

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

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In re:

Docket Nos. 50-247-LR; 50-286-LR

License Renewal Application Submitted by

ASLBP No. 07-858-03-LR-BD01

Entergy Nuclear Indian Point 2, LLC,
Entergy Nuclear Indian Point 3, LLC, and
Entergy Nuclear Operations, Inc.

DPR-26, DPR-64

September 9, 2015

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**STATE OF NEW YORK AND RIVERKEEPER'S
SUPPLEMENTAL REPLY STATEMENT OF POSITION
CONTENTION NYS-38/RK-TC-5**

United States Nuclear Regulatory Commission Official Hearing Exhibit	
In the Matter of:	Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3)
	ASLBP #: 07-858-03-LR-BD01 Docket #: 05000247 05000286 Exhibit #: NYS000573-PUB-00-BD01 Admitted: 11/5/2015 Rejected: Other:
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TABLE OF CONTENTS

PRELIMINARY STATEMENT.....1
BACKGROUND.....2
LEGAL STANDARDS.....3
ARGUMENT.....4
CONCLUSION.....13

PRELIMINARY STATEMENT

In accordance with 10 C.F.R. § 2.107(a)(1) and the Atomic Safety and Licensing Board’s (“Board”) July 1, 2010 Scheduling Order,¹ the Board’s December 9, 2014 Revised Scheduling Order,² and the Board’s May 27, 2015 Order,³ the State of New York (the “State”) and Riverkeeper, Inc. (collectively, “Intervenors”) hereby submit this Supplemental Reply Statement of Position (or “SOP”) on New York and Riverkeeper’s Joint Contention NYS-38/RK-TC-5 (“NYS-38/RK-TC-5”), as supplemented on February 13, 2015. This Reply SOP and the underlying Contention are supported by the September 9, 2015 Reply Supplemental Testimony of Dr. David J. Duquette (“Duquette Reply Testimony” [Exh. NYS000571]), the September 9, 2015 Reply Supplemental Testimony of Dr. Richard T. Lahey, Jr. (“Lahey Reply Testimony” [Exh. NYS000572]), the Rebuttal Testimony and Report of Dr. Joram Hopenfeld (“Hopenfeld Rebuttal Testimony” [Exh. RIV000162]; “Hopenfeld Report” [Exh. RIV000161]), and the exhibits cited therein.

Intervenors submit this Supplemental Reply and accompanying expert testimony and report to buttress their contention that Entergy’s license renewal application (“LRA”) for Indian Point Units 2 and 3 should be denied because: (1) it continues to lack appropriate consideration of aging mechanisms on reactor vessels, reactor vessel internals, and steam generators, and (2) it fails to provide well-defined and enforceable remedies for effective management of such degradation, which, taken together, leave NRC without an adequate record and a rational basis

¹ *Entergy Nuclear Operations, Inc.* (Indian Point, Units 2 and 3), Scheduling Order (July 1, 2010) (unpublished) (ML101820387).

² *Entergy Nuclear Operations, Inc.* (Indian Point, Units 2 and 3), Revised Scheduling Order (December 9, 2014) (unpublished) (ML14343A757).

³ *Entergy Nuclear Operations, Inc.* (Indian Point, Units 2 and 3), Order (Granting New York’s Motion for an Eight-Day Extension of the Filing Deadline) (May 27, 2015) (unpublished).

upon which it can make a reasonable assurance determination pursuant to 10 C.F.R. § 54.21, 42 U.S.C. §§ 2133 and 2232, and the Administrative Procedure Act (5 U.S.C. §§ 701 et seq.).

