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AEP-NRC-2014-63
10 CFR 50.90

Docket Nos.: 50-315
50-316

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Donald C. Cook Nuclear Plant Units 1 and 2
Response to a Request for Additional Information Regarding the License Amendment Request to Change the Reactor Coolant System Pressure and Temperature Limits

References:

1. Letter from J. P. Gebbie, Indiana Michigan Power Company (I&M), to U. S. Nuclear Regulatory Commission (NRC), "Donald C. Cook Nuclear Plant Unit 1 and Unit 2, License Amendment Request Regarding a Change to the Reactor Coolant System Pressure and Temperature Limits," AEP-NRC-2014-24, dated April 9, 2014, Agencywide Documents Access and Management System Accession No. ML14101A367.

2. Email from T. A. Beltz, NRC, to H. L. Etheridge, I&M, "Draft Requests for Additional Information Vessels & Internals Integrity Branch and Technical Specifications Branch of the Office of Nuclear Reactor Regulation Regarding the Donald C. Cook Nuclear Plant, Units 1 and 2, License Amendment Request to Change Reactor Coolant System Pressure and Temperature Limit Curves to Address Vacuum Fill Operations (TAC Nos. MF4280 and MF4281)," dated July 21, 2014.

This letter provides Indiana Michigan Power Company's (I&M), the licensee for Donald C. Cook Nuclear Plant Units 1 and 2, response to Requests for Additional Information (RAI) by the U. S. Nuclear Regulatory Commission (NRC) regarding a license amendment request to change the reactor coolant system (RCS) pressure and temperature limits.

By Reference 1, I&M submitted a request to amend the Technical Specifications (TS) to Facility Operating Licenses DPR-58 and DPR-74. I&M proposes to change TS 3.4.3, "RCS Pressure and Temperature (P/T) Limits," to address an issue regarding the applicability of Figure 3.4.3-1, "Reactor Coolant System Pressure versus Temperature Limits – Heatup Limit, Criticality Limit, and Leak Test Limit (Applicable for service period up to 32 EFPY)" and Figure 3.4.3-2, "Reactor Coolant System Pressure versus Temperature Limits – Various Cooldown Rates Limits (Applicable for service period up to 32 EFPY)," during vacuum fill of the RCS. By Reference 2, the NRC transmitted RAIs regarding the proposed amendment. This letter provides I&M's response to Reference 2.

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Enclosure 1 to this letter provides an affirmation statement. Enclosure 2 to this letter provides I&M's response to the NRC's RAIs.

Copies of this letter and its enclosures are being transmitted to the Michigan Public Service Commission and Michigan Department of Environmental Quality, in accordance with the requirements of 10 CFR 50.91. There are no new regulatory commitments associated with this response. Should you have any questions, please contact Mr. Michael K. Scarpello, Regulatory Affairs Manager, at (269) 466-2649.

Sincerely,

Joel P. Gebbie
Site Vice President

JMT/kmh

Enclosures:
1. Affirmation
2. Responses to Request for Additional Information Regarding Reactor Coolant System Pressure and Temperature Limit Curves to Address Vacuum Fill Operations

c: M. L. Chawla, NRC Washington, D.C.
J. T. King, MPSC
MDEQ – RMD/RPS
NRC Resident Inspector
C. D. Pederson, NRC Region III
A. J. Williamson, AEP Ft. Wayne, w/o enclosures

Enclosure 1 to AEP-NRC-2014-63

AFFIRMATION

I, Joel P. Gebbie, being duly sworn, state that I am Site Vice President of Indiana Michigan Power Company (I&M), that I am authorized to sign and file this request with the U. S. Nuclear Regulatory Commission on behalf of I&M, and that the statements made and the matters set forth herein pertaining to I&M are true and correct to the best of my knowledge, information, and belief.

Indiana Michigan Power Company

Joel P. Gebbie
Site Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 15 DAY OF August, 2014

Notary Public

My Commission Expires 04-04-2018

DANIELLE BURGOYNE
Notary Public, State of Michigan
County of Berrien
My Commission Expires 04-04-2018
Acting In the County of Berrien

Enclosure 2 to AEP-NRC-2014-63

RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING REACTOR COOLANT SYSTEM PRESSURE AND TEMPERATURE LIMIT CURVES TO ADDRESS VACUUM FILL OPERATIONS

By letter dated April 9, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14101A367), Indiana Michigan Power Company (I&M), the licensee for Donald C. Cook Nuclear Plant (CNP) Units 1 and 2, submitted a license amendment request (LAR) which proposed changes to the CNP Technical Specifications (TSs) TS 3.4.3, "RCS Pressure and Temperature (P/T) Limits", to address an issue regarding the applicability of Figures 3.4.3-1 "Reactor Coolant System Pressure versus Temperature Limits - Heatup Limit, Criticality Limit, and Leak Test Limit (Applicable for service period up to 32 EFPY)" and 3.4.3-2 "Reactor Coolant System Pressure versus Temperature Limits - Various Cooldown Rates Limits (Applicable for service period up to 32 EFPY)" during vacuum fill operations of the Reactor Coolant System (RCS). These changes provide the graphical representation of vacuum conditions, which would be encountered during vacuum fill evolutions. By electronic mail dated July 21, 2014, the NRC transmitted a request for additional information (RAI) regarding the April 19, 2014, LAR. This enclosure provides I&M's response to the RAI.

