2) screening of RVI components based on susceptibility to degradation; (3) functionality analysis and failure modes, effects, and criticality analyses (“FMECA”), which resulted in the “binning” of components into different risk severity and inspection categories; and (4) development of the inspection and evaluation guidelines and flaw evaluation methodology.¹⁸¹ The screening process explicitly considered potential combinations of aging effects, including all of the effects mentioned by Dr. Lahey.¹⁸²

The aging management guidelines in MRP-227-A are supported by numerous underlying EPRI MRP technical studies, covering topics from aging degradation mechanisms and resulting effects, categorization of components, aging management strategies, acceptance criteria, and other topics.¹⁸³ These technical studies document the considerable body of operating experience, state-of-the art research, and laboratory experiments that underpin the MRP-227-A guidelines.¹⁸⁴

¹⁷⁷ See Entergy’s Testimony § VI.A (ENT000616); *see also* LR-ISG-2011-04 (NYS000524).

¹⁷⁸ See Revised Lahey Testimony at 39 (NYS000482).

¹⁷⁹ See Entergy’s Testimony § VII (ENT000616).

¹⁸⁰ See *id.* § VI.B.

¹⁸¹ See *id.* at A124.

¹⁸² See *id.* at A125.

¹⁸³ See *id.* at A126.

¹⁸⁴ See *id.*

The principal documents, along with MRP-227-A, total over 1600 pages of research and analysis and include:

- MRP-232: Aging Management Strategies for Westinghouse and Combustion Engineering PWR Internals;¹⁸⁵
- MRP-230: Functionality Analysis for Westinghouse and Combustion Engineering Representative PWR Internals;¹⁸⁶
- MRP-228 Inspection Standard for PWR Internals;¹⁸⁷
- MRP-210: Fracture Toughness Evaluation of Highly Irradiated PWR Stainless Steel Internal Components;¹⁸⁸
- MRP-191: Screening, Categorization and Ranking of Reactor Internals of Westinghouse and Combustion Engineering PWR Designs;¹⁸⁹
- MRP-175: PWR Internals Material Aging Degradation Mechanism Screening and Threshold Values;¹⁹⁰
- MRP-134: Framework and Strategies for Managing Aging Effects in PWR Internals,¹⁹¹ and
- WCAP-17096-NP, Rev. 2, Reactor Internals Acceptance Criteria Methodology and Data Requirements.¹⁹²

¹⁸⁵ See MRP-232, EPRI Materials Reliability Program: Aging Management Strategies for Westinghouse and Combustion Engineering PWR Internals (Dec. 2008) (“MRP-232”) (ENT000642A-C); *see also* MRP-232, Revision 1, EPRI Materials Reliability Program: Aging Management Strategies for Westinghouse and Combustion Engineering PWR Internals (Dec. 2012) (“MRP-232, Rev. 1”) (ENT000643).

¹⁸⁶ See MRP-230, EPRI Materials Reliability Program: Functionality Analysis for Westinghouse and Combustion Engineering Representative PWR Internals (Oct. 2009) (“MRP-230”) (ENT000644).

¹⁸⁷ See MRP-228, EPRI Materials Reliability Program: Inspection Standard for PWR Internals (July 2009) (NYS000323); *see also* MRP-228, Rev. 1, EPRI Materials Reliability Program: Inspection Standard for PWR Internals (Dec. 2012) (ENT000645).

¹⁸⁸ See MRP-210, EPRI Materials Reliability Program: Fracture Toughness Evaluation of Highly Irradiated PWR Stainless Steel Internal Components (Dec. 2007) (“MRP-210”) (ENT000646).

¹⁸⁹ See MRP-191, EPRI Materials Reliability Program: Screening, Categorization and Ranking of Reactor Internals of Westinghouse and Combustion Engineering PWR Designs (NYS000321).

¹⁹⁰ See MRP-175 EPRI Materials Reliability Program: PWR Internals Material Aging Degradation Mechanism Screening and Threshold Values (ENT000631).

¹⁹¹ See MRP-134, EPRI Materials Reliability Program: Framework and Strategies for Managing Aging Effects in PWR Internals (June 2005) (ENT000647).

[REDACTED]

Based on these supporting reports, MRP-227-A provides comprehensive aging management guidelines, detailing inspections to detect the effects of aging (individually or in combination), methods to evaluate such aging effects, and considerations for repair or replacement of degraded components.¹⁹³ MRP-227-A also defines risk-prioritized inspections to detect the effects of aging, and recommends methods to evaluate aging effects.¹⁹⁴ Dr. Lahey generally disregards all of these analyses, and explains no disagreements with any information in them, despite the fact that they have nearly all been available to the State for several years through the mandatory disclosure process.¹⁹⁵ This approach does not meet the State's burden of moving forward with providing sufficient probative evidence to support its contention at the hearing stage.¹⁹⁶

Instead, the State offers baseless legalistic justifications in an apparent attempt to excuse Dr. Lahey from the obligation to actually review the technical basis for the IPEC RVI AMP. First, the State asserts that Entergy can only rely on its own RVI AMP documentation:

The RPVI AMP that is currently before the Board for review consists of the Revised and Amended RVI Plan, developed between 2012 and 2014 and approved by NRC Staff in the SSER2. Thus, the adequacy of the AMP for RPVIs must stand or fall on the adequacy of these documents.¹⁹⁷

¹⁹² See WCAP-17096-NP, Rev. 2, Reactor Internals Acceptance Criteria Methodology and Data Requirements (Dec. 2009) (ENT000635).

¹⁹³ See Entergy's Testimony at A125 (ENT000616).

¹⁹⁴ See *id.*

¹⁹⁵ See *id.* at A127. Notably, Entergy has disclosed all of these documents to the State under the mandatory disclosure process in 10 C.F.R. § 2.336—and nearly all of them several years ago.