BACKGROUND

The background and procedural history of Contention NYS-38 are set forth in Intervenors' June 9, 2015 Revised Statement of Position (Exh. NYS000531). That Revised Statement of Position and the underlying Contention are supported by the June 2015 revised testimony of Dr. Duquette (Exh. NYS000532), the revised testimony of Dr. Lahey (Exh. NYS000562), the revised testimony and supplemental report of Dr. Joram Hopenfeld (Exhs. RIV000143, RIV000144), and the exhibits cited therein. In addition, the Contention is supported by previous submissions by these three witnesses, including the June and November 2012 testimony and report of Dr. Duquette (Exhs. NYS000372, NYS000373, NYS000399, NYS000452), the June and November 2012 testimony of Dr. Lahey (Exhs. NYSR000344, NYS000374, NYS000453), the June and November 2012 testimony of Dr. Hopenfeld (Exhs. RIV00035, RIV000102, RIV000134, RIV000143) and the documents referenced therein. In response, Entergy and NRC Staff submitted statements of position (Exhs. ENT000698 and NRCR000101), prefiled testimony (Exhs. ENT000699 and NRCR000161, NRC000168 and NRC000197),⁴ and various supporting exhibits, urging that Contention NYS-38/RK-TC-5 should be resolved in favor of the applicant. These submissions fail to fully address Intervenors' concerns or rebut Intervenors' claim that Entergy's aging management plan for the reactor vessels, reactor vessel internals, and steam generators at Indian Point Units 2 and 3 are

⁴ Notably, Entergy submitted only a non-public version of its Statement of Position and Prefiled Testimony, both of which were designated as proprietary in their entirety. On August 31, 2015, the State requested that Entergy submit public versions of its Statement of Position and Prefiled Testimony, in order to permit public participation in the upcoming November 2015 evidentiary hearing on Contention NYS-38. On September 3, 2015, counsel for Entergy indicated that they would submit redacted versions of the documents within two weeks.

insufficient in detail, adequacy and enforceability. Accordingly, Contention NYS-38/RK-TC-5 should be resolved in the State's and Riverkeeper's favor.

LEGAL STANDARDS

The applicable legal standards have been previously briefed by the State and Riverkeeper. *See* NYS and Riverkeeper Revised SOP on NYS-38 (Exh. NYS000531). Notably, Entergy and NRC place virtually determinative emphasis on Entergy's alleged compliance with various NRC Guidance Documents. Entergy SOP on NYS-38 (Exh. ENT000699); NRC SOP on NYS-38 (Exh. NRCR0161). However, NRC NUREGs, Regulatory Guides and other Guidance Documents are "routine agency policy pronouncements that do not carry the binding effect of regulation." *International Uranium (USA) Corp.* (Request for Materials License Amendment), CLI-00-1, 51 N.R.C. 9, 19 (2000). Ultimately, Entergy is required to show, among other things, that "there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the [current licensing basis]. . . [including] managing the effects of aging during the period of extended operation on the functionality of structures and components" such as RVIs. 10 C.F.R. § 54.29(a)(1); *see id.* § 54.21(a), (c). The State, with the aid of its expert witnesses, has shown that the numerous deficiencies of Entergy's analyses and actions to date in support of its LRA deprives NRC with a basis to make the necessary reasonable assurance determination and that Entergy cannot, in any event, meet the regulatory requirements of 10 C.F.R. § 54.29.

ARGUMENT

Entergy and NRC Staff have failed to rebut the State's evidence that Entergy's license renewal application for Indian Point Units 2 and 3 cannot form an adequate basis for NRC to determine that aging degradation of various reactor vessels, steam generators, and reactor pressure coolant boundary components will be adequately managed during the period of extended operation. As an initial matter, Entergy's claim that it has recently fulfilled some of the commitments which formed the basis of contention NYS-38/RK/TC-5 does not render the contention moot. Several commitments, such as Commitments 41 and 42 relating to steam generators, remain outstanding. Furthermore, while Entergy has implemented an inspection-based reactor vessel internals aging management program (RVI AMP) and has recently performed Environmentally-Assisted Fatigue (EAF) analyses in accordance with various commitments (Commitments 30, 43, and 49), those actions are based on fundamentally flawed analyses. As set forth in greater detail in the State and Riverkeeper's June 2015 Revised and September 2015 Supplemental Reply Statements of Position on NYS-25 and NYS-26B, and summarized below, Entergy's RVI AMP and EAF analyses rely on flawed methodologies and erroneous assumptions, including:

- failure to consider neutron embrittlement of RVI, and its impact on core coolability, particularly during loss-of-coolant-accidents and other pressure or thermal shockloads;
- assumption that inspections are sufficient to identify components weakened by embrittlement;
- failure to maintain conservatism in performing EAF calculations;
- failure to consider synergistic effects of multiple aging mechanisms such as embrittlement and fatigue;

- assumption that embrittled components will not experience cracking or failure prior to its environmentally adjusted cumulative usage factor (CUFen) reaches unity;
- failure to perform EAF error analyses;
- failure to properly expand its EAF analyses to the most limiting locations;
- failure to identify proper transients or apply appropriate shock codes for its EAF analyses.