TECHNICAL SPECIFICATIONS BRANCH (STSB)

Regarding the vacuum fill operation, the licensee states, "Following the installation of Reactor Coolant Vacuum Refill System (RCVRS) connections to the Unit 1 and Unit 2 RCS, the RVCRS connections are used during each refueling outage, and the RCS is subjected to a pressure less than 0 psig (i.e. vacuum) via a temporary modification that is controlled by plant procedures.

As a part of technical assessment for the proposed changes, the application refers to the following documentation:

- *"Westinghouse SECL-96-226, Reactor Coolant Vacuum Refill System Final SECL, Revision 0 (in its entirety) assessed the structural integrity of the Unit 1 and Unit 2 reactor vessels, SGs, RCPs, RCP seals, piping and components to determine if any detrimental impact would result from vacuum refill of the RCS.*

- *Per the licensee, Westinghouse's correspondence MCOE-LTR-14-17, "Applicability of the Pressure-Temperature (P/T) Limit Curve Figures During Vacuum Refill of the RCS in Mode 5 for Westinghouse and CE NSSS Plants, Revision 0," concluded that vacuum refill of the Unit 1 and Unit 2 RCS in Mode 5 does not violate the 10 CFR 50, Appendix G P/T requirements.*

The NRC staff's review of the licensee's application determined a need for additional information:

<u>RAI-STSB-1</u>

The NRC staff previously reviewed WCAP-15878, "D.C. Cook Unit 1 Heatup and Cooldown Limit Curves for Normal Operation for 40 Years and 60 Years," Revision 0 (ADAMS Accession

No. ML023460503) and WCAP-15047, "D.C. Cook Unit 2 WOG Reactor Vessel 60-Year Evaluation Minigroup Heatup and Cooldown Limit Curves for Normal Operation," Revision 2 (ADAMS Accession No. ML022110334), and approved P/T curves for CNP Units 1 and 2 in safety evaluations (SEs) dated July 18, 2003, and March 20, 2003 (ADAMS Accession Nos. ML031600548 and ML03220073), respectively. These SEs addressed the ferritic components of the reactor coolant pressure boundary as described in Appendix G to 10 CFR Part 50 and approved P/T curves for 32 effective full power years (EFPY).

Please provide a technical basis addressing the impact of operating under a vacuum on systems and components not covered by 10 CFR Part 50, Appendix G, such as (but not limited to) fuel and instrumentation associated with such operation. Include the referenced documentation (as stated above) or excerpted text which provides the basis of the technical assessment.

Response to RAI-STSB-1

The technical basis addressing the impact of operating under a vacuum on systems and components not covered by 10 CFR Part 50, Appendix G, such as (but not limited to) fuel and instrumentation associated with such operation is contained within Westinghouse Safety Evaluation Check List (SECL) 96-226, RCVRS, Revision 0. SECL-96-226, Revision 0 provides a detailed evaluation of RCS components including instrumentation and concludes that the use of the RCVRS will not impair the safety function or performance of the reactor vessel, reactor internals, control rod drive mechanism (CRDM) system analysis, level monitoring systems, reactor coolant pump (RCP) seals, pressurizers, steam generators, tanks, pumps, heat exchangers, filters, demineralizers, valves, nor RCS piping. Although the fuel in the reactor vessel was not explicitly discussed, it is recognized that the fuel in the reactor vessel will always be covered by water and never directly exposed to RCVRS vacuum. Therefore, no adverse impact to nuclear fuel resulting from exposure to RCVRS vacuum is possible.

RAI-STSB-2

Please apprise the staff whether CNP's current licensing basis addresses the Reactor Coolant Vacuum Refill System (RCVRS) as stated in the application.

Regarding the proposed TS change, it should be noted that technical specifications are derived from the analyses and evaluation included in licensee's safety analysis report as stated in Title 10 of Code of Federal Regulation 50.36(a)(2)(b).

