



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

July 25, 2016

Mr. Joel P. Gebbie  
Senior Vice President and  
Chief Nuclear Officer  
Indiana Michigan Power Company  
Nuclear Generation Group  
One Cook Place  
Bridgman, MI 49106

SUBJECT: DONALD C. COOK NUCLEAR PLANT, UNITS 1 AND 2 - REGULATORY AUDIT  
REPORT REGARDING LICENSE AMENDMENT REQUEST TO ADOPT  
TECHNICAL SPECIFICATIONS TASK FORCE-490, REV. 0, AND IMPLEMENT  
ALTERNATIVE SOURCE TERM (CAC NOS. MF5184 AND MF5185)

Dear Mr. Gebbie:

By letter dated November 14, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14324A209), as supplemented by letter dated February 12, 2015 (ADAMS Accession No. ML15050A247), Indiana Michigan Power Company (I&M), submitted a license amendment request for the Donald C. Cook Nuclear Plant, Units 1 and 2. The proposed amendment consists of adoption of Technical Specifications Task Force-490, Revision 0, and implementation of a full-scope alternative source term (AST) radiological analysis methodology.

An audit was conducted from June 27, 2016 to June 30, 2016 at the U.S. Nuclear Regulatory Commission (NRC) Headquarters in Rockville, MD, using an electronic reading room containing documents provided by I&M. The purpose of the audit was to support the NRC staff's review of the thermal hydraulic (TH) parameters used in the AST. Specifically, the auditor reviewed supporting documentation for the licensee's May 6, 2016, request for additional information response concerning steam generator tube uncover time and flashing fractions.

The NRC staff determined, based on the audit, that the licensee has applied the appropriate TH values to the AST calculations.

J. Gebbie

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The details of the results of the audit are set forth in the enclosed audit report. The NRC staff appreciates the resources that were made available by your staff during the audit. If you have any questions, please contact me at (301) 415-2846.

Sincerely,

A handwritten signature in black ink, appearing to read "Allison W. Dietrich". The signature is written in a cursive style with a large initial "A" and "D".

Allison W. Dietrich, Project Manager  
Plant Licensing Branch III-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-315 and 50-316

Enclosure:  
Audit Report

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

AUDIT REPORT BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
REGARDING LICENSE AMENDMENT REQUEST TO ADOPT TSTF-490, REVISION 0  
AND IMPLEMENT FULL-SCOPE ALTERNATIVE SOURCE TERM  
DONALD C. COOK NUCLEAR PLANT, UNITS 1 AND 2  
DOCKET NOS. 50-315 AND 50-316

1.0 INTRODUCTION

By letter dated November 14, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14324A209), as supplemented by letter dated February 12, 2015 (ADAMS Accession No. ML15050A247), Indiana Michigan Power Company (I&M, the licensee), submitted a license amendment request (LAR) for the Donald C. Cook Nuclear Plant (CNP), Units 1 and 2. The proposed amendment consists of adoption of Technical Specifications Task Force-490, Revision 0, and implementation of a full-scope alternative source term (AST) radiological analysis methodology.

The U.S. Nuclear Regulatory Commission (NRC) staff requested additional descriptions of the thermal hydraulic (TH) analysis and parameter information sources for the accidents considered in the AST analysis through a request for additional information (RAI) dated July 14, 2015 (ADAMS Accession No. ML15195A698). The licensee responded via letter dated August 24, 2015 (ADAMS Accession No. ML15238A726). An audit was conducted from September 21, 2015, to September 24, 2015, at the offices of I&M in Buchanan, Michigan to review the TH analysis and parameter information sources for each accident considered in the AST analysis. The results of the audit were documented in an audit report dated January 20, 2016 (ADAMS Accession No. ML16007A180). Based on the audit, the NRC staff issued an RAI dated February 11, 2016 (ADAMS Accession No. ML16043A484) and I&M responded in a letter dated May 6, 2016 (ADAMS Package Accession No. ML16169A129).