Not only has Entergy failed to properly analyze and address issues of irradiation embrittlement and metal fatigue, its RVI AMP lacks important details such inspection schedules and acceptance criteria for baffle former bolts cracking and identification of effective non-destructive examination techniques. Entergy's RVI AMP and EAF analyses are wholly inadequate to manage the effects of aging during the period of extended operation.

With respect to Entergy's outstanding commitments to address aging degradation of the Indian Point steam generator divider plate assemblies and tube-to-tubesheet welds, namely Commitments 41 and 42, [REDACTED]

[REDACTED] (NYSR000544A-D) calls into serious question whether Entergy will ever perform actual inspections of those components. Entergy's recent testimony suggests that despite Entergy's prior commitment in Commitment 41 to inspect IP2 and IP3 divider plates for PWSCC, Entergy is now considering retraction of that commitment based on [REDACTED]

[REDACTED] Entergy is also considering, in lieu of tube-to-tubesheet inspections for Commitment 42, [REDACTED]

[REDACTED] As discussed in greater detail in the reply testimonies and reports of Drs. Duquette, Lahey, and Hopenfeld (Exhs. NYS000571,

NYS000572, RIV000161, RIV000162), divider plate assemblies and tube-to-tubesheet welds at IP2 and IP3 are potentially susceptible to PWSCC due to their relatively low-chromium content, and baseline inspections of these components are necessary to detect cracks due to PWSCC and other aging mechanisms. Even though IP2 is now into its period of extended operations, and IP3 will be entering extended operations in a matter of months, neither NRC nor the Intervenors currently know what course of action Entergy will ultimately take to address PWSCC in divider plates and tube-to-tubesheet-welds. If Entergy opts to rely on the [REDACTED], the divider plates and tube-to-tubesheet welds at IP2 and IP3 may never be inspected for PWSCC even though industry research suggests that the chromium content of these components may be insufficient to mitigate PWSCC. For these reasons, Entergy's license renewal application and aging management plan lack the detail and substance required under the Atomic Energy Act, Administrative Procedure Act and NRC regulations, for the NRC to determine a rational basis for license renewal. 42 U.S.C. § 2133(b),(d); 42 USC § 2232(a); 5 U.S.C. §§ 701 *et seq.*; 10 C.F.R. §§ 54.21(a)(3), (c)(1)(iii).

POINT I

ENTERGY'S RVI AMP AND EAF ANALYSES ARE BASED ON FLAWED METHODOLOGIES AND ERRONEOUS ASSUMPTIONS, AND ARE THEREFORE INADEQUATE TO FORM THE BASIS FOR A DETERMINATION BY THE NRC THAT ENTERGY HAS PROVIDED REASONABLE ASSURANCE THAT AGING MECHANISMS WILL BE ADEQUATELY MANAGED IN THE PERIOD OF EXTENDED OPERATION.

The State and Riverkeeper's June 2015 Revised and September 2015 Supplemental Reply SOPs and supporting testimonies, reports and exhibits relating to Contentions NYS-25 and NYS-26B/RK-TC-1B address the inadequacies of Entergy's RVI AMP and EAF analyses, including Entergy's deferral of important RVI program elements. These elements include the

development of appropriate techniques and schedules for the inspection of baffle-former bolts, as well as the development of acceptance criteria for baffle-former bolt cracking. For the sake of brevity, Intervenors refer the Board to arguments set forth in those documents and hereby incorporate their contents by reference.

POINT II

ENERGY HAS FAILED TO CONDUCT AN ADEQUATELY EXPANDED FATIGUE ANALYSIS OF THE MOST LIMITING LOCATIONS AND HAS THEREFORE FAILED TO PROVIDE REASONABLE ASSURANCE THAT AGING MECHANISMS WILL BE ADEQUATELY MANAGED IN THE PERIOD OF EXTENDED OPERATION.

The State and Riverkeeper's June 2015 Revised and September 2015 Supplemental Reply SOPs and supporting testimonies, reports and exhibits relating to Contentions NYS-26B/RK-TC-1B address the inadequacies of Entergy's EAF screening analyses and failure to conduct an adequately expanded fatigue analysis based on the most limiting locations at IP2 and IP3. Intervenors refer the Board to arguments set forth in those documents and hereby incorporate their contents by reference.

POINT III

ENERGY'S LACK OF COMMITMENT TO INSPECTING FOR PWSCC IN STEAM GENERATOR DIVIDER PLATE ASSEMBLIES AND TUBE-TO-TUBESHEET WELDS, TOGETHER WITH ITS FAILURE TO CLEARLY IDENTIFY WHAT ACTIONS IT WILL TAKE TO MANAGE THIS AGING DEGRADATION MECHANISM DEPRIVES NRC OF A RATIONAL BASIS TO DETERMINE THAT AGING DEGRADATION OF SUCH COMPONENTS WILL BE ADEQUATELY MANAGED.

Entergy has not inspected its steam generator divider plates and tube-to-tubesheet welds for PWSCC, and may never do so. Indeed, Entergy has admitted that it is now reconsidering its

Commitment 41, in which it unambiguously agreed to perform divider plate inspections for IP2 and IP3. Entergy Testimony at A190 (Exh. ENT000699). The company has also indicated that, in lieu of inspecting tube-to-tubesheet welds for PWSCC, it is evaluating whether to rely instead on [REDACTED] to satisfy its obligations under Commitment 42. *Id.* Entergy cannot show, and NRC cannot find, that Entergy's LRA adequately provides for aging management because Entergy has failed to make any enduring commitment to monitor for PWSCC in steam generator divider plates and tube-to-tubesheet welds through inspection, which is the only effective means to ensure that cracks do not occur and/or grow undetected.

A. Commitment 41 – Divider plate inspections.

In response to industry experience and NRC concerns regarding PWSCC in steam generator divider plates, Entergy adopted Commitment 41 in 2011. See NL-11-074, Attach. 1 (NYS000152). That commitment required Entergy to perform inspections of the eight steam generators at IP2 and IP3 using a method capable of identifying PWSCC. The one-time inspections were proposed to take place after the units entered their respective periods of extended operation. As written, however, Commitment 41 included only a nebulous plan to address PWSCC in aging steam generators with future, one-time inspections. Indeed, rather than identifying a method for inspections, Entergy chose to postpone developing any description of an inspection program until industry guidelines for such inspections were developed. Unfortunately, this means that Entergy, under its Commitment 41, is not obligated to produce the inspection program until sometime prior to the completion of the first 10 years of extended operation for IP3. *Id.* at 3-19. For IP2, Entergy committed to produce details of its inspection program prior to the time of the first refueling outage after license extension for IP 2. *Id.*

It now appears that Entergy's commitment to addressing PWSCC in steam generator divider plate assemblies is even more tenuous. Entergy's recent testimony clearly reflects that Entergy is non-committal about its fulfillment of Commitment 41 regarding inspection of divider plates in the eight IP2 and IP3 steam generators. While Entergy states that it is prepared to conduct divider plate inspections and is planning to conduct such inspections according to the schedule set forth in Commitment 41, it is also considering retraction of that commitment based on [REDACTED].⁵ Entergy Testimony at A190 (Exh. ENT000699). The fate of Entergy's proposed one-time inspection plan for the IP2 and IP3 divider plates is therefore uncertain pending NRC's review of the [REDACTED]

[REDACTED] Notably, Commitment 41 was accepted by the NRC and formed a basis for NRC's Safety Evaluation Report , Supplement 1 ("SSER1") for Indian Point. Retraction of that commitment would render the SSER1 invalid. In any event, Entergy's equivocation on the issue of future inspections to identify PWSCC in the divider plates deprives NRC with any rational basis to determine that PWSCC in the divider plate assemblies will be adequately managed.