¹⁹⁶ See *Oyster Creek*, CLI-09-07, 69 NRC at 269.

¹⁹⁷ NYS Revised SOP at 19 (NYS000481).

[REDACTED]

Similarly, the State claims that “Entergy has failed to submit an analysis” of the allegedly “synergistic effects of embrittlement, fatigue, and stress corrosion” on RVIs.¹⁹⁸ But these objections are groundless, as nothing in the NRC’s regulations prevents Entergy from relying on an NRC-approved topical report as the basis for its RVI AMP, or requires Entergy to “submit” to the NRC Staff in this proceeding the MRP reports reviewed on a generic basis by the Staff. On the contrary, the Commission has endorsed and encouraged the practice of using generic guidance to improve efficiency, as has the Board in this proceeding.¹⁹⁹ Overall, the State’s weak attempt to avoid its expert’s obligation to review the available technical basis for the RVI AMP fails.

Throughout Entergy’s Testimony, the witnesses explain that the IPEC RVI AMP is consistent with MRP-227-A—a point the State *does not dispute*. To challenge the adequacy of an NRC-approved guidance document, an intervenor must provide specificity and substantial support for such a challenge, in order to show “unusual circumstances”²⁰⁰ are present to overcome the “special weight” it is accorded in NRC proceedings.²⁰¹ The State has not done so.

C. Entergy’s LRA Effectively Addresses Aging Management of RVIs and RPVs

In Section VII, Entergy’s expert witnesses show that the IPEC RVI AMP provides reasonable assurance that the RVI components will continue to perform their intended functions,

¹⁹⁸ *Id.* at 23 ¶ 10.

¹⁹⁹ *See Vt. Yankee*, CLI-10-17, 72 NRC at 19 (noting that the GALL Report may be referenced in a license renewal application in the same manner as an approved topical report); *Indian Point*, CLI-15-6, slip op. at 21-22 (requiring “unusual circumstances” to be present to justify setting Staff guidance aside); *Indian Point*, LBP-13-13, 78 NRC at 297 (allowing Entergy to rely on the guidance in NSAC-202L as the basis for its flow-accelerated corrosion (“FAC”) AMP).

²⁰⁰ *Indian Point*, CLI-15-6, slip op. at 21.

²⁰¹ *Vt. Yankee*, CLI-10-17, 72 NRC at 32-33, n.185.

consistent with the CLB, during the PEO, as required by 10 C.F.R. §§ 54.21(a)(3), (c)(1)(iii), and 54.29(a).

1. The IPEC RVI AMP

a. Overview of the RVI AMP and Inspection Plan

Consistent with the guidance in MRP-227-A, the IPEC RVI AMP is divided into three main areas: (1) examinations and other inspections, along with a comparison of data to examination acceptance criteria, as defined in MRP-227-A and MRP-228; (2) process for resolution of indications that exceed examination acceptance criteria by entering them into the applicant's Corrective Action Program; and (3) monitoring and control of reactor primary coolant water chemistry based on industry guidelines.²⁰² The RVI Inspection Plan provides additional details on the inspections to be conducted under the RVI AMP, including: (1) the type of examinations; (2) the level of examination qualification; (3) the schedule of initial inspection and frequency of subsequent inspections; (4) the criteria for sampling and coverage; (5) the criteria for expansion of scope if unanticipated indications are found; (6) the acceptance criteria; (6) the methods for evaluation of examination results that do not meet the acceptance criteria; (7) provisions to update the program based on industry-wide results; and (8) contingency measures to repair, replace, or mitigate, beyond the information set forth in the RVI AMP.²⁰³

b. The RVI AMP Describes Inspections in Detail

Dr. Lahey alleges that Entergy has not provided sufficient details about its inspection schedule.²⁰⁴ The IPEC RVI AMP, however, provides a comprehensive inspection schedule

²⁰² See Entergy's Testimony at A139 (ENT000616) (citing NL-12-037, Attach. 1 (NYS000496)).

²⁰³ See Entergy's Testimony at A137 (ENT000616).

²⁰⁴ See Revised Lahey Testimony at 48-49 (NYS000482).

[REDACTED]

based on the guidance in MRP-227-A.²⁰⁵ RVI components are separated into four groups with aging management strategies specified for each group (Primary, Expansion, Existing Programs, and No Additional Measures) depending on: (1) the relative susceptibility to and tolerance of applicable aging effects; and (2) the existence of other programs that manage the effects of aging on those components.²⁰⁶ The inspections are specified in Table 5-2 (primary components), Table 5-3 (expansion components), and Table 5-4 (existing program components) of the Inspection Plan.²⁰⁷

Importantly, the inspection categorization is not dependent on analyzing the behavior of the individual components under accident loads.²⁰⁸ Rather, the EPRI MRP evaluated possible component failure under accident loads, and if the assumed failure could impact a design basis function the component was assigned to an inspection category using the appropriate inspection techniques and frequency of inspections.²⁰⁹ Dr. Lahey provides no critique of EPRI's categorization methodology—indeed, he does not mention it at all. Therefore, contrary to Dr. Lahey's bare assertions, the inspection schedule is “comprehensive and adequate.”²¹⁰

*c. **The RVI AMP Manages the Effects of Aging on RVIs Regardless of the Underlying Aging Mechanism***

Dr. Lahey asserts that Entergy has considered various aging mechanisms that could affect the RVIs in “silos,” without considering the “synergistic interactions” between mechanisms.²¹¹ As a threshold matter, this position is directly contrary to the approach the Commission specified

²⁰⁵ See Entergy's Testimony at A139 (ENT000616).

²⁰⁶ See *id.* at A138.

²⁰⁷ See *id.* at A139 (citing NL-12-037, Attach. 2, at 37-51 (NYS000496)).

²⁰⁸ See *id.* at A137.

²⁰⁹ See *id.*

²¹⁰ Revised Lahey Testimony at 48-49 (NYS000482).

²¹¹ See *id.* at 14-15.

[REDACTED]

when it promulgated the license renewal rules in 10 C.F.R. Part 54. As described in Sections VII.A.3 and 5 of Entergy’s Testimony, the NRC’s license renewal process has long focused on aging “effects,” rather than aging “mechanisms.”²¹² Since 1995, when the NRC promulgated its revised license renewal rules, the NRC has emphasized that the identification of individual aging mechanisms is *not required* as part of the license renewal review.²¹³ Instead, the regulations in 10 C.F.R. Part 54 concentrate on ensuring that important structures, systems and components (“SSCs”) will continue to perform their intended functions during the PEO regardless of the particular aging mechanism.²¹⁴ Consistent with this principle, the inspections conducted under the RVI AMP will look for evidence of any of the aging effects of concern, and appropriate action is taken if any relevant conditions related to those effects are discovered, regardless of their cause.²¹⁵

In any event, to the extent Dr. Lahey’s claim is that the combined effects of multiple aging mechanisms are not addressed in the RVI AMP, he is mistaken. As specified in MRP-227-A, Section 3.2, the RVI AMP addresses the following eight age-related degradation mechanisms and their associated effects, each of which are further described in MRP-227-A:

- Stress corrosion cracking (“SCC”);
- IASCC;
- Wear;
- Fatigue;
- Thermal aging embrittlement;
- Irradiation embrittlement (also referred to as neutron embrittlement);
- Void swelling and irradiation growth; and

²¹² See Entergy’s Testimony §§ VII.A.3, 5 (ENT000616).

²¹³ See *id.* at A143; see also Nuclear Power Plant License Renewal; Revisions, 60 Fed. Reg. 22,461, 22,463 (May 8, 1995) (“Part 54 SOC”) (NYS000016).

²¹⁴ See Entergy’s Testimony at A143 (ENT000616); see also Part 54 SOC, 60 Fed. Reg. at 22,463 (NYS000016).

²¹⁵ See Entergy’s Testimony at A143 (ENT000616).

- Thermal and irradiation-enhanced stress relaxation or irradiation-enhanced creep.²¹⁶

For each of the eight mechanisms, MRP-227-A identifies the resulting aging effect, which will then be managed through inspections under the MRP-227-A guidelines.²¹⁷ Notably, in most cases, the key effects are cracking, dimensional changes, or wear, but in all cases, as explained below, the inspections specified in MRP-227-A are designed to detect potential aging effects applicable to each RVI component, regardless of the underlying mechanism.²¹⁸

Therefore, contrary to Dr. Lahey’s claims, the IPEC RVI AMP does not “fail[] to consider how those interacting degradation mechanisms will impact the . . . RPV internals.”²¹⁹

With respect to the effects of embrittlement, no recommendations for inspection to determine embrittlement level are contained in the guidance because these mechanisms cannot be directly observed.²²⁰ But, as Entergy’s witnesses show, embrittlement is only an issue for RVI components if there is a crack.²²¹ Therefore, while it is not possible to detect the level of embrittlement directly through visual inspection, MRP-227-A provides for inspections that detect the manifestation of significant thermal aging or neutron-irradiation embrittlement—specifically, the potential growth of a pre-existing defect.²²²

Once a defect is discovered, its ability to withstand fatigue and combinations of both normal and accident shock loads is evaluated by either fracture mechanics analysis or a structural analysis (an engineering evaluation) using the lower bound fracture toughness; *i.e.*, the

²¹⁶ See *id.* at A144 (citing NL-12-037, Attach. 1 at 6 (NYS000496)).

²¹⁷ See Entergy’s Testimony at A144 (ENT000616).

²¹⁸ See *id.*

²¹⁹ Revised Lahey Testimony at 49 (NYS000482).

²²⁰ See Entergy’s Testimony at A146 (ENT000616).

²²¹ See *id.*

²²² See *id.*

[REDACTED]

evaluation assumes the maximum level of embrittlement of the material.²²³ Thus, the program has compensated for any inability to directly determine the level of embrittlement through a conservative assumption employed during evaluation of inspection findings.²²⁴ Thus, reasonable assurance that the effects of aging will be adequately managed is provided without the need for direct observation or analysis of the level of embrittlement.²²⁵

d. The RVIs Are Robust and Highly Failure Tolerant

Next, Entergy's witnesses show that the RVI materials are constructed of damage-resistant and flaw-tolerant materials that have performed well in service at many plants for thousands of reactor years, with very little adverse operating experience.²²⁶ For example, ASME Code Section XI periodic inspections for PWR RVIs to date have included inspections of baffle-former bolts at several plants.²²⁷ Although these bolts are leading indicators for Westinghouse RVIs for the combination of irradiation-induced stress relaxation, void swelling, and IASCC, very few cracked or failed baffle-former bolts have been detected during these examinations and, in most cases, no cracked or failed bolts were detected at all.²²⁸ [REDACTED]

[REDACTED]

[REDACTED]

.²²⁹

²²³ See *id.* at A146 (citing MRP-227-A at 6-4 (NRC000114B)).

²²⁴ See Entergy's Testimony at A146 (ENT000616).

²²⁵ See *id.*

²²⁶ See *id.* at A148 (citing MRP-227-A, App. A (NRC000114C)).

²²⁷ See Entergy's Testimony A148, A150 (ENT000616).

²²⁸ See *id.* at A150.

²²⁹ See *id.* at A156.