Regulatory Basis

The regulations under 10 CFR 50.36(c)(2)(i) state that limiting conditions for operation (LCOs) are the lowest functional capability of performance levels of equipment required for safe operation of the facility (emphasis added). When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications until the condition can be met. Per the licensee, the proposed changes to TS Figures 3.4.3-1 and 3.4.3-2 reflect RCS pressure conditions

experienced during RCS vacuum fill operation. The requirements of 10 CFR 50.36 would continue to be met with the NRC staff's review and approval of the proposed change.

Response to RAI-STSB-2

Operation of the RCVRS is described in CNP's RCS Design Basis Document DB-12-RCS, "Design Basis Document for the Reactor Coolant System," Revision 5.

The RCVRS is not described in the "Indiana and Michigan Power, D.C. Cook Nuclear Plant, Updated Final Safety Analysis Report (UFSAR)," Revision 25.0. Description of the RCVRS is not necessary in the UFSAR, per the guidance of NEI 98-03, "Guidelines for Updating Final Safety Analysis Reports," Revision 1. NEI-98-03 quotes directly from 10 CFR 50.34(b) when it states that the UFSAR should include: "...information that describes the facility, presents the design bases and the limits on its operation, and presents the safety analyses of the structures, systems and components and of the facility as a whole." The RCVRS is not associated with a design limit.

With the requested change to the TS, the operational use of the RCVRS will be reflected in the licensing bases. Additionally, the operational use of the RCVRS will be described in the Bases for the TS, as provided in the original LAR, dated April 9, 2014, as Enclosures 5 and 6 and would be subject to the requirements of 10 CFR 50.59 for any future changes.

VESSELS & INTERNALS INTEGRITY BRANCH (EVIB)

Background

Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix G, "Fracture Toughness Requirements," states, "this appendix specifies fracture toughness requirements for ferritic materials of pressure-retaining components of the reactor coolant pressure boundary (RCPB) of light water nuclear power reactors to provide adequate margins of safety..." In addition, 10 CFR Part 50, Appendix G, Paragraph IV.A states that, "the pressure-retaining components of the RCPB that are made of ferritic materials must meet the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), supplemented by the additional requirements set forth in [paragraph IV.A.2, "Pressure-Temperature (P/T) Limits and Minimum Temperature Requirements"]..." Therefore, 10 CFR Part 50, Appendix G requires that P/T limits be developed for the entire RCPB, consisting of ferritic RCPB materials in the reactor vessel (RV) beltline (neutron fluence ≥ 1 x 1017 n/cm2, E > 1 MeV), as well as ferritic RCPB materials not in the RV beltline (neutron fluence < 1 x 1017 n/cm2, E > 1 MeV).

RAI-EVIB-1

The P-T limit calculations for ferritic RCPB components that are not RV beltline shell materials may define P/T curves that are more limiting than those calculated for the RV beltline shell materials due to the following factors:

1. *RV nozzles, penetrations, and other discontinuities have complex geometries that may exhibit significantly higher stresses than those for the RV beltline shell region. These higher stresses can potentially result in more restrictive P-T limits, even if the reference temperature (RT_{NDT}) for these components is not as high as that of RV beltline shell materials that have simpler geometries.*

2. *Ferritic RCPB components that are not part of the RV may have initial RT_{NDT} values, which may define a more restrictive lowest operating temperature in the P-T limits than those for the RV beltline shell materials.*

Please describe how the P/T limit curves in Technical Specification Figures 3.4.3- 1, "Reactor Coolant System Pressure versus Temperature Limits – Heatup Limit, Criticality Limit, and Heat Test Limit (Applicable for service period up to 32 effective full power years [EFPY])" and 3.4.3-2, "Reactor Coolant System Pressure versus Temperature Limits – Various Cooldown Rates Limits (Applicable for service period up to 32 EFPY)" submitted for CNP Units 1 and 2, and the methodology used to develop these curves, considered all RV materials (beltline and non-beltline) consistent with the requirements of 10 CFR Part 50, Appendix G.

<u>Response to RAI-EVIB-1</u>

Westinghouse has performed plant specific evaluations for multiple plants to determine if the RV beltline P/T limits are limiting and bound all other ferritic components. The response to this RAI is dependent on several factors, such as, existing plant specific P/T limits, stresses at the other non-beltline ferritic components, fluence, initial material properties (i.e. RTNDT), component geometry, and EFPY of operation. All of the before mentioned inputs are plant specific; therefore, a conclusive response to the RAI cannot be determined unless a plant specific analysis is performed. For the plants that have been evaluated by Westinghouse to date, it has been demonstrated that the existing RV beltline P/T limit curves are more limiting and bound all other ferritic components. The plants evaluated by Westinghouse were based on a detailed fracture mechanics analysis per ASME Section XI Appendix G and 10 CFR 50 Appendix G. The fracture mechanics analyses were submitted, reviewed, and accepted by the NRC.

