



An AEP Company

BOUNDLESS ENERGY™

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August 29, 2023

AEP-NRC-2023-40
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 Units 1 and 2. I&M is providing, as an Enclosure 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 2022.

There are no new or revised commitments in this letter. Should you have any questions, please contact me at (269) 466-2649.

Sincerely,

A handwritten signature in black ink that reads "Mr. K. Scarpello".

Michael K. Scarpello
Regulatory Affairs Director

BMC/sjh

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

- c: EGLE – RMD/RPS
- J. B. Giessner – NRC Region III
- NRC Resident Inspector
- N. Quilco – MPSC
- R. M. Sistevaris – AEP Ft. Wayne, w/o enclosures
- S. P. Wall – NRC Washington, D.C.
- A. J. Williamson – AEP Ft. Wayne, w/o enclosures

ENCLOSURE TO AEP-NRC-2023-40

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
NOP/NOT	normal operating pressure/normal operating temperature
NRC	Nuclear Regulatory Commission
PBOT/PMID	Integrated power fraction in the bottom third of the core/middle third of the core
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 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. In a subsequent 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. Pursuant to 10 CFR Part 50, Section 50.46, Paragraph (a)(3), by letter dated August 30, 2013, I&M submitted a report to the NRC describing the impact of Revised Heat Transfer Multiplier Distributions on the predicted PCT for CNP Unit 1 (ADAMS Accession No. ML13247A174). As documented in the subsequent rack-up sheets, the error results in a benefit to the calculated PCT.

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. Pursuant to 10 CFR Part 50, Section 50.46, Paragraph (a)(3), by letter dated February 27, 2014, I&M submitted a report to the NRC describing the impact of an Error in Burst Strain Application on the predicted PCT for CNP Unit 1 (ADAMS Accession No. ML14063A043).

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.

By letter dated May 4, 2018, (ADAMS Accession No. ML18130A580), I&M submitted a report of a significant change in calculated PCT for the CNP Unit 2 SB LOCA analysis as a result of the reactor vessel upflow conversion modification. This report was submitted pursuant to 10 CFR Part 50, Section 50.46 within 30-days of reactor start-up.

By letter dated May 9, 2019, (ADAMS Accession No. ML19133A060), I&M submitted a report of a significant change in calculated PCT for the CNP Unit 1 SB LOCA analysis as a result of the reactor vessel upflow conversion modification. This report was submitted pursuant to 10 CFR Part 50, Section 50.46 within 30-days of reactor start-up.

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. Pages are included that also summarize the SB LOCA PCT analyses of record for CNP Units 1 and 2. In addition, the impact on the SB and LB LOCA PCT analyses of record from the upflow conversion in Units 1 and 2 is addressed.

Note that there was a cycle-specific PBOT/PMID violation which applied for U1C30. This violation resulted in a 0°F PCT change for the CNP Unit 1 LB LOCA analysis, by Westinghouse letter LTR-LIS-20-200, "10 CFR 50.46 Reporting Text for the Evaluation of the D. C. Cook Unit 1 Cycle 30 PBOT/PMID Violations," dated October 21, 2020.

CNP UNIT 1
LOCA Peak Clad Temperature Summary for ASTRUM Best Estimate Large Break
Applicable to U1C30

Evaluation Model: ASTRUM (2004)			
F _Q = 2.15	FdH = 1.55	SGTP = 10%	Break Size: Split
Analysis Date: November 2008			

Notes: Post-Analysis evaluation for FQ of 2.09 and FdH of 1.53

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)
	2. Upflow Conversion	14°F
	3. PBOT/PMID Evaluation for Cycle 30	0°F(b)
C.	NEW 10 CFR 50.46 ASSESSMENTS	0°F
D.	OTHER	0°F

LICENSING BASIS PCT + MARGIN ALLOCATIONS

PCT = 2022°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.
- b. Normalized PBOT/PMID were slightly exceeding limits used in the LBLOCA analysis of record. It was determined that expanding the PBOT/PMID box to include the Cycle 30 values is acceptable and the violations have a 0°F peak cladding temperature impact on the LBLOCA analysis of record.

CNP UNIT 1
LOCA Peak Clad Temperature Summary for ASTRUM Best Estimate Large Break
Applicable to U1C31

Evaluation Model: ASTRUM (2004)			
F _Q = 2.15	FdH = 1.55	SGTP = 10%	Break Size: Split
Analysis Date: November 2008			

Notes: Post-Analysis evaluation for FQ of 2.09 and FdH of 1.53

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)
	2. Upflow Conversion	14°F
C.	NEW 10 CFR 50.46 ASSESSMENTS	0°F
D.	OTHER	0°F

LICENSING BASIS PCT + MARGIN ALLOCATIONS

PCT = 2022°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 ₀ =2.32	FdH=1.55	SGTP=10%	3.25 inch cold leg break
Analysis Date: January 26, 2012			

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
	1. Upflow Conversion	107°F (a)
C.	NEW 10 CFR 50.46 ASSESSMENTS	0°F
D.	OTHER	0°F
		0°F

LICENSING BASIS PCT + MARGIN ALLOCATIONS

PCT = 1832°F

Notes:

- a. The evaluation resulted in a minor shift in limiting break size from 3.25 inches to 3.00 inches.

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

Evaluation Model: ASTRUM (2004)			
F _Q = 2.335	F _{dH} = 1.644	SGTP = 10%	Break Size: Split
Analysis Date: February 11, 2009			

Notes: Post-Analysis evaluation of 1.5% SGTP and F_{dH} of 1.61

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. Upflow Conversion	37°F
C.	NEW 10 CFR 50.46 ASSESSMENTS	0°F
D.	OTHER	0°F

LICENSING BASIS PCT + MARGIN ALLOCATIONS

PCT = 2004°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 2
LOCA Peak Clad Temperature Summary for Appendix K Small Break

Evaluation Model: NOTRUMP
 $F_Q = 2.32$ $F_{dH} = 1.62$ SGTP = 10% 4 inch cold leg break
 Analysis Date: June 28, 2011

LICENSING BASIS

Analysis-of-Record

PCT = 1274°F (a)

MARGIN ALLOCATIONS (Delta PCT)

A.	PREVIOUS 10 CFR 50.46 ASSESSMENTS	0°F
B.	PLANNED PLANT MODIFICATION EVALUATIONS	
	1. Upflow Conversion	75°F
C.	NEW 10 CFR 50.46 ASSESSMENTS	0°F
D.	OTHER	0°F

LICENSING BASIS PCT + MARGIN ALLOCATIONS

PCT = 1349°F

Notes:

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