The May 6, 2016, RAI response provided additional information regarding the sources for the reactor coolant system (RCS) TH parameter values concerning steam generator tube uncover time, based on Plant Process Computer (PPC) data, and flashing fractions, derived from a prior LOFTTR2 calculation. To verify the validity of the two sets of RCS TH parameter values, the NRC staff held an audit to review the supporting documentation for the May 6, 2016, RAI response.

Enclosure

This technical audit was performed consistent with NRC Office of Nuclear Reactor Regulation Office Instruction LIC-111, "Regulatory Audits," dated December 29, 2008 (ADAMS Accession No. ML082900195). The audit supports the NRC staff's review of the TH parameters used in the AST analysis.

## 2.0 AUDIT ACTIVITIES AND OBSERVATIONS

The area of focus for the regulatory audit was the supporting documentation used in the development of the licensee's May 6, 2016, RAI response. The audit was conducted the week of June 27, 2016, and included a conference call with the licensee on June 30, 2016. The audit was conducted by reviewing an electronic reading room containing documents provided by I&M.

### 2.1 Overview

The auditor reviewed the licensee's models and supporting calculations, as documented in the following references:

- Calculation TH-00-03, dated April 11, 2000, "D.C. Cook Unit 2 Steam Generator Tube Rupture with Operator Actions," Revision 0.
- Design Information Transmittal DIT-B-03680, "Steam Generator Tube Recovery Time for Alternative Source Term Dose Effort (Contract #01576001)," dated February 4, 2016

The above references support the analyses in the following documents, which were included in Enclosures 4 and 5 of the licensee's May 6, 2016, RAI response (ADAMS Package Accession No. ML16169A129):

- RWA-1313-010, Revision 1, "Cook Nuclear Plant Main Steam Line Break AST Radiological Analysis," March 31, 2016 (ADAMS Accession No. ML16169A114)
- RWA-1313-011, Revision 1, "Cook Nuclear Plant Steam Generator Tube Rupture AST Radiological Analysis," March 30, 2016 (ADAMS Accession No. ML16169A117)
- RWA-1313-015, Revision 1, "D.C. Cook AST Radiological Analysis Technical Report, March 31, 2016" (ADAMS Accession No. ML16169A118)

### 2.2 Auditor Observations and Evaluation

The auditor reviewed the technical information provided in TH-00-03 and DIT-B-03680 to ensure that the evaluations were reasonable and applicable for their use in the AST radiological analyses. The licensee did not have a prior transient safety analysis calculation for the steam generator tube uncover time that could be used in the AST analyses. Thus, the licensee applied an alternative approach based on actual plant data for the basis of the steam generator tube uncover time. For determining the flashing fractions, the licensee did have a prior TH calculation available that was based on an NRC-approved computer code for providing primary and secondary system TH information. The following sections describe the audit of these two sources of specific TH input parameter values used to support the licensee's AST radiological analyses.

### 2.2.1 Steam Generator Tube Uncovery Time

The auditor reviewed the licensee's analysis of steam generator tube uncovery time as assessed in DIT-B-03680-00. In this assessment, the licensee applied actual plant response information regarding the water levels in the steam generators immediately following an unplanned full power trip of one of the CNP reactors. This information was obtained from the unit's PPC recording of the four steam generators' narrow range level instrumentation. This specific instrumentation was selected due to the lower tap for the detector being above the top of the steam generator tubes. Once the indicated water level decreased to below this tap level, this instrumentation would measure a relatively constant near-zero level reading until the water level was recovered by the auxiliary feedwater system. The licensee assumed that during the time when this level indication was at a relatively constant near-zero value, the top of the steam generator (SG) tubes would be uncovered. Since the narrow range tap is above the top of the tube bundle, the licensee considers the timing information to be conservative due the additional time needed for the water level to actually decrease to the top of the tube bundle and recover back to the level of the tap.