[REDACTED]

Dr. Lahey disregards the overall operating experience when he labels Entergy's plans regarding the baffle-former bolts as a "wait-and-see" approach.²³⁰ Entergy's plans to inspect the baffle-former bolts are adequately and sufficiently specified in the record to provide the requisite reasonable assurance that the effects of aging on baffle-former bolts will be adequately managed.²³¹ Specifically, at IPEC, Entergy is appropriately planning to inspect 100% of the baffle former bolts at IP2 in Spring 2016 and at IP3 in Spring 2019, with subsequent examinations on ten-year intervals.²³² In preparation for these inspections, Entergy is preparing a technical justification ("TJ") which will demonstrate that the ultrasonic testing ("UT") inspections at IPEC will be capable of detecting defects exceeding 30% of the bolt cross-sectional area, as specified in Westinghouse's evaluations of the baffle-former assembly.²³³ In addition, Entergy has contracted with Westinghouse to perform a more realistic plant-specific minimum bolting pattern analysis for IPEC.²³⁴ This evaluation will consider design basis loads for IP2 and IP3, including the dynamic effects and blowdown loads from pipe breaks of various sizes, low cycle thermal fatigue loads, high cycle flow induced vibration loads, and seismic loads.²³⁵ If inspections reveal degradation in baffle-former bolts, then this minimum bolting pattern will be used as the basis for engineering evaluations to determine the acceptability of the bolts following the required UT examinations from MRP-227-A.²³⁶

²³⁰ Revised Lahey Testimony at 55-56 (NYS000482).

²³¹ *See id.* § VII.A.4.b.

²³² *See id.* at A152.

²³³ *See id.* at A154.

²³⁴ *See id.* at A158.

²³⁵ *See id.*

²³⁶ *See id.* at A158.

[REDACTED]

Considering the operating experience, Dr. Lahey's demand for wholesale replacement of the clevis insert bolts is likewise baseless.²³⁷ The clevis insert bolts are treated as an Existing Program component under the RVI AMP, because they are periodically inspected once every ten year interval under the ASME Code, Section XI program per Table IWB-2500.²³⁸ Entergy last inspected the clevis bolt inserts at IP2 in 2006 and at IP3 in 2009.²³⁹ Entergy has further evaluated recent operating experience regarding clevis insert bolts, and demonstrated that the existing ASME Code inspections are adequate at IPEC.²⁴⁰ Therefore, Entergy's planned inspections of clevis insert bolts provide reasonable assurance that the effects of aging will be adequately managed.²⁴¹

*e. **The RVI AMP Addresses Combinations of Aging Effects from Multiple Degradation Mechanisms***

Entergy's experts further explain that MRP-227-A guidelines and the IPEC RVI AMP properly address applicable aging effects, including combinations of effects.²⁴² Specifically, during the development of MRP-227-A, the EPRI MRP experts developed a set of standard screening criteria that were used to identify components with one or more potential aging mechanisms and how those effects could combine to affect functionality.²⁴³ That work, documented in MRP-175, identified thresholds for aging effects which were then used to develop the screening and categorization results documented in MRP-191 (NYS000321). These results,

²³⁷ Revised Lahey Testimony at 56-57 (NYS000482).

²³⁸ See Entergy's Testimony at A163 (ENT000616).

²³⁹ See *id.*

²⁴⁰ See *id.* at A164.

²⁴¹ See *id.* § VII.A.4.c.

²⁴² See *id.* §§ VII.A.3, 5.

²⁴³ See *id.* at A168.

[REDACTED]

in turn, provide the technical basis for the functionality analysis in MRP-230 (ENT000644) and ultimately the examinations specified in MRP-227-A.²⁴⁴

Dr. Lahey raises no dispute with this information. Instead, he incorrectly assumes that his concerns regarding “synergistic” aging effects have never been addressed,²⁴⁵ and remarkably states he has “discovered” this important new issue.²⁴⁶ Entergy’s witnesses show that the RVI AMP—and the license renewal process in general—appropriately consider the combined effects resulting from multiple aging mechanisms that could impact the IPEC RVIs.²⁴⁷ In short, Dr. Lahey does not dispute *how* EPRI addressed his “over-arching concern.”²⁴⁸ This misconception is a fundamental reason why NYS-25 lacks merit.

Instead of discussing the substantial work of the EPRI MRP, Dr. Lahey claims that the Department of Energy (“DOE”), the NRC, and national laboratories have “recently embarked on an ambitious R&D program to understand and resolve” his concerns regarding the synergistic aging effects on nuclear plant components.²⁴⁹ But Dr. Lahey is mistaken, as this program is intended to address the long-term challenges and research needs for operating nuclear plants beyond 60 years, not beyond 40 years.²⁵⁰ Therefore, Dr. Lahey’s purported evidence falls short of identifying any deficiency regarding the PEO for IP2 and IP3 at issue here. In any event, the MRP-227 inspection and evaluation guidelines were based on state-of-the art engineering, and designed to accommodate the uncertainties associated with areas where research remains

²⁴⁴ *See id.*

²⁴⁵ *See id.* at A169.

²⁴⁶ Revised Lahey Testimony at 78 (NYS000482).

²⁴⁷ *See* Entergy’s Testimony §§ VII.A.3, 5 (ENT000616).

²⁴⁸ Revised Lahey Testimony at 14 (NYS000482).

²⁴⁹ *See, e.g., id.* at 17 (citing DOE, Light Water Sustainability Program, Material Aging and Degradation Technical Program Plan (Aug. 2014) (“MAaD Program Plan”) (NYS000485)).

²⁵⁰ *See* Entergy’s Testimony at A171 (ENT000616).

