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AEP-NRC-2018-62
10 CFR 50.46

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
ANNUAL REPORT OF LOSS-OF-COOLANT ACCIDENT
EVALUATION MODEL CHANGES

Pursuant to 10 CFR 50.46, Indiana Michigan Power Company (I&M), the licensee for Donald C. Cook Nuclear Plant (CNP), is transmitting an annual report of loss-of-coolant accident (LOCA) evaluation model changes affecting the peak cladding temperature (PCT) for CNP Unit 1 and Unit 2. I&M is providing, as Enclosure 1, to this letter, the Units 1 and 2 Large Break and Small Break LOCA Analyses-of-Record PCT values and error assessments for calendar year 2017.

There are no new or revised commitments in this letter. Should you have any questions, please contact Mr. Michael K. Scarpello, Regulatory Affairs Director, at (269) 466-2649.

Sincerely,

Q. Shane Lies
Site Vice President

JMT/mll
Enclosure: Donald C. Cook Nuclear Plant Units 1 and 2, Large and Small Break Loss-of-Coolant Accident Peak Clad Temperature Summary

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A002
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ENCLOSURE TO AEP-NRC-2018-62

DONALD C. COOK NUCLEAR PLANT UNITS 1 AND 2
LARGE AND SMALL BREAK LOSS-OF-COOLANT ACCIDENT
PEAK CLAD TEMPERATURE SUMMARY

Abbreviations:

10 CFR	Title 10 of the Code of Federal Regulations
ADAMS	Agencywide Documents Access and Management System
CNP	Donald C. Cook Nuclear Plant
°F	degrees Fahrenheit
ECCS	emergency core cooling system
EM	evaluation methodology
FdH	nuclear enthalpy rise hot channel factor
FQ	heat flux hot channel factor
HHSI	high head safety injection (Safety Injection System at CNP)
I&M	Indiana Michigan Power Company
LB	large break
LOCA	loss of coolant accident
MWt	megawatts – thermal
NOP/NOT	normal operating pressure/normal operating temperature
NRC	Nuclear Regulatory Commission
PCT	peak cladding temperature
RHR	residual heat removal
SGTP	steam generator tube plugging
SB	small break
TCD	thermal conductivity degradation

Summary:

By letter dated March 19, 2012, (ADAMS Accession No. ML12088A104), and supplemented by letter dated June 11, 2012, (ADAMS Accession No. ML12173A025), I&M, the licensee for CNP Units 1 and 2, submitted a report describing the impact of fuel pellet TCD on the LB LOCA ECCS evaluation model, and an estimate of the effect on the predicted PCT for CNP Units 1 and 2. This report was submitted pursuant to 10 CFR Part 50, Section 50.46, Paragraph (a)(3), and referred to a letter from Westinghouse Electric Company dated March 7, 2012, (ADAMS Accession No. ML12072A035). The report was subsequently found to be acceptable by NRC letter dated March 7, 2013, (ADAMS Accession No. ML13077A137).

By letter dated August 30, 2013, (ADAMS Accession No. ML13247A174), I&M submitted a report describing the impact of Revised Heat Transfer Multiplier Distributions on the predicted PCT for CNP Unit 1. This report was submitted pursuant to 10 CFR Part 50, Section 50.46, Paragraph (a)(3). By Westinghouse letter LTR-LIS-13-360, "D. C. Cook Units 1 and 2 10 CFR 50.46 Report for Revised Heat Transfer Multiplier Distributions," dated July 31, 2013, Westinghouse Electric Company notified I&M of significant errors in the EM for the LB LOCA

analysis of record for CNP Unit 1. By Westinghouse letter LTR-LIS-13-406, "Additional Information on the Evaluation of Revised Heat Transfer Multiplier Distributions," dated August 14, 2013, Westinghouse Electric Company provided I&M additional detail on the nature of the errors and the corrections made. As documented in the subsequent rack-up sheets the error results in a benefit to the calculated PCT.

By letter dated February 27, 2014, (ADAMS Accession No. ML14063A043), I&M submitted a report describing the impact of an Error in Burst Strain Application on the predicted PCT for CNP Unit 1. This report was submitted pursuant to 10 CFR Part 50, Section 50.46, Paragraph (a)(3). By Westinghouse letter LTR-LIS-14-44, "D. C. Cook Units 1 and 2 10 CFR 50.46 Report for the HOTSPOT Burst Strain Error Correction," dated January 29, 2014, Westinghouse Electric Company notified I&M of significant errors in the EM for the LB LOCA analysis of record for CNP Unit 1.

By letter dated May 20, 2016, (ADAMS Accession No. ML16145A291), I&M submitted a report of significant changes to the ECCS EM as a result of CNP Unit 1 returning to NOP/NOT. This report was submitted pursuant to 10 CFR Part 50, Section 50.46.

The following pages summarize the impact of TCD, peaking factor burndown, heat transfer multiplier distribution revisions, error in burst strain application, decay group uncertainty factors errors, changes to grid blockage ratio and porosity (Unit 2 only), and plant modification evaluations on the CNP Units 1 and 2 LB LOCA analyses of record. No changes have been made to the analysis between 2016 and 2017. In addition, pages are included that summarize the SB LOCA PCT analyses of record for CNP Units 1 and 2.

