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**Indiana Michigan Power**  
Cook Nuclear Plant  
One Cook Place  
Bridgman, MI 49106  
AEP.com

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10 CFR 50.46

Docket Nos: 50-315  
50-316

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Mail Stop O-P1-17  
Washington, D. C. 20555-0001

**Donald C. Cook Nuclear Plant Units 1 and 2  
ANNUAL REPORT OF LOSS-OF-COOLANT ACCIDENT  
EVALUATION MODEL CHANGES**

- References:
1. Letter from Joseph N. Jensen, I&M, to NRC Document Control Desk, "Donald C. Cook Nuclear Plant Unit 1, Thirty-Day Report of Loss-of-Coolant Accident Evaluation Model Changes," AEP:NRC:5046, dated April 29, 2005.
  2. Letter from E. E. Fitzpatrick, I&M, to NRC Document Control Desk, "Donald C. Cook Nuclear Plant Units 1 and 2, Annual Operating Report," AEP:NRC:1147B, dated February 26, 1992.
  3. Letter from Joseph N. Jensen, Indiana Michigan Power Company (I&M), to U. S. Nuclear Regulatory Commission (NRC) Document Control Desk, "Donald C. Cook Nuclear Plant Units 1 and 2, 10 CFR 50.46 Loss-of-Coolant Accident Reanalysis Schedule," AEP:NRC:4046-01, dated December 28, 2004.

Pursuant to 10 CFR 50.46, Indiana Michigan Power Company (I&M), the licensee for the Donald C. Cook Nuclear Plant (CNP), is transmitting an annual report of loss-of-coolant accident (LOCA) model changes affecting the peak cladding temperature (PCT) for CNP Units 1 and 2. There were no new assessments against the large break and small break LOCA analyses of record. Attachment 1 to this letter describes the recent assessment against the Unit 1 large break LOCA analysis of record which was previously reported by Reference 1. Attachment 2 provides the Unit 1 and Unit 2 large break and small break LOCA analyses of record PCT values and error assessments.

Tables 4 and 5 of Attachment 2 have been altered to include a PCT accounting change of 12 degrees Fahrenheit (°F) for a modification made to the Unit 2 South Safety Injection Pump Flowpath. This penalty has been conservatively imposed upon both Unit 2 small break LOCA analyses: 4 inch cold

AOO1

leg (CL), high head safety injection (HHSI) Cross Tie Valve Open and 3 inch CL, HHSI Cross Tie Valve Closed. The summary of the evaluation was previously reported to the Nuclear Regulatory Commission by Reference 2. The 12°F PCT penalty taken for the modification has been tracked internally since implementation to ensure the calculated PCT, with assessments, remains below 2200°F. The 12°F penalty is now being reported on the CNP annual report of LOCA evaluation model changes for completeness.

By Reference 1, I&M submitted a schedule for reanalysis of the Unit 1 large break LOCA analysis of record. By Reference 3, I&M submitted a schedule for reanalysis of the Unit 1 and Unit 2 small break LOCA and the Unit 2 large break LOCA analyses of record. These schedules remain unchanged.

There are no new commitments in this submittal. Should you have any questions, please contact Mr. John A. Zwolinski, Director of Safety Assurance, at (269) 466-2428.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Jensen', with a large, sweeping flourish extending to the right.

Joseph N. Jensen  
Site Vice President

DB/rdw

Attachments

c: J. L. Caldwell, NRC Region III  
K. D. Curry - AEP Ft. Wayne, w/o attachments  
J. T. King - MPSC, w/o attachments  
MDEQ - WHMD/HWRPS  
NRC Resident Inspector  
D. W. Spaulding - NRC Washington, DC

## ATTACHMENT 1 TO AEP:NRC:5046-01

### ASSESSMENT AGAINST THE UNIT 1 LARGE BREAK LOSS-OF-COOLANT ACCIDENT ANALYSIS OF RECORD

Indiana Michigan Power Company (I&M) previously submitted a 30-day report of loss-of-coolant accident evaluation model changes for Donald C. Cook Nuclear Plant (CNP) Unit 1 in a letter from Joseph N. Jensen to Nuclear Regulatory Commission Document Control Desk, dated April 29, 2005. The previous submittal reported a new PCT assessment against the CNP Unit 1 LBLOCA analysis of record as described below. The new assessment is reflected in the PCT accounting in Attachment 2, and is being reported below for completeness of annual report purposes.

#### Assessment Against the LBLOCA Analysis of Record

#### **Spacer Grid Heat Transfer Model Inputs Discrepancy Correction**

##### **Background**

A discrepancy was identified for the 15x15 fuel spacer grid blocked area ratio and open area fraction inputs used in the BASH evaluation model for the CNP Unit 1 LBLOCA analysis. The discrepant inputs were corrected and a plant-specific calculation was performed to estimate the impact on peak cladding temperature.

##### **Affected Evaluation Models**

1981 Westinghouse LBLOCA Evaluation Model with BASH

##### **Estimated Effect**

The impact on PCT was estimated using a plant-specific LOCBART calculation. As indicated in the PCT accounting in Attachment 2, the effect of the change to spacer grid heat transfer model inputs is a 37 degree Fahrenheit (°F) penalty.

##### **Conclusion**

This transmittal satisfies the annual reporting requirement of 10 CFR 50.46(a)(3)(ii). Attachment 2 demonstrates that the PCT value remains within the 2200°F PCT limit specified in 10 CFR 50.46(b)(1).

ATTACHMENT 2 TO AEP:NRC:5046-01

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

TABLE 1  
CNP UNIT 1  
LARGE BREAK LOCA

Evaluation Model: BASH			
$F_Q=2.15$	$F_{AH}=1.55$	$SGTP=15\%$	Break Size: $C_d=0.4$
Operational Parameters: RHR System Cross-Tie Valves Closed, 3250 <sup>1</sup> MWt Reactor Power			
Notes: ZIRLO clad, IFM grids			

## LICENSING BASIS

Analysis-of-Record, December 2000

PCT= 2038°F

## MARGIN ALLOCATIONS (Delta PCT)

A. PREVIOUS 10 CFR 50.46 ASSESSMENTS		
1.	LOCBART Cladding Emissivity Errors	-11°F
2.	Spacer Grid Blocked Area Ratio/Open Area Fraction	+37°F
B. PLANNED 50.59 PLANT CHANGE EVALUATIONS		
1.	Reduced Containment Spray Temperature	+23°F
C. NEW 10 CFR 50.46 ASSESSMENTS		
		0°F
D. OTHER		
1.	Transition Core Penalty <sup>2</sup>	+31°F
E. LICENSING BASIS PCT+ MARGIN ALLOCATIONS		
		PCT= 2118°F

<sup>1</sup> The 3250 MWt power level used in the reanalysis is acceptable because it bounds the Unit 1 3304 MWt steady state power limit in the operating license after adjusting for recapture of feedwater flow measurement and power calorimetric uncertainty.

<sup>2</sup> This penalty will be dropped once all fuel assemblies include the Intermediate Flow Mixing (IFM) Grids.

TABLE 2  
CNP UNIT 1  
SMALL BREAK LOCA

Evaluation Model: NOTRUMP			
$F_Q=2.32$	$F_{AH}=1.55$	SGTP=30%	3" cold leg break
Operational Parameters: SI System Cross-Tie Valves Closed, 3250 <sup>3</sup> MWt Reactor Power			
Notes: ZIRLO clad, IFM grids			

## LICENSING BASIS

Analysis-of-Record, December 2000

PCT= 1720°F

MARGIN ALLOCATIONS ( $\Delta$  PCT)

A.	PREVIOUS 10 CFR 50.46 ASSESSMENTS	
	1. Asymmetric HHSI Delivery	+50°F
	2. Reduction in Turbine Driven Auxiliary Feedwater Flow	+109°F
	3. Burst and Blockage / Time in Life	+111°F
B.	NEW 10 CFR 50.46 ASSESSMENTS	0°F
C.	OTHER	0°F
		<hr/>
D.	LICENSING BASIS PCT+ MARGIN ALLOCATIONS	PCT= 1990°F

<sup>3</sup> The 3250 MWt power level used in the reanalysis is acceptable because it bounds the Unit 1 3304 MWt steady state power limit in the operating license after adjusting for recapture of feedwater flow measurement and power calorimetric uncertainty.

TABLE 3  
CNP UNIT 2  
LARGE BREAK LOCA

Evaluation Model: BASH			
$F_Q=2.335$	$F_{AH}=1.644$	$SGTP=15\%$	Break Size: $C_d=0.6$
Operational Parameters: RHR System Cross-Tie Valves Closed, 3413 MWt Reactor Power <sup>4</sup>			

## LICENSING BASIS

Analysis-of-Record, December 1995

PCT= 2051°F

MARGIN ALLOCATIONS ( $\Delta$  PCT)

A.	PREVIOUS 10 CFR 50.46 ASSESSMENTS	
1.	ECCS double disk valve leakage	+8°F
2.	BASH current limiting break size reanalysis to incorporate LOCBART spacer grid single phase heat transfer and LOCBART zirc-water oxidation error	+58°F
3.	Cycle 13 ZIRLO Fuel Evaluation	-50°F
B.	PLANNED 50.59 PLANT CHANGE EVALUATIONS	
1.	Reduced Containment Spray Temperature	+47°F
C.	NEW 10 CFR 50.46 ASSESSMENTS	0°F
D.	OTHER	0°F
E.	LICENSING BASIS PCT+ MARGIN ALLOCATIONS	<u>PCT= 2114°F</u>

<sup>4</sup> Power level used as basis for PCT acceptance is 3413 MWt due to the reanalysis (see Item A.2) to provide an integrated error effect on the limiting case. This reanalysis (Item A.2) is not considered the analysis-of-record due to the spectrum of break sizes not being reanalyzed to ensure that the limiting break size at 3413 MWt with the errors incorporated would not change. Thus, the analysis-of-record remains as the 1995 analysis at a power level of 3588 MWt. The difference between the limiting case PCT (2051°F) and the PCT from the reanalysis of that limiting break size at 3413 MWt is the 58°F being reported. The 3413 MWt power level used in the reanalysis is acceptable because it bounds the Unit 2 3468 MWt steady state power limit in the operating license after adjusting for recapture of feedwater flow measurement and power calorimetric uncertainty.

TABLE 4  
CNP UNIT 2  
SMALL BREAK LOCA

Evaluation Model: NOTRUMP			
$F_Q=2.45$	$F_{\Delta H}=1.666$	SGTP=15%	3" cold leg break
Operational Parameters: SI System Cross-Tie Valves Closed, 3250 MWt Reactor Power <sup>5</sup>			

#### LICENSING BASIS

Analysis-of-Record, March 1992

PCT= 1956°F

#### MARGIN ALLOCATIONS ( $\Delta$ PCT)

A. PREVIOUS 10 CFR 50.46 ASSESSMENTS		
1.	Limiting NOTRUMP and SBLOCA analysis	-214°F
2.	Burst and blockage / time in life	+95°F
3.	Asymmetric HHSI Delivery	+50°F
4.	NOTRUMP mixture level tracking/region depletion errors	+13°F
5.	NOTRUMP Bubble Rise/Drift Flux Model Inconsistency	+35°F
	Corrections	
B. PLANNED 50.59 PLANT CHANGE EVALUATIONS		
1.	Artificial Leak-By	+12°F
C. NEW 10 CFR 50.46 ASSESSMENTS		
		0°F
D. OTHER		
		0°F
E. LICENSING BASIS PCT+ MARGIN ALLOCATIONS		
		PCT= 1947°F

<sup>5</sup> Unit 2 is licensed to a 3468 MWt steady-state power level. However, 3304 MWt is assumed for the small break LOCA analysis with the safety injection (SI) system cross-tie valves closed. This is because Unit 2 Technical Specification 3.5.2 limits thermal power to 3304 MWt with a SI cross-tie valve closed. The 3250 MWt power level used in the reanalysis is acceptable because it bounds the Unit 2 3304 MWt steady state power limit in the operating license after adjusting for recapture of feedwater flow measurement and power calorimetric uncertainty.



TABLE 5  
CNP UNIT 2  
SMALL BREAK LOCA

Evaluation Model: NOTRUMP			
$F_Q=2.32$	$F_{\Delta H}=1.62$	SGTP=15%	4" cold leg break
Operational Parameters: SI System Cross-Tie Valves Open, 3588 MWt Reactor Power			

## LICENSING BASIS

Analysis-of-Record, August 1992

PCT= 1531°F

MARGIN ALLOCATIONS ( $\Delta$  PCT)

## A. PREVIOUS 10 CFR 50.46 ASSESSMENTS

1.	Effect of SI in Broken Loop	+150°F
2.	Effect of Improved Condensation Model	-150°F
3.	Drift Flux Flow Regime Errors	-13°F
4.	LUCIFER Error Corrections	-16°F
5.	Containment Spray During Small Break LOCA	+20°F
6.	Boiling Heat Transfer Correlation Error	-6°F
7.	Steam Line Isolation Logic Error	+18°F
8.	Axial Nodalization, and SBLOCA correction	+3°F
9.	NOTRUMP Specific Enthalpy Error	+20°F
10.	SBLOCA Fuel Rod Initialization Error	+10°F
11.	Loop Seal Elevation Error	-38°F
12.	NOTRUMP Mixture Level Tracking / Region Depletion Errors	+13°F
13.	NOTRUMP Bubble Rise/Drift Flux Model Inconsistency Corrections	+35°F

## B. PLANNED 50.59 PLANT CHANGE EVALUATIONS

1.	Artificial Leak-By	+12°F
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## C. NEW 10 CFR 50.46 ASSESSMENTS

0°F

## D. OTHER

0°F

## E. LICENSING BASIS PCT+ MARGIN ALLOCATIONS

PCT= 1589°F