[REDACTED]

ongoing.²⁵¹ Ultimately, the fact that certain research is ongoing is not an indication of any deficiency in an AMP.²⁵² In fact, it is a sign of a healthy, constantly-improving program.²⁵³ What Dr. Lahey and the State are proposing—to prevent an applicant from using a state-of-the-art AMP because some research related to it remains ongoing—would transform the license renewal process into an “open-ended research project,” which the Commission explicitly intended to avoid when it promulgated 10 C.F.R. Part 54.²⁵⁴

Another misconception from Dr. Lahey is that he broadly implies that the synergy between combined aging effects may have a greater (*i.e.*, worsening) effect than the sum of the individual mechanisms alone.²⁵⁵ This overlooks the fact that a combination of aging effects may in some cases have less of an effect, or even an improvement, in the material’s resistance to aging.²⁵⁶ Fatigue and irradiation embrittlement, for example, do not interact “synergistically,” and in some cases irradiation can increase the fatigue life of RVI materials.²⁵⁷ The RVI AMP accounts for this recognized complexity, but Dr. Lahey does not.²⁵⁸

Dr. Lahey raises concerns about the potential combined effects of thermal and irradiation embrittlement on the CASS LSCCs.²⁵⁹ Entergy’s witnesses do not dispute that there is ongoing research on this topic, but this is precisely why the NRC Staff identified the need for

²⁵¹ *See id.*

²⁵² *See id.*

²⁵³ *See id.*

²⁵⁴ *See* Part 54 SOC, 60 Fed. Reg. at 22,469.

²⁵⁵ *See* Revised Lahey Testimony at 17 (NYS000482).

²⁵⁶ *See* Entergy’s Testimony at A173 (ENT000616).

²⁵⁷ *See id.*

²⁵⁸ *See id.* at A174.

²⁵⁹ *See* Revised Lahey Testimony at 18 & 20 (NYS000482).

[REDACTED]

further evaluation of CASS components in its Safety Evaluation for MRP-227-A.²⁶⁰ Entergy, in response, demonstrated to the NRC Staff that the potential combined effects of thermal and irradiation embrittlement of CASS components is not an issue for the specific materials used at IPEC because the LSCCs do not have a high percentage of delta ferrite.²⁶¹ Dr. Lahey does not mention or dispute this information. As a result, he has failed to carry the State’s burden of moving forward with evidence to support this contention at hearing.

f. The RVI AMP Addresses Appropriate Design Basis Loads, Including Seismic and LOCA Loads

Dr. Lahey asserts that the RVI AMP has not adequately addressed potential “shock loads” on RVI components, but it is not entirely clear what Dr. Lahey means by the term “shock loads.”²⁶² If the concern is with loads caused by “postulated” events that are greater than or different from those specified in the CLB for IP2 and IP3, or with scenarios that are beyond the plants’ licensing bases,²⁶³ then there is no requirement to address such loads in the RVI AMP.²⁶⁴ As previously noted, the adequacy of the CLB itself is not open to challenge in this proceeding.²⁶⁵ In particular, the State argues in its Revised SOP that “the potential seismic hazard curves for the Indian Point site are higher than the seismic spectra developed in the 1970s during the proceedings concerning the initial operating licenses.”²⁶⁶ To the extent the State is arguing that the seismic hazards considered in the CLB for IP2 and IP3 should be reconsidered in

²⁶⁰ See Entergy’s Testimony at A175 (ENT000616).

²⁶¹ See *id.* at A176; NL-14-013, Letter from F. Dacimo to NRC Document Control Desk, Additional Information Regarding the License Renewal Application – Action Item 7 from MRP-227-A, Attach. 1 at 3, 4 (Jan. 28, 2014) (NYS000503).

²⁶² See Entergy’s Testimony at A179 (ENT000616).

²⁶³ NYS Revised SOP at 17 (NYS000481).

²⁶⁴ See Entergy’s Testimony at A179 (ENT000616).

²⁶⁵ See *Pilgrim*, CLI-10-14, 71 NRC at 461; *Oyster Creek*, CLI-09-7, 69 NRC at 270.

²⁶⁶ NYS Revised SOP at 41.

[REDACTED]

this proceeding, such arguments are a collateral attack the license renewal rules in 10 C.F.R. Part 54.

If Dr. Lahey and the State's concern is with loads that are within the CLB of IP2 and IP3, then such loads are appropriately addressed in the RVI AMP.²⁶⁷ The MRP-227-A inspection and evaluation guidelines are intended to detect conditions that may impair the continued functionality of the RVIs, under CLB loads—including loss-of-coolant accident (“LOCA”) and seismic loads.²⁶⁸ First, the MRP-227-A guidelines specify inspections of key irradiated components to assure that there are no cracks that could lead to failure and loss of functionality under transient loads.²⁶⁹ Without the presence of cracking, the ability of the irradiation-strengthened RVI-material to withstand shock loads is not degraded.²⁷⁰ Second, if a degraded component is discovered, then MRP-227-A requires the explicit evaluation of CLB loads, including accident and transient loads such as acoustic loads and rarefaction waves due to a LOCA in an engineering evaluation, to the extent such loads are part of the IP2 or IP3 CLB.²⁷¹ For potentially irradiated components, the engineering evaluation assumes the component is embrittled.²⁷² Dr. Lahey disregards rather than disputes this well-established analytical approach to accounting for design basis loads, and instead merely speculates that synergistic aging effects

²⁶⁷ See Entergy's Testimony § V.A.6 (ENT000616).

²⁶⁸ See *id.* at A180.

²⁶⁹ See *id.*

²⁷⁰ See *id.*

²⁷¹ See *id.* (citing MRP-227-A § 6 (NRC00014C)).