B. Commitment 42 – Tube-to-Tubesheet Welds.

Entergy has indicated that it is evaluating whether to rely on [REDACTED] to demonstrate IP3's tube-to-tubesheet welds' lack of susceptibility to PWSCC in fulfillment of Commitment 42. For IP2, Entergy proposes to take no further action.⁶

C. The divider plates and tube-to-tubesheet welds are susceptible to PWSCC, and any aging management plan that does not include visual inspections is inadequate.

⁵ EPRI has asserted that the [REDACTED] contains confidential business information and therefore is proprietary.

⁶ In 2014, Entergy applied for, and received a license amendment for IP2 which redefined the reactor coolant pressure boundary so as to exclude tube-to-tubesheet welds. Technical Specification Amendment 277 (Exh. NYS000542).

Essentially, Entergy's current plan for addressing PWSCC in divider plates and tube-to-tubesheet welds could include any one of the following: 1) reliance on industry-funded analysis of PWSCC susceptibility; 2) deferred one-time inspections; or 3) no inspections at all. The testimony of Intervenors' experts establishes that any aging management program proposed by Entergy that does not include baseline visual inspections prior to entering extended operations, with appropriate periodic follow-up inspections, is inadequate.

Entergy's expert, Barry Gordon, suggests that inspections are unnecessary because the tubes and tube-to-tubesheet weldments contain greater than [REDACTED] and are therefore resistant to PWSCC based on their chromium content. Entergy Testimony at A188 (Exh. ENT000699). However, [REDACTED]

Dr. Duquette concludes that baseline visual inspections prior to license renewal (or as soon as possible in the case of IP2), with periodic follow-up inspections is the only effective means to ensure that cracks – whether due to PWSCC or fatigue -- do not occur and/or grow undetected. As Dr. Duquette notes, Mr. Gordon himself has identified in a 2013 article a list of myriad problems associated with unexpected corrosion-related events encountered in the PWR fleet. Entergy has indicated that it already has the means to perform inspections of the divider plate assemblies, tubesheet welds and channel head components. Entergy Testimony at A190. (Exh. ENT000699). The NRC should require Entergy to perform such inspections as a condition of any license renewal.

Although Entergy contends that a cracked divider plate does not pose a safety concern, Dr. Lahey’s testimony points out that [REDACTED] [REDACTED] (Exh. NYS000572). They do not address the potential loss of heat transfer functionality – and its impact on core cooling – should a highly fatigued divider plate such as the one in IP3, is subjected to a thermal or pressure shock load associated with a loss of coolant accident. Dr. Lahey also notes that appropriate stress analyses of the divider plates requires the use of specialized shock codes, [REDACTED] [REDACTED]

Finally, Intervenors note that NRC’s testimony identified four pillars of good engineering practice for managing aging degradation issues, which include the “development of reasonable measures to assess the condition of one’s plant.” NRC Testimony at A143 (Exh. NRCR000161). NRC therefore determined that Entergy’s commitments to address PWSCC and verify the effectiveness of its Water Chemistry Control program through one-time inspections of the steam generator divider plates and tube-to-tubesheet welds demonstrated good engineering practice.

Id. Conversely, then, any retreat from those commitments should be viewed as poor engineering practice on Entergy's part.

CONCLUSION

In this proceeding, Intervenors have satisfied the standards contained in 10 C.F.R. § 2.309 governing contention admissibility – standards that NRC and Entergy have described as “strict by design.” The State and Riverkeeper now submit this Reply Statement of Position and accompanying testimony and exhibits to show that Entergy has not met its burden; that is, Entergy has not demonstrated that the effects of aging on the intended function(s) of steam generator components and other components in the reactor coolant system and reactor coolant pressure boundary will be adequately managed for the period of extended operation. The deficiencies of Entergy's application deprive the NRC of a sufficient record to make a “reasonable assurance” determination pursuant to 10 C.F.R. § 54.21 and 5 U.S.C. §§ 701 *et seq.* For the above reasons Entergy's application to renew the operating licenses for Indian Point Unit 2 and Unit 3 should be denied.

Respectfully submitted,

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