UNITED STATES

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In re:	Docket Nos. 50-247-LR; 50-286-LR
License Renewal Application Submitted by Entergy Nuclear Indian Point 2, LLC, Entergy Nuclear Indian Point 3, LLC, and Entergy Nuclear Operations, Inc.	ASLBP No. 07-858-03-LR-BD01 DPR-26, DPR-64 November 8, 2012

PRE-FILED WRITTEN REBUTTAL TESTIMONY OF DR. DAVID J. DUQUETTE REGARDING CONTENTION NYS-38 / RK-TC-5

On behalf of the State of New York ("NYS" or "the State"), the Office of the Attorney General hereby submits the following rebuttal testimony by David J. Duquette, Ph.D. regarding Contention NYS-38/RK-TC-5.

Q. Please state your full name.

A. David J. Duquette.

Q. What is the purpose of this rebuttal testimony you are now providing?

A. The State of New York has asked me to respond to Entergy's August 20, 2012 and NRC Staff's August 20, 2012 testimony and statements on Contention NYS-38/RK-TC-5.

Q. What documents did you review in preparation for this rebuttal testimony?

A. I reviewed Entergy's August 20, 2012 Statement of Position Regarding Contention NYS-38/RK-TC-5 (ENT000520), Entergy's Pre-filed Testimony of Entergy witnesses Nelson Azevedo, Robert Dolansky, Alan Cox, Jack Strosnider, Robert Nickel, Ph.D., and Mark Gray Regarding Contention NYS-38/RK-TC-5 (ENT000521), and the accompanying exhibits. I also reviewed the NRC Staff's August 20, 2012 Statement of Position on Contention NYS-38/RK-TC-5 (NRC000147), NRC's Pre-filed Testimony of NRC Witnesses Dr. Allen Hiser and Kenneth Karwoski Concerning Portions of Contention NYS-38/RK-TC-5 (NRC000161), which focuses on steam generator issues, and the accompanying exhibits.[1] In addition, I have reviewed documents previously submitted by the State on this contention and various additional documents

[1] NRC Staff also submitted pre-filed testimony on another aspect of Contention NYS-38/RK-TC-5, namely NRC000148. That testimony focused on metal fatigue issues and did not discuss my June 2012 testimony or report on steam generator issues. NRC Staff's Pre-filed Testimony of NRC witnesses Dr. Allen Hiser, On Yee, and Dr. Ching Ng, Concerning Portions of Contention NYS-38/RK-TC-5 (NRC000148). Accordingly, my rebuttal testimony here does not discuss NRC000148.

including a presentation from the EPRI Steam Generator Task Force (SGTF) to the NRC entitled “NRC/EPRI Steam Generator Task Force Meeting”, dated August 21, 2012 (NYS000463), a NRC chart identifying original and replacement steam generators at U.S. plants prepared in 2009 (NYS000458), a paper numbered ICONE18-29457 entitled “Inspection of the Steam Generator Divider Plate,” presented at the 18th International Conference on Nuclear Engineering, authored by D. D’Annucci and E. Lecour of Westinghouse for the May 2010 ICONE meeting (ENT000526), EPRI Report 1025133, “Steam Generator Management Program: Assessment of Channel Head Susceptibility to Primary Water Stress Corrosion Cracking,” dated June 2012 (ENT000524), and various summary or demonstrative exhibits prepared by the State (NYS000454 to NYS000456).

Q. What are your overall conclusions regarding NRC Staff and Entergy’s testimony?

A. It appears that both Entergy and the NRC staff agree with my assessment that there are no qualified techniques currently in use in the United States to inspect the channel head, and specifically the divider plates of the steam generators in use at Indian Point Unit 2 and Unit 3. While both Entergy and NRC Staff indicate that there may be techniques

currently used in other countries to perform these inspections, their testimony makes clear that those techniques have not been qualified for service in the United States. In essence, since the rebuttal testimony by Entergy and NRC staff suggests that divider cracking has not been observed to date in United States-based steam generators it is unlikely to occur in the future, and Entergy's general approach to aging management issues will effectively provide adequate safety measures if cracking were to occur. Thus, the rebuttal testimony has a "trust us" attitude in the absence of real data, or an active and sufficiently detailed aging management program specifically focused on the divider plates. Both Entergy and NRC Staff testimonies acknowledge that the EPRI-sponsored Steam Generator Task Force is currently conducting an extensive research program to address cracks in the divider plates that may propagate and compromise pressure boundary components. It is unrealistic to recommend that divider plate cracking and the development of divider plate inspection programs can be either ignored or deferred while the aforementioned research program is ongoing. The EPRI research program also addresses research into the development of potential remote inspection techniques to monitor primary water stress corrosion cracking (PWSCC) crack propagation. Until a

qualified inspection technique has been identified for use in the United States and at the Indian Point steam generators, it is unreasonable to continue to operate the steam generators for extended periods of time without some method for determining the possibility and/or extent of cracking.

Q. Did the Entergy and NRC Staff testimony and exhibits change the opinions that you previously presented in connection with this Contention NYS-38/RK-TC-5?

A. Absolutely not. I did not find any of their testimony or exhibits to be compelling.

Q. Please summarize your rebuttal testimony.

A. This rebuttal testimony reinforces my initial position on Contention NYS-38/RK-TC-5.

1. Both Entergy and the NRC staff agree that the Indian Point Unit 2 and Indian Point Unit 3 steam generators have divider plates that are constructed from Alloy 600 and that the weld materials are also an Alloy 600 derivative (Alloy 82/182). It is well known that Alloy 600 is susceptible to PWSCC.

2. The susceptibility of the divider plates to PWSCC and the possibility of the propagation of stress corrosion cracks into the pressure boundary components are still under investigation by the SGTF. The investigation includes

development of possible inspection techniques for the detection of cracks and of crack propagation.

3. While conventional inspection techniques may be available to detect cracking, there are no qualified techniques that are currently accepted in the United States for divider plate cracking that will assure the safety of inspecting personnel.

4. Entergy has elected to "analyze" the possibility of crack initiation in the divider plates that may propagate into the pressure boundary components including the tube-to-tubesheet welds. It implies that actual inspections are unlikely when it states: "in the unlikely event that inspections become necessary . . ." Entergy Pre-filed Testimony, at 112, Q/A 145 (ENT000521). However, it does not state how the analyses they will perform to reach this ultimate conclusion will be performed, nor does it state what observations or events would trigger the need for inspections. To reiterate, with the possible exception of conventional *in situ* inspection techniques, which Entergy admits could present a potential for high personnel radiation exposure, it does not and cannot present a reliable, defined program for remote inspection. Instead, it will have to wait for the SGTF to possibly develop a

qualified procedure at some future, unspecified date. I also note that locations at which steam generator tubes taper or narrow can be susceptible to corrosion.

5. The evidence provided to date suggests that Entergy has not attempted to inspect the divider plates in the eight steam generators at Indian Point Unit 2 and Unit 3 by any technique. Accordingly, the current state of those divider plates appears to be entirely unknown.

6. Entergy has stated that its approach to the divider cracking problem is not dependent on the results of EPRI research, but that inspections being committed to by plants with renewed licenses will occur at an "appropriate" time, and that the IPEC Quality Assurance Program will "drive appropriate safety evaluations." Neither of these statements is a cause for celebration. "Appropriate" is an ill-defined term, and the IPEC Quality Assurance Program, which is principally under the auspices and control of the proponent, cannot be defined as good engineering practice. Good engineering practice would suggest external periodic reviews of safety related programs.

7. In my June 2012 report, I pointed out that EPRI has generically stated that the divider plates in United States steam generators are thicker than those that have experienced

cracking in international steam generators, and that factor may mitigate against PWSCC initiation in United States steam generators. Even if that general statement proved to be true for the majority of United States steam generators, the divider plates at Indian Point Unit 2 and Unit 3 are an exception to this general rule. While the majority of steam generators in the United States have divider plate thicknesses of approximately 1.9 inches, the Westinghouse Model 44F steam generators at Indian Point Unit 2 and Unit 3 have a plate thickness of 1.26 inches, essentially the equivalent of the 1.3 inch thick divider plates used in the French steam generators where PWSCC cracking was first discovered. Thus, barring the possibility of differences in loading of the divider plates and associated assemblies, the steam generators at Indian Point have essentially the same sensitivity to PWSCC as the French steam generators.

8. In my initial June 2012 testimony in this proceeding I referred to cracking that had occurred in the steam generator at Indian Point Unit 2. I agree with Entergy that replacement of mill annealed Alloy 600 tubing with thermally treated Alloy 600 tubing will reduce (but not eliminate) the potential for PWSCC

in steam generator tubes.[2] However, no evidence has been presented that the divider plates are constructed from thermally treated alloys. Even if they were, the geometry of cracking that has been observed in foreign steam generators has occurred near the welds joining the divider plates to the stub runners. Welding of these components can be expected to lead to dissolution of the grain boundary precipitates that are believed to provide a degree of PWSCC resistance in thermally treated alloys. Accordingly, the Entergy comments concerning the lack of cracking in the steam generator with Alloy 600TT tubes has little or no relevance to the possibility of PWSCC in the divider plates or stub runners -- or for that matter in the tube-to-tubesheet welds.

Q. Does this conclude your rebuttal testimony?

A. Yes. However, I reserve the right to offer further opinions if new information is presented.

[2] Often times the abbreviation “TT” is used to designate thermally treated components, e.g., “Alloy 600 TT” tubes.

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DECLARATION OF DAVID J. DUQUETTE

I, David J. Duquette, do hereby declare under penalty of perjury that my statements in the foregoing rebuttal testimony and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

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

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