²⁷² See Entergy's Testimony at A171 (ENT000616).

and “shock loads” “have not been considered.”²⁷³ This is simply not enough at this stage of the proceeding for NYS to meet its burden of going forward with evidence to support its case.²⁷⁴

g. The RVI AMP Uses Appropriate Inspection Techniques

MRP-227-A and its companion document, MRP-228, specify inspection techniques for those PWR RVI components that are most susceptible to the aging effects of concern and have the highest risk associated with failure.²⁷⁵ The standards for deployment of these inspection techniques and the necessary qualification requirements for both equipment and personnel are given in MRP-228.²⁷⁶ The NRC Staff reviewed and approved the selected inspection techniques in its Safety Evaluation for MRP-227-A.²⁷⁷

Dr. Lahey criticizes the use of “VT-3” visual inspections as inadequate for use in inspections for cracking,²⁷⁸ but the adequacy of these techniques is explained in extensive detail in MRP-228, and further explained in the response to an NRC Staff non-concurrence on this topic.²⁷⁹ Again, the State and Dr. Lahey disregard the available information, rather than dispute the adequacy of the record on the use of VT-3 examinations. Moreover, the State and Dr. Lahey cannot simply rely on an NRC Staff nonconcurrency as the basis for their challenge to the use of VT-3 inspections. In particular, Dr. Lahey does not assert any expertise in this area and he offers no opinion of his own regarding the strength or weakness of the VT-3 inspections, or even offer

²⁷³ Revised Lahey Testimony at 15-16 (NYS000482); *see also, e.g.*, Declaration of Richard T. Lahey, Jr. at 13 ¶ 19 (Feb. 13, 2015) (NYS000483) (“New York’s main concerns . . . have simply been ignored”).

²⁷⁴ *See Oyster Creek*, CLI-09-07, 69 NRC at 268-70.

²⁷⁵ *See* Entergy’s Testimony at A186 (ENT000616).

²⁷⁶ *See id.*

²⁷⁷ *See id.* at A188.

²⁷⁸ *See* Revised Lahey Testimony at 62 (NYS000482).

²⁷⁹ *See* Entergy’s Testimony at A188, A132 (ENT000616).

[REDACTED]

a preferred alternative of his own.²⁸⁰ Again, Dr. Lahey must do much more at this stage of the proceeding.²⁸¹

h. The RVI AMP Includes Appropriate Acceptance Criteria, Corrective Actions, and Preventive Actions

Dr. Lahey criticizes the RVI AMP for allegedly failing to include “objective criteria . . . for corrective actions”²⁸² Entergy’s witnesses demonstrate that the RVI AMP includes appropriate acceptance criteria, corrective actions, and preventive actions, consistent with the applicable guidance and current operating practice. First, the RVI AMP contains specific, conservative examination acceptance criteria,²⁸³ based on the acceptance criteria in MRP-227-A.²⁸⁴ The inspections required in Section 4 of MRP-227-A and relied upon in the IPEC RVI AMP and Inspection Plan are designed to detect all of the pertinent aging effects described above, with conservative examination acceptance criteria.²⁸⁵ In most cases the examination acceptance criterion is any detectable degradation.²⁸⁶ The specific acceptance criteria will be carried forward into the program procedural documents, including the Pre-Inspection Engineering Packages prepared prior to each inspection.²⁸⁷

If examinations reveal conditions that do not meet the examination acceptance criteria set forth in the IPEC RVI Inspection Plan, then the discovery of the condition is entered into the

²⁸⁰ Revised Lahey Testimony at 62 (NYS000482); *cf. USEC, Inc. (Am. Centrifuge Plant), CLI-06-10, 63 NRC 451, 472 (2006)* (holding that mere references to documents without “explanation or analysis” does not supply an adequate basis for admitting a contention, and that “conclusory” statements proffered by an alleged expert do not provide “sufficient” support for a contention).

²⁸¹ *See Oyster Creek, CLI-09-07, 69 NRC at 268-70.*

²⁸² Revised Lahey Testimony at 49 (NYS000482).

²⁸³ *See Entergy’s Testimony at A189 (ENT000616) (citing NL-12-037, Attach. 2 at 52-57 (NYS000496)).*

²⁸⁴ *See id.* (citing MRP-227-A at 5-1 to 5-23 (NRC000114B)).

²⁸⁵ *See Entergy’s Testimony at A189 (ENT000616).*

²⁸⁶ *See NL-12-037, Attach. 2 at 52-57 (NYS000496).*

²⁸⁷ *See Entergy’s Testimony at A189 (ENT000616).*

[REDACTED]

IPEC corrective action program for resolution.²⁸⁸ This could lead to: (1) a more detailed inspection; (2) an engineering evaluation; (3) repair; or (4) replacement of the affected component.²⁸⁹ MRP-227-A Section 6 provides an overview of the methodologies to be used for the development of engineering evaluations, which consider CLB loading and the characteristics of the material including the potential effects of embrittlement.²⁹⁰ In addition, if an inspection of a “Primary” component detects aging effects that exceed the “Expansion Criteria” specified in the tables of Section 5 of MRP-227-A, then inspections of corresponding “Expansion” components must take place.²⁹¹

Contrary to Dr. Lahey’s demand, there is no further regulatory requirement for “objective criteria” for corrective actions.²⁹² On the contrary, it would be impractical to establish pre-defined criteria in advance for all potential unsatisfactory examination results for all components. Instead, such issues are handled on a case-by-case basis through engineering evaluations conducted under Entergy’s corrective action and quality assurance programs.²⁹³ This is fully consistent with how such matters are managed for operating plants under Part 50.

On the topic of Primary and Expansion components, Dr. Lahey criticizes the linkage between the core barrel girth weld (which is a leading indicator for IASCC and irradiation embrittlement) to the LSCCs because of the alleged differences between these components.²⁹⁴

²⁸⁸ *See id.* at A190.

²⁸⁹ *See id.*

²⁹⁰ *See id.* at A191, A192.

²⁹¹ *See id.* at A193.