CNP UNIT 1
LOCA Peak Clad Temperature Summary for ASTRUM Best Estimate Large Break

Evaluation Model: ASTRUM (2004)			
F_Q = 2.15	FdH = 1.55	SGTP = 10%	Break Size: Split
Analysis Date: November 20, 2007			

LICENSING BASIS		
	Analysis-of-Record	PCT = 2128°F
MARGIN ALLOCATIONS (Delta PCT)		
A.	PREVIOUS 10 CFR 50.46 ASSESSMENTS	
	1. Return to NOP/NOT Including Pellet Thermal Conductivity Degradation and Peaking Factor Burndown	404°F(a)
	2. Revised Heat Transfer Multiplier Distributions for NOP/NOT Conditions	-91°F
	3. Error in Burst Strain Application	85°F
	4. Decay Group Uncertainty Factors Errors	-29°F
B.	PLANNED PLANT MODIFICATION EVALUATIONS	
	1. Design Input Changes with Respect to Plant Operation for Return to NOP/NOT Evaluation	-489°F(a)
C.	NEW 10 CFR 50.46 ASSESSMENTS	0°F
D.	OTHER	0°F
LICENSING BASIS PCT + MARGIN ALLOCATIONS		PCT = 2008°F

Notes:
a. These assessments are coupled via an evaluation of burnup effects which include thermal conductivity degradation, peaking factor burndown and design input changes.

CNP UNIT 1

LOCA Peak Clad Temperature Summary for Appendix K Small Break

Evaluation Model: NOTRUMP
F_Q=2.32 FdH=1.55 SGTP=10% 3.25 inch cold leg break
Analysis Date: January 6, 2012

Notes: 3304 MWt (plus 0.34% calorimetric uncertainty)

LICENSING BASIS		
	Analysis-of-Record	PCT = 1725°F
MARGIN ALLOCATIONS (Delta PCT)		
A.	PREVIOUS 10 CFR 50.46 ASSESSMENTS	0°F
B.	PLANNED PLANT MODIFICATION EVALUATIONS	0°F
C.	NEW 10 CFR 50.46 ASSESSMENTS	0°F
D.	OTHER	0°F
LICENSING BASIS PCT + MARGIN ALLOCATIONS		PCT = 1725°F

CNP UNIT 2
LOCA Peak Clad Temperature Summary for ASTRUM Best Estimate Large Break
Applicable to U2C23

Evaluation Model: ASTRUM (2004)

F_Q = 2.335 FdH = 1.644 SGTP = 10%[a.] Break Size: Split

Analysis Date: February 9, 2009

LICENSING BASIS		
	Analysis-of-Record	PCT = 2107°F
MARGIN ALLOCATIONS (Delta PCT)		
A.	PREVIOUS 10 CFR 50.46 ASSESSMENTS	
	1. Evaluation of TCD and Peaking Factor Burndown	73°F(a)
	2. Changes to Grid Blockage Ratio and Porosity	16°F
	3. Revised Heat Transfer Multiplier Distributions	-3°F
	4. Error in Burst Strain Application	13°F
B.	PLANNED PLANT MODIFICATION EVALUATIONS	
	1. Plant Evaluations associated with TCD	-239°F(a)
	2. Evaluation of 12 Stainless Steel Filler Rods in 2 Reconstituted Fuel Assemblies	1°F(b)
C.	NEW 10 CFR 50.46 ASSESSMENTS	
	1. None	0°F
D.	OTHER	0°F
LICENSING BASIS PCT + MARGIN ALLOCATIONS		PCT = 1968°F

Notes:

a. These assessments are coupled via an evaluation of burnup effects which include thermal conductivity degradation, peaking factor burndown and design input changes (e.g., reduction in the maximum allowed steam generator tube plugging from 10% to 1.5% and maximum FdH reduced to 1.61).
b. This PCT impact is only applicable to the Unit 2 Cycle 23, which began December 2016 and ended March 2018.

CNP UNIT 2

LOCA Peak Clad Temperature Summary for Appendix K Small Break

Evaluation Model: NOTRUMP
F_Q = 2.32 FdH = 1.62 SGTP = 10% 4 inch cold leg break
Analysis Date: April 25, 2011

Notes: The 3600 MWt power level used in this analysis bounds the Unit 2 3468 MWt steady state power limit in the operating license.

LICENSING BASIS		
	Analysis-of-Record	PCT = 1274°F (a)
MARGIN ALLOCATIONS (Delta PCT)		
A.	PREVIOUS 10 CFR 50.46 ASSESSMENTS	
	1. None	0°F
B.	PLANNED PLANT MODIFICATION EVALUATIONS	0°F
C.	NEW 10 CFR 50.46 ASSESSMENTS	0°F
D.	OTHER	0°F
LICENSING BASIS PCT + MARGIN ALLOCATIONS		PCT = 1274°F

Notes:

a. Analysis models RHR injection flow diversion to RHR spray and HHSI cross-tie valves open during cold leg recirculation.