



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

November 23, 2015

Vice President, Operations
Entergy Nuclear Operations, Inc.
Indian Point Energy Center
450 Broadway, GSB
P.O. Box 249
Buchanan, NY 10511-0249

**SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT NO. 2 – STAFF REVIEW OF
NETCO REPORT NET-300067-01, "CRITICALITY SAFETY ANALYSIS OF THE
INDIAN POINT UNIT 2 SPENT FUEL POOL WITH CREDIT FOR INSERTED
NEUTRON ABSORBER PANELS" (CAC NO. MF5282)**

Dear Sir or Madam:

On August 26, 2013, a Category 1 public meeting was held between Entergy Nuclear Operations, Inc. (Entergy), the licensee for Indian Point Nuclear Generating Unit No. 2 (IP2), its consultant, NETCO, and the staff of the Nuclear Regulatory Commission (NRC) in Rockville, MD, for the purpose of discussing Entergy's long-term spent fuel pool (SFP) management program. As discussed in the meeting summary (Agencywide Documents Access and Management Systems (ADAMS) Accession No. ML13256A079), the SFP management program focused on the development of a new SFP criticality safety analysis (CSA) for IP2 that would no longer take credit for the existing Boraflex panels but will take credit for newly designed neutron absorbing panels. While the new neutron absorbing panels had not reached final design, the CSA would be bounded by its design parameters. The program included submittal of a CSA that would be reviewed and accepted by the NRC staff, which would form the basis for a subsequent license amendment application that would seek NRC approval for the new neutron absorbing panels and revised technical specifications for the IP2 SFP.

By letter dated November 13, 2014, as supplemented by letters dated January 28, February 19, and August 14, 2015 (ADAMS Accession Nos. ML14329A194, ML15036A029, ML15062A206, and ML15261A536, respectively), Entergy submitted NETCO Report NET-300067-01, "Criticality Safety Analysis of the Indian Point 2 Spent Fuel Pool with Credit for Inserted Neutron Absorber Panels," for NRC review and approval.

The NRC staff reviewed the NETCO Report with the understanding that Entergy intends to submit a future license amendment referencing this report. By letter dated June 29, 2015 (ADAMS Accession No. ML15148A403), the staff issued a request for additional information (RAI) to which the licensee responded on August 14, 2015.

The report and RAI review covered both the licensee's depletion and criticality calculations using the review guidance provided in Division of Safety Systems Interim Staff Guidance 2010-01, "Staff Guidance Regarding the Nuclear Criticality Safety Analysis for Spent Fuel Pools". As part of the depletion analysis, the NRC staff reviewed (1) the depletion code validation, and (2) the selection of bounding fuel assembly and depletion conditions, which included the following modeling considerations:

- Burnable absorber usage
- Soluble boron usage
- Fuel and moderator temperature
- Assembly power and operating history effects
- Control rod operation
- Hafnium flux suppression insert usage
- Axial burnup profile specification

As part of the criticality analysis, the NRC staff reviewed (1) the criticality code validation, (2) the normal condition calculations, (3) the accident condition calculations, and (4) the bias and uncertainty analysis, which includes consideration of manufacturing tolerance uncertainties.

In Section 10, "Summary," of NETCO Report NET-300067-01, the licensee summarizes: (1) allowable fuel loading, (2) absorber panel requirements, (3) fuel requirements, and (4) reactor operation limits. These areas summarize the acceptable design parameters, operational practices, and corresponding limits that define the scope of the CSA performed in NETCO Report NET-300067-01.

Additionally, based on the licensee's RAI response, the NRC staff has identified several areas where further verification and discussion will be needed as part of a future license amendment application referencing NETCO Report NET-300067-01. These are as follows:

- (1) Verification that the neutron absorber insert will be appropriately monitored.
- (2) Verification that the neutron absorber insert installation will be procedurally controlled and that one insert type will be used as discussed in the RAI 1 response. Verify that all allowed fuel storage configurations during neutron absorber insert installation will be bounded by the CSA.
- (3) Verification that any future changes to the control rod design will be appropriately captured in existing processes for changes to the facility as discussed in the RAI 15, part c response.
- (4) Verification that the onsite part length control rods, as discussed in the RAI 15, part c response, are or will be appropriately controlled to ensure that they are not used in the IP2 SFP.
- (5) Verification that the curve fit equation is updated consistent with the discussion in the RAI 20 response.
- (6) Verification that appropriate administrative controls exist limiting the number of rods (i.e. 36) allowed to be stored in failed fuel canisters as discussed in the RAI 23 response.
- (7) Verification that fuel reconstitution administrative controls, as discussed in the RAI 26 response, are appropriate and consistent with the CSA.
- (8) Verification that plans for allowing missing panels are consistent with the CSA which assumes no more than "one out of every 36 cells is missing an absorber panel" as

discussed in the RAI 29 response. There should be either a discussion describing how it will be ensured that this assumption is met when installing inserts, or a discussion describing why the installation procedure would bound this assumption.

Based on its detailed review, the NRC staff finds that the CSA methodology is acceptable for use at IP2 and would meet the requirements of Title 10 *Code of Federal Regulations* (10 CFR) 50.68, "Criticality accident requirements," and General Design Criterion 62, "Prevention of criticality in fuel storage and handling," of 10 CFR Part 50, Appendix A, after verification of the eight areas discussed above. Any deviation from the design parameters and operational practices in a subsequent IP2 license amendment application would necessitate re-evaluation of the applicability or acceptability of the CSA methodology presented in NETCO Report NET-300067-01. The staff has no further technical concerns at this time.

Sincerely,

A handwritten signature in black ink, appearing to read "Douglas V. Pickett". The signature is written in a cursive, flowing style.

Douglas V. Pickett, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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Sincerely,

/RA/

Douglas V. Pickett, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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***by memo**

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