²⁹² Revised Lahey Testimony at 49 (NYS000482).

²⁹³ *See* Entergy’s Testimony at A190 (ENT000616).

²⁹⁴ *See* Revised Lahey Testimony at 60 (NYS000482).

[REDACTED]

Entergy’s witnesses show that Dr. Lahey’s criticisms lack merit.²⁹⁵ In MRP-227-A, the LSCCs are an Expansion component linked to the control rod guide tube lower flanges as a Primary component.²⁹⁶ In response to NRC Staff RAIs, Entergy appropriately modified the RVI AMP to link the LSCCs to an additional Primary component that is an appropriate predictor of IASCC and irradiation embrittlement (“IE”) in the LSCCs: the core barrel girth weld.²⁹⁷ Although Dr. Lahey disputes this linkage, he only asserts that the core barrel girth weld “may” be exposed to different aging mechanisms and shock loads than the LSCCs.²⁹⁸ This unsupported speculation does not directly challenge Entergy’s detailed plant-specific technical evaluation of the susceptibility of LSCCs to thermal embrittlement (“TE”), IE, and IASCC in support of its RVI AMP.²⁹⁹

Dr. Lahey and the State next assert that the IPEC RVI AMP “manifestly ‘does not include preventative actions.’”³⁰⁰ But this claim is based on a single phrase, lifted from the RVI AMP out of context, and in disregard of the remainder of the section which explains the preventive actions Entergy is taking related to RVIs—even if they are being taken in the context of programs other than the RVI AMP.³⁰¹

In any event, Entergy’s witnesses readily show that this claim is incorrect, as shown in the LRA itself and the RVI AMP. Specifically, the IPEC Water Chemistry Control program provides for preventive and mitigative action by maintaining primary water chemistry in

²⁹⁵ See Entergy’s Testimony § VII.A.8.c (ENT000616).

²⁹⁶ See MRP-227-A at 4-26 (NRC000114B).

²⁹⁷ See Entergy’s Testimony at A194 (ENT000616).

²⁹⁸ Revised Lahey Testimony at 60 (NYS000482).

²⁹⁹ See Entergy’s Testimony at A196 (ENT000616).

³⁰⁰ Revised SOP at 26 ¶ 21 (quoting NL-12-037, Attach. 1 at 5 (NYS000496)); see also Revised Lahey Testimony at 53 (NYS000482).

³⁰¹ See NL-12-037, Attach. 1 at 5 (NYS000496).

[REDACTED]

accordance with EPRI guidelines.³⁰² In addition, as part of the RVI aging management activities, Entergy replaced the IP2 split pins in 1995, the IP3 split pins in 2009, and will replace the IP2 split pins again in 2016.³⁰³ Further, Entergy will use the Fatigue Monitoring Program to track fatigue usage of RVI components with CUF analyses, thereby ensuring that the number of transients does not exceed the assumptions in the Westinghouse fatigue analyses.³⁰⁴ In addition, Entergy has implemented neutron flux reduction programs to minimize radiation effects and the resulting potential for degradation.³⁰⁵

Finally, the State and Dr. Lahey argue that Entergy must proactively replace RVIs, rather than managing the effects of aging through inspections and appropriate corrective actions (*i.e.*, an AMP).³⁰⁶ This position is entirely unsupported and disregards the technical basis for the RVI AMP as documented in all of the supporting reports for MRP-227-A. Moreover, the State's position is contrary to Commission precedent, because it amounts to a demand that aging effects be *precluded*, and seeks to negate the regulatory standard in 10 C.F.R. § 54.21(a)(3), which requires the applicant to show that there is reasonable assurance that the effects of aging will be adequately *managed*.³⁰⁷ Thus, the State's view is entirely without merit.

The IPEC Fatigue Evaluations Appropriately Analyze Environmentally-Assisted Fatigue

The State also claims, in NYS-25, that the EAF evaluations prepared by Westinghouse in support of the IPEC LRA, including EAF evaluations of RVI components, “may” be non-

³⁰² See Entergy's Testimony at A203 (ENT000616) (citing NL-12-037, Attach. 1 at 5 (NYS000496); SSER 2 at 3-66 (NYS000507) (emphasis added)).

³⁰³ See *id.* (citing SSER 2 at A-15 (NYS000507)).

³⁰⁴ See *id.*

³⁰⁵ See *id.* (citing NL-12-037, Attach. 2 at 21-22 (NYS000496)).

³⁰⁶ See NYS Revised SOP at 31 (NYS000481); Revised Lahey Testimony at 79 (NYS000482).

³⁰⁷ See *Seabrook*, CLI-12-5, 75 NRC at 315.

[REDACTED]

conservative.³⁰⁸ In contrast to this speculation, Entergy's witnesses show that the Westinghouse EAF evaluations are fully-documented, conservative engineering analyses that support a finding that the effects of fatigue, including the effects of the reactor water environment, will be adequately managed.³⁰⁹ Entergy's witnesses explain this in their testimony on this contention,³¹⁰ and on the metal fatigue contention (NYS-26B/RK-TC-1B),³¹¹ which is incorporated by reference into their NYS-25 testimony. Specifically, consistent with Entergy's commitments and with standard ASME Code methods, Westinghouse recalculated each of the limiting CLB CUFs provided in Section 4.3 of the LRA for the RVIs to include reactor coolant environmental effects.³¹² Entergy's witnesses show that there is no technical basis to apply any additional correction factors to account for the potential effects of embrittlement on fatigue life, beyond the correction factors specified in NRC guidance.³¹³

Moreover, fatigue is one of the eight age-related degradation mechanisms evaluated during the development of the guidelines in MRP-227-A.³¹⁴ As a result, the RVI AMP includes inspections intended to identify potential cracking caused by fatigue in susceptible RVI components.³¹⁵ These inspection activities are in addition to, not in lieu of, the review of EAF for RVI components under the FMP.³¹⁶ Thus, taken together, the RVI AMP and FMP provide

³⁰⁸ NYS Revised SOP at 17 (NYS000481).

