INDIANA MICHIGAN POWER
A unit of American Electric Power

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

August 30, 2011

AEP-NRC-2011-54
10 CFR 50.46

Docket Nos.: 50-315
50-316

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

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

Reference:

1) Letter from P. S. Tam, U. S. Nuclear Regulatory Commission (NRC), to M. W. Rencheck, Indiana Michigan Power Company (I&M), "Donald C. Cook Nuclear Plant, Unit 1 - Issuance of Amendment to Renewed Facility Operating License Regarding Use of the Westinghouse ASTRUM Large Break Loss-Of-Coolant Accident Analysis Methodology (TAC No. MD7556)," dated October 17, 2008 (ADAMS Accession No. ML082670351).

2) Letter from P. S. Tam, NRC, to L. J. Weber, I&M, "Donald C. Cook Nuclear Plant, Unit 2 (CNP-2) - Issuance of Amendment to Adopt a New Large Break Loss-Of-Coolant Accident Analysis (TAC No. ME1017)," dated March 31, 2011, (ADAMS Accession No. ML110730783).

3) Letter from J. P. Gebbie, I&M, to U. S. NRC Document Control Desk, "Donald C. Cook Nuclear Plant Unit 2, Docket No. 50-316, Response to Second Request for Additional Information Regarding a License Amendment Request Associated With the Large-Break Loss-Of-Coolant Accident Analysis Methodology (TAC No. ME1017)," dated February 24, 2011, AEP-NRC-2011-15 (ADAMS Accession Number ML110680210).

4) Letter from M. H. Carlson, I&M, to NRC Document Control Desk, "Donald C. Cook Nuclear Plant Unit 2, Docket No. 50-316, Errors in Containment Backpressure Calculation in Large Break Loss-of-Coolant Accident Analysis," dated June 16, 2011, AEP-NRC-2011-35 (ADAMS Accession No. ML11171A655).

A002
NRR

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. The enclosure to this letter provides the Unit 1 and Unit 2 large break and small break LOCA analyses of record PCT values and error assessments for calendar year 2010.

During the second half of 2010, I&M was notified of two errors involving the Unit 1 and Unit 2 large break LOCA analyses that had been performed using a plant-specific adaptation of the Westinghouse ASTRUM methodology. The Unit 1 analysis affected by the errors had been approved by the NRC in October 2008 (Reference 1) and was therefore the analysis of record in 2010. The Unit 2 analysis affected by the errors was approved in 2011 (Reference 2) and was therefore not the analysis of record in 2010. The NRC was informed of the errors in the Unit 2 analysis via Reference 3.

The initial method for resolving the errors consisted of changing the limiting single failure assumed in the analyses. This method resulted in no impact on the calculated PCT. Errors that do not impact PCT are not reported under 10 CFR 50.46. Therefore, the errors are not included in the enclosed Unit 1 large break LOCA PCT summary for 2010. Since the Unit 2 analysis using the plant-specific adaptation of the ASTRUM methodology had not been approved by the NRC in 2010, the two errors are not applicable to the analysis addressed in the enclosed Unit 2 large break LOCA PCT summary for 2010. In 2011, the method for resolving these errors for both units was revised to be as described for Unit 2 in Reference 4. Although the planned method of resolving the errors was revised, there will continue to be no impact on the calculated PCT.

There are no new or revised commitments in this letter. 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

JRW/jen

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

c: J. T. King, MPSC
S. M. Krawec – AEP Ft. Wayne, w/o enclosure
MDEQ – WHMD/RPS
NRC Resident Inspector
M. A. Satorius - NRC Region III
P. S. Tam – NRC Washington DC

ENCLOSURE TO AEP-NRC-2011-54

DONALD C. COOK NUCLEAR PLANT UNITS 1 AND 2

LARGE AND SMALL BREAK LOSS-OF-COOLANT ACCIDENT
PEAK CLAD TEMPERATURE SUMMARY

Abbreviations

CNP	Donald C. Cook Nuclear Plant
°F	degrees Fahrenheit
$F_{\Delta H}$	nuclear enthalpy rise hot channel factor
F_Q	heat flux hot channel factor
HHSI	high head safety injection (Safety Injection System at CNP)
IFM	intermediate flow mixer
LOCA	loss of coolant accident
MWt	megawatts – thermal
PCT	peak cladding temperature
RHR	Residual Heat Removal
SGTP	steam generator tube plugging

CNP UNIT 1

LARGE BREAK LOCA

Evaluation Model: ASTRUM (2004)
$F_Q = 2.15$ $F_{\Delta H} = 1.55$ SGTP = 10% Break Size: Split
Operational Parameters: 3304 MWt Reactor Power

LICENSING BASIS

Analysis-of-Record, October 2008	PCT = 2128°F

MARGIN ALLOCATIONS (Delta PCT)

A.	PREVIOUS 10 CFR 50.46 ASSESSMENTS	
	1. None	0°F
B.	PLANNED PLANT MODIFICATION EVALUATIONS	
	1. None	0°F
C.	NEW 10 CFR 50.46 ASSESSMENTS	0°F
D.	OTHER	0°F
LICENSING BASIS PCT + MARGIN ALLOCATIONS		PCT = 2128°F

CNP UNIT 1

SMALL BREAK LOCA

Evaluation Model: NOTRUMP

F_Q=2.32 $F_{\Delta H}$=1.55 SGTP=30% 3″ cold leg break

Operational Parameters: SI System Cross-Tie Valves Closed, 3250 MWt Reactor Power[1]

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
LICENSING BASIS PCT+ MARGIN ALLOCATIONS		PCT= 1990°F

[1] 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.

CNP UNIT 2
LARGE BREAK LOCA
Scenario 1

Evaluation Model: BASH
$F_Q = 2.335$ $F_{\Delta H} = 1.644$ SGTP = 15% Break Size: $C_d = 0.6$
Operational Parameters: RHR System Cross-Tie Valves Closed, 3413 MWt Reactor Power[1]

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. LOCBART Pellet Volumetric Heat Generation Rate Error[2]	+25°F
B.	PLANNED 50.59 PLANT CHANGE EVALUATIONS	
	1. Cycle 13 ZIRLO Fuel Evaluation	-50°F
	2. Reduced Containment Spray Temperature	+47°F
C.	NEW 10 CFR 50.46 ASSESSMENTS	0°F
D.	OTHER	0°F
LICENSING BASIS PCT + MARGIN ALLOCATIONS		PCT = 2139°F

1. 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.
2. Includes 9°F penalty due to rebaselining of the limiting LOCBART calculation.

CNP UNIT 2
LARGE BREAK LOCA
Scenario 2

Evaluation Model: BASH
$F_Q = 2.335$ $F_{\Delta H} = 1.644$ SGTP = 15%[4] Break Size: $C_d = 0.6$
Operational Parameters: RHR System Cross-Tie Valves Closed, 3413 MWt Reactor Power[3]

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. LOCBART Pellet Volumetric Heat Generation Rate Error	+14°F
	4. Increased Accumulator Water Temperature Evaluation[4]	+27°F
B.	PLANNED 50.59 PLANT CHANGE EVALUATIONS	
	1. Cycle 13 ZIRLO Fuel Evaluation	-50°F
C.	NEW 10 CFR 50.46 ASSESSMENTS	0°F
D.	OTHER	0°F
LICENSING BASIS PCT + MARGIN ALLOCATIONS		PCT = 2108°F

3. 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.
4. Margin allocation A.4 utilized a reduced SGTP of one percent.

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[1]

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 Small Break LOCA 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 Corrections	+35°F
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
LICENSING BASIS PCT + MARGIN ALLOCATIONS		PCT = 1947°F

1. 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.

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 Small Break LOCA correction	+3°F
	9.	NOTRUMP Specific Enthalpy Error	+20°F
	10.	Small Break LOCA 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
C.	NEW 10 CFR 50.46 ASSESSMENTS		0°F
D.	OTHER		0°F

LICENSING BASIS PCT + MARGIN ALLOCATIONS	PCT = 1589°F