In I&M's discussions with the NRC staff, the staff indicated that there have been cases where the traditional beltline region became less limiting than other ferritic components relative to P/T limits. To address this concern, I&M will have a detailed fracture mechanics analysis performed to verify that the RV beltline P/T limits are limiting and bound all other ferritic components. I&M proposes the following License Condition be added to Unit 1 and Unit 2 Facility Operating Licenses DPR-58 and DPR-74.

<u>Unit 1:</u>

<u>"Operation with vacuum fill:</u>

The licensee is authorized to operate the facility using Reactor Coolant System (RCS) vacuum fill operation in accordance with TS 3.4.3, "RCS Pressure and Temperature (P-T) Limits," with corresponding revisions to Figure 3.4.3-1, "Reactor Coolant System Pressure versus

Temperature Limits - Heatup Limit, Criticality Limit, and Leak Test Limit (Applicable for service period up to 32 EFPY)," and Figure 3.4.3-2, "Reactor Coolant System Pressure versus Temperature Limits - Various Cooldown Rates Limits (Applicable for service period up to 32 EFPY)," as approved in License Amendment No. ___ to Renewed Facility Operating License No. DPR-58. This includes an approved extension to -14.7 pounds per square inch gage to bound the RCS conditions required to support vacuum fill operation. The licensee shall submit an analysis of the P-T curves in Figures 3.4.3-1 and 3.4.3-2 within one year of the date of issuance of License Amendment No. ___, which demonstrates consideration of the ferritic reactor coolant pressure boundary components that are not reactor vessel beltline shell materials."

Unit 2:

"Operation with vacuum fill:

The licensee is authorized to operate the facility using Reactor Coolant System (RCS) vacuum fill operation in accordance with TS 3.4.3, "RCS Pressure and Temperature (P-T) Limits," with corresponding revisions to Figure 3.4.3-1, "Reactor Coolant System Pressure versus Temperature Limits - Heatup Limit, Criticality Limit, and Leak Test Limit (Applicable for service period up to 32 EFPY)," and Figure 3.4.3-2, "Reactor Coolant System Pressure versus Temperature Limits - Various Cooldown Rates Limits (Applicable for service period up to 32 EFPY)," as approved in License Amendment No. ___ to Renewed Facility Operating License No. DPR-74. This includes an approved extension to -14.7 pounds per square inch gage to bound the RCS conditions required to support vacuum fill operation. The licensee shall submit an analysis of the P-T curves in Figures 3.4.3-1 and 3.4.3-2 within one year of the date of issuance of License Amendment No. ___, which demonstrates consideration of the ferritic reactor coolant pressure boundary components that are not reactor vessel beltline shell materials."

To provide assurance of continued compliance with 10 CFR Part 50, Appendix G requirements until the fracture mechanics analysis are completed and reviewed by the NRC, a discussion is provided below on CNP Unit 1 and Unit 2 RV fluence.

As documented in WCAP-12483, "Analysis of Capsule U from the American Electric Power Company D.C. Cook Unit 1 Reactor Vessel Radiation Surveillance Program," Revision 1 the last surveillance capsule for Unit 1 ("Capsule U") was pulled at 9.17 EFPY and the 2002 analysis determined that the capsule had received an average fast neutron fluence (E > 1.0 MeV) of 1.837 E19 n/cm^2 at the geometric center of the capsule. The surveillance capsule materials were found to exhibit a more than adequate upper shelf energy level for continued safe plant operations and are expected to maintain an upper shelf energy of greater than 50 foot pounds (ft-lb) throughout the life (32 EFPY) and life extension (48 EFPY) of the vessel as required by 10 CFR 50, Appendix G.

As documented in WCAP-13515, "Analysis of Capsule U from the Indiana Michigan Power Company D.C. Cook Unit 2 Reactor Vessel Radiation Surveillance Program," Revision 1, the last surveillance capsule for Unit 2 ("Capsule U") was pulled at 8.65 (EFPY) and the 2002 analysis determined that the capsule had received an average fast neutron fluence (E > 1.0 MeV) of 1.583 E19 n/cm^2 at the geometric center of the capsule. The surveillance capsule

materials were found to exhibit a more than adequate upper shelf energy level for continued safe plant operations and are expected to maintain an upper shelf energy of greater than 50 ft-lb throughout the life (32 EFPY) and life extension (48 EFPY) of the vessel as required by 10 CFR 50, Appendix G.

As of October 2, 2013, Unit 1 was at 25.529 EFPY and Unit 2 was at 24.021 EFPY; therefore, acceptable margin for the current operating status versus the 32 EFPY P/T curves exists and any adjustment to the P/T curves resulting from consideration of the ferritic RCPB components that are not RV beltline shell materials would support the proposed schedule for submitting an analysis within one year.