³⁰⁹ See Entergy's Testimony § VII.A.9 (ENT000616).

³¹⁰ See *id.*

³¹¹ See generally Entergy's NYS-26B/RK-TC-1B Testimony (ENT000679).

³¹² See Entergy's Testimony at A206 (ENT000616).

³¹³ See Entergy's NYS-26B/RK-TC-1B Testimony at A76 (ENT000679).

³¹⁴ See *id.* at A208.

³¹⁵ See *id.*

³¹⁶ See *id.*



reasonable assurance that the effects of aging due to fatigue on RVI components will be adequately managed throughout the PEO.

j. The RVI AMP Addresses Operating Experience

Entergy’s witnesses describe how the industry has engaged in a decade-long effort to evaluate aging management of PWR RVIs, implement plant-specific AMPs for aging management of internals, develop a detailed RVI inspection program that has been approved by the NRC, and continues to collect and share relevant inspection results and operating experience for improved reliability.³¹⁷ Consistent with the operating experience element of the RVI AMP and Commitment 40, Entergy will continue to review domestic and international operating experience during the PEO, and appropriately apply that operating experience in the IPEC RVI AMP, including updated inspection methods and improved methods of evaluating aging effects.³¹⁸

* * * * *

In sum, Entergy’s experts demonstrate that the IPEC RVI AMP is consistent with MRP-227-A, as it uses state-of-the-art engineering and operating experience and demonstrated inspection techniques. Dr. Lahey and the State have overlooked rather than disputed the substantial technical basis developed by the EPRI MRP. Overall, the RVI AMP provides reasonable assurance that the effects of aging on the IP2 and IP3 RVIs will be adequately managed such that the intended functions of the IP2 and IP3 RVIs will be maintained consistent with the CLB throughout the PEO, as required by 10 C.F.R. §§ 54.21(a)(3), 54.21(c), and 54.29(a).

³¹⁷ See *id.* at A211.

³¹⁸ See *id.* § VII.A.10.

2. Entergy's Aging Management Activities for RPVs

As noted above, the State's initial pleadings in 2007 on this contention focused primarily on the RPVs, rather than the RVIs, claiming that the information in the LRA on the RPV TLAA's did not include information on "age-related accident analyses,"³¹⁹ and that an "intermediate shell in IP2 will not meet the upper shelf energy acceptance criterion of 50ft-lb."³²⁰ Following the admission of contention NYS-25, Entergy submitted several RPV-related amendments to clarify its LRA, revise the description of how Entergy would address the then-proposed alternate PTS rule, and note the closure of certain RPV-related commitments.³²¹ The State, however, has never amended NYS-25 to address or challenge these updates.³²² Instead, the State has shifted its focus to RVIs.³²³ In particular, in Dr. Lahey's prefiled testimony and the State's statements of position on this contention, Dr. Lahey and the State do not allege any specific deficiency in Entergy's LRA regarding the RPVs.³²⁴ To ensure a complete record, however, Entergy's expert witnesses summarize the information regarding RPVs in the IPEC LRA and show that the LRA complies fully with 10 C.F.R. Parts 50 and 54 and is consistent with NRC Staff guidance regarding the management of the effects of aging and the evaluation of TLAA's for RPVs.³²⁵

In his most recent testimony, Dr. Lahey refers to certain documents discussing Branch Technical Position ("BTP") 5-3, which is longstanding NRC guidance for estimating the initial,

³¹⁹ NYS Petition at 224.

³²⁰ *Id.* at 226.

³²¹ *See* Entergy's Testimony at A50 (ENT000616).

³²² *See id.* at A51.

³²³ NYS Revised SOP at 17 (NYS000481) ("[t]he focus of Contention 25 is Entergy's deficient AMP for RPVIs"); *see also* Position Statement at 10 (NYS000293).

³²⁴ *See* Report (NYS000296); Lahey 2011 Testimony (NYS000294); Revised Lahey Testimony at 74 (NYS000482).

³²⁵ *See* Entergy's Testimony §§ V.A.C, VII.B (ENT000616).

[REDACTED]

unirradiated transition temperature for certain RPVs when some of the required testing information is not available, and suggests that certain RPV embrittlement analyses “may” be non-conservative.³²⁶ But he cites this example only for the general principle that it is “very important to preserve – rather than erode – operational safety margins” as reactors age.³²⁷ Therefore, the State’s testimony contains no valid challenge to Entergy’s LRA with regard to the management of the effects of aging on RPVs. In any event, Entergy’s witnesses explain that this is actually a good example of the level of inherent conservatisms in embrittlement evaluations for RPVs. Specifically, the industry has now shown that other conservatisms and margin in RPV embrittlement calculations were more than sufficient to offset the potential non-conservatism identified in the BTP 5-3 methodology.³²⁸

VI. CONCLUSION

For the foregoing reasons, the IPEC RVI and RPV aging management activities are consistent with NRC guidance, which is entitled to special weight, and satisfy all regulatory requirements. Therefore, Entergy’s LRA provides reasonable assurance that the effects of aging will be adequately managed throughout the PEO. The Intervenors have not carried their burden of providing sufficient evidence to support the claims made in NYS-25. Accordingly, NYS-25 should be resolved in Entergy’s favor.

³²⁶ Revised Lahey Testimony at 74 (NYS000482).

³²⁷ *Id.*

³²⁸ *See* Entergy’s Testimony at A79 (ENT000616).

Respectfully submitted,

Executed in Accord with 10 C.F.R. § 2.304(d)

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