



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

June 8, 2018

Mr. Richard Webster  
Legal Program Director  
Riverkeeper, Inc.  
20 Secor Road  
Ossining, NY 10562

Dear Mr. Webster,

I am responding to your letter dated April 23, 2018 (Agencywide Documents and Access Management System (ADAMS) Accession No. ML18129A173), regarding evidence of leakage of a very small amount, identified in one of 97 reactor pressure vessel (RPV) head penetration welds during the Spring 2018 refueling outage at Indian Point, Unit 2 (IP2). Specifically, a very small amount of dried white residue was observed at the base of RPV Penetration No. 3. The condition was identified by Entergy personnel completing an NRC required examination intended to closely monitor for this potential condition.

The NRC completed a teleconference call, open to public participation, on April 12, 2018, between the NRC and the State of New York<sup>1</sup> to discuss ongoing NRC inspections and reviews. In follow-up to the call, the NRC received your letter dated April 23, 2018, which asked that the NRC respond to two issues that you raised. The first issue you raised pertained to whether the NRC considered the leakage a violation of the operating license and whether NRC would take any related enforcement actions. The second issue you raised pertained to whether the NRC should require more frequent or more thorough inspections to ensure that leaks do not develop around other penetrations in the reactor head during the next operating cycle.

As background, the NRC inspectors, specializing in material related issues, complete inspections every refueling outage at each U.S. Nuclear Power Plant to independently verify that plant owners examine RPV heads and risk significant piping components in accordance with our regulatory requirements. Our inspection staff was onsite at IP2 completing NRC inspections when Entergy staff examined the Unit 2 RPV head and identified evidence that a leak had occurred in Penetration No. 3 during the previous operating cycle. During this inspection, our inspectors independently confirmed that Entergy staff properly characterized the leak and performed an extent-of-condition assessment of all RPV head penetrations and their associated J-groove welds. This assessment included a qualified volumetric and surface examination and assessment of all 97 RPV head penetration nozzles, and bare metal visual examinations of the top surface of the RPV upper head for indications of possible leakage through penetration nozzles or weld material. No additional indications were identified during these activities.

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<sup>1</sup> Summary of 4/12/2018 Meeting with the State of New York regarding the Indian Point Generating Unit No. 2 Reactor Pressure Vessel Head Penetration Alternative Weld Repair, ADAMS Accession No. ML18131A057

In response to your first issue through-wall flaws similar to that identified and repaired in Penetration No. 3 are not considered to be safety significant because there was no evidence of corrosion or degradation of RPV base material, and flaws of this type have been bounded by existing technical evaluations to not challenge the structural integrity of the reactor coolant pressure boundary (RCPB). The NRC staff further determined Entergy's repair provided for an acceptable level of quality and safety because the repair, which had been implemented successfully at a number of plants, embedded the flaw which sealed and isolated the J-groove weld from the reactor coolant water environment by application of a weld overlay of material highly resistant to primary water stress corrosion cracking (PWSCC). The NRC staff will document its review of Entergy's recent Licensee Event Report<sup>2</sup>, which reported this condition to the NRC as a RCPB leak, in a future publicly available inspection report. The inspection report will describe any enforcement actions that may be warranted in accordance with NRC policy.

NRC regulatory requirements implement a defense-in-depth approach involving initial material qualification for use, leakage monitoring technical specifications to identify action levels to maintain safety, and inspection and examination requirements intended to ensure reasonable assurance of the structural integrity of the RCPB. These requirements are appropriate as reasonable assurance is a high standard.

The design of nuclear components follows the criteria established in Section III of the Boiler and Pressure Vessel Code promulgated by the American Society of Mechanical Engineers (ASME). The NRC requires, in 10 CFR 50.55a, "Codes and Standards," the performance of in-service inspection, examination and testing of nuclear power plant components. Thus, the concept of defense-in-depth is applied to provide assurance that the structural integrity of the RCPB is maintained. NRC in-service examination requirements specifically address the active degradation mechanism of concern for the RPV upper head penetration nozzles and associated J-groove welds, which is PWSCC. Based upon operating experience, certain materials used to make the nozzles and welds of the IP2 RPV upper head have been shown to be susceptible to PWSCC.

In response to your second issue, the nature and frequency of the NRC-required examinations performed on the RPV upper head penetration nozzles and associated J-groove welds consider the effects of PWSCC, and are designed to provide reasonable assurance that structural integrity of the RCPB is maintained. In particular, the frequency of these examinations is based on the age and materials of the RPV head as well as a time-at-temperature model. To address uncertainties in this model, and in accordance with operating experience, the NRC requires licensees with previous indications of PWSCC to perform all of these examinations each refueling outage, regardless of the time-at-temperature model. In this way, the NRC finds that this in-service inspection program ensures that PWSCC cracking or RCPB leakage from a RPV upper head penetration or associated J-groove weld would be identified prior to impacting the structural integrity of the RPV upper head. This was the case at IP2 where these NRC-required examinations were conducted each refueling outage since 2009 due to reaching the time-at-temperature model limit.

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<sup>2</sup> ADAMS Accession No. ML18149A126

Additionally, NRC requirements are structured such that significant RCPB leakage would likely first show up as unidentified leakage if the leak location was not in an accessible area for visual inspection during plant operation such as inside containment on top of the RPV head. The IP2 technical specifications include limits on unidentified leakage, and leakage monitoring equipment in use at the plant is capable of identifying pressure boundary leakage well before the leakage exceeds the unidentified leak rate limit of one gallon per minute. As such, leakage would be readily identified by reactor coolant system leakage detection systems within a reasonable amount of time to allow for a controlled shutdown of the reactor prior to propagation of the leak into a gross structural failure. This is referred to as the leak-before-break criteria.

I trust this information is responsive to your questions. If you have any questions, please contact me at 301-415-1030 or via e-mail at [Richard.Guzman@nrc.gov](mailto:Richard.Guzman@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read 'R. Guzman', with a long horizontal flourish extending to the right.

Richard V. Guzman, Senior Project Manager  
Plant Licensing Branch I  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-247

cc: Listserv



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

June 8, 2018

Mr. David Lochbaum  
Director, Nuclear Safety Project  
Union of Concerned Scientists  
P.O. Box 15316  
Chattanooga, TN 37415

Dear Mr. Lochbaum,

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Sincerely,

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Richard V. Guzman, Senior Project Manager  
Plant Licensing Branch I  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-247

cc: Listserv

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT NO. 2 – REACTOR HEAD  
LEAKAGE DETECTED IN APRIL 2018

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**ADAMS Accession No. ML18144A065**

**\*concurrence via e-mail**

OFFICE	NRR/DORL/LPL1/PM	NRR/DORL/LPL1/LA	NRR/DMLR/MPHB/BC*
NAME	RGuzman	IBetts	SRuffin
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