The licensee selected a total of four full-power reactor trips from both reactor units that occurred over the last 11 years. The approximate tube uncovery duration was assessed by examining the SG water level plots obtained from the PPC for all 4 SGs. A total of 16 time durations were calculated from the plots. The average steam generator tube uncovery time was calculated to be 30 minutes. The licensee then added additional conservatism by increasing the tube uncovery duration for the AST radiological analyses to 40 minutes.

Because the licensee applied an alternative approach for determining steam generator tube uncovery time rather than obtaining the information directly from a safety-related TH analysis computer code, the auditor reviewed prior NRC-approved amendments to determine whether the 40 minute duration calculated by the licensee was reasonable. The auditor selected and reviewed license amendments that were issued for other Westinghouse 4-loop pressurized water reactors.

In a Catawba Nuclear Station amendment dated March 3, 2005 (ADAMS Accession No. ML042320059), a RETRAN-02 model calculated total time spans for steam generator tube bundle uncovery ranging from several minutes to over an hour, depending on the accident being evaluated. The auditor also reviewed the AST LAR for Braidwood and Byron Stations, dated February 15, 2005 (ADAMS Accession No. ML050560102), which was approved by the NRC on September 8, 2006 (ADAMS Accession No. ML062340420). In the Braidwood and Byron LAR, the iodine partition factor is set to a very small value (no mixing with any secondary coolant) for up to approximately 47 minutes to account for tube uncovery in the intact steam generator during a steam generator tube rupture event. This information can be found on Attachment 1, page 60, and Attachment 6, page 25 of the LAR. The Braidwood and Byron AST analyses were performed using NRC-approved computer codes as discussed in Attachment 1, page 8 of the LAR. Based on the previously-approved times for steam generator tube uncovery for accidents evaluated under the AST (i.e., Regulatory Guide 1.183) from plants that are similar to the CNP units, the NRC staff concludes the CNP steam generator tube uncovery time of 40 minutes is reasonable.

### 2.2.2 Flashing Fractions

The auditor reviewed the Unit 2 SG tube rupture calculation, TH-00-03, which was previously reviewed and approved by the NRC. This calculation was performed in support of a LAR dated October 24, 2000 (ADAMS Accession No. ML003762982), which was approved by the NRC on October 24, 2001 (ADAMS Accession No. ML012690136). The calculation included operator actions and was performed using the NRC-approved Westinghouse thermal hydraulic code LOFTTR2.

As noted on page A7 of RWA-1313-001, Rev 1, which was included in Enclosure 4 of the May 6, 2016, RAI response, the licensee reviewed and applied information from pages 42 through 44 of TH-00-03. The auditor reviewed the information on these pages and notes that these pages contain LOFTTR2 plots for break flow rate, integrated break flow, and integrated flashed break flow. The auditor reviewed Table 1 of Enclosure 2 of the May 6, 2016, RAI response for integrated break flow and flashed break flow, and determined that the table values were reasonable, based on the plots in TH-00-03. The auditor also determined that the resulting flashing fractions were consistently applied in the subsequent AST radiological analyses.

### 3.0 CONCLUSION

The NRC staff reviewed the documents listed in Section 2.1 of this audit report, and verified the proper application of TH input parameter values for steam generator tube uncover time and flashing fractions in the licensee's CNP AST radiological analyses. The staff concludes that the licensee's method of determining these values is reasonable for the CNP AST LAR. These conclusions were discussed with the licensee in the June 30, 2016 audit conference call.

### 4.0 LICENSEE PERSONNEL CONTACTED FOR THIS AUDIT

Terry Curtiss  
Jason Wright  
Gregory Hill  
Helen Kish

Principal Contributors: Donald Palmrose, NRO

Date: July 25, 2016

J. Gebbie

- 2 -

The details of the results of the audit are set forth in the enclosed audit report. The NRC staff appreciates the resources that were made available by your staff during the audit. If you have any questions, please contact me at (301) 415-2846.

Sincerely,

*/RA/*

Allison W. Dietrich, Project Manager  
Plant Licensing Branch III-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-315 and 50-316

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