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October 16, 2007

AEP:NRC:7046-03
10 CFR 50.46

Docket No.: 50-315
50-316

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

Donald C. Cook Nuclear Plant Unit 1 and Unit 2
THIRTY-DAY REPORT FOR LOSS-OF-COOLANT
ACCIDENT EVALUATION MODEL CHANGES

References:
1. 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," submittal AEP:NRC:4046-01, Accession Number ML050040216, dated December 28, 2004.
2. Letter from Joseph N. Jensen, I&M, to U. S. NRC Document Control Desk, "Donald C. Cook Nuclear Plant Unit 1, Thirty-day Report of Loss-of-Coolant Accident Evaluation Model Changes," submittal AEP:NRC:5046, Accession Number ML051300368, dated April 29, 2005.
3. Letter from Joseph N. Jensen, I&M, to U. S. NRC Document Control Desk, "Donald C. Cook Nuclear Plant Unit 1, Thirty-day Report of Loss-of-Coolant Accident Evaluation Model Change," submittal AEP:NRC:6046-01, Accession Number ML063530324, dated December 7, 2006.

Pursuant to 10 CFR 50.46, Indiana Michigan Power Company (I&M), the licensee for Donald C. Cook Nuclear Plant (CNP), is submitting a 30-day report on a loss-of-coolant accident (LOCA) model error resulting in a significant change in calculated peak fuel cladding temperature (PCT) for the CNP Unit 1 and Unit 2 large break LOCA (LBLOCA) analyses. A significant change is defined in 10 CFR 50.46(a)(3)(i) as a change or error identified in the model which results in a calculated PCT greater than 50 degrees Fahrenheit (°F) or a cumulation of changes and errors such that the sum of the absolute magnitudes of the respective temperature changes is greater than 50°F.

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Attachment 1 to this letter describes an assessment against the CNP Unit 1 and Unit 2 LBLOCA analyses of record. Attachment 2 provides the CNP Unit 1 and Unit 2 LBLOCA analysis of record PCT value and error assessments. Attachment 2 also demonstrates that the PCT values remain within the 2200°F PCT limit as required by 10 CFR 50.46(b)(1).

Regulation 10 CFR 50.46(a)(3)(ii) requires that, when significant changes are identified, licensees submit a schedule for reanalysis. By Reference 1, I&M submitted a schedule for reanalysis of the Unit 2 LBLOCA analysis-of-record. By Reference 2, I&M submitted a schedule for reanalysis of the Unit 1 LBLOCA analysis-of-record. I&M provided an updated schedule for the Unit 1 and Unit 2 LBLOCA reanalyses by Reference 3. This schedule remains unchanged as documented in Attachment 3.

Should you have any questions concerning this subject, please contact Ms. Susan D. Simpson, Regulatory Affairs Manager, at (269) 466-2428.

Sincerely,

Mark A. Peifer
Vice President - Site Support Services

Attachments

KAS/jen

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/RPMWS, w/o attachments
NRC Resident Inspector
P. S. Tam – NRC Washington, DC

ATTACHMENT 1 TO AEP:NRC:7046-03

ASSESSMENT AGAINST THE LOSS-OF-COOLANT ACCIDENT (LOCA) ANALYSES OF RECORD

Indiana Michigan Power Company's (I&M's) most recent annual 10 CFR 50.46 report for Donald C. Cook Nuclear Plant (CNP) was submitted by Reference 1. New peak cladding temperature (PCT) assessments against the CNP Unit 1 and Unit 2 large break loss-of-coolant accident (LBLOCA) analyses of record are described below. The new assessments are reflected in the PCT accounting in Attachment 2.

Assessment Against the LBLOCA Analysis of Record

BASH-EM Accumulator Water Temperature

Background

Westinghouse sensitivity studies developed in the early 1990s form part of the basis for the selection of an accumulator water temperature input value of 100 degrees Fahrenheit (°F) used in the CNP 10 CFR 50, Appendix K LBLOCA analyses. Westinghouse has informed I&M that these accumulator water temperature sensitivity studies can no longer be supported on a generic basis. Evaluations were completed for CNP Unit 1 and Unit 2 to support a maximum accumulator water temperature of 120°F which corresponds to the maximum containment lower compartment average air temperature of Technical Specification (TS) 3.6.5, "Containment Air Temperature." These evaluations are reflected in the PCT accounting in Attachment 2 as Scenario 2 for the Unit 1 and Unit 2 LBLOCA analyses of record. Scenario 1 reflects the Unit 1 and Unit 2 LBLOCA analyses of record without the assessed change to accumulator water temperature.

Table 1 of this attachment identifies the major differences between Scenarios 1 and 2. Scenario 2 was created to specifically address the increased accumulator water temperature while also using margin available by restricting the steam generator tube plugging limit (SGTP) and restricting the circulation of essential service water (ESW) through the containment spray (CTS) heat exchangers (HXs) during Modes 1 through 4 when ESW temperature is cooler than the minimum Refueling Water Storage Tank (RWST) temperature (70°F) allowed by TS Surveillance Requirement 3.5.4.1. The purpose of circulating ESW through the CTS HXs is to provide an optional ESW system flow path to allow operations personnel to achieve the 2000 gallons per minute (gpm) minimum flow prescribed for ESW pumps. ESW flow through the CTS HXs potentially results in a lower containment spray temperature during the injection phase of a postulated loss-of-coolant accident. Scenario 1 remains applicable when lower containment average air temperature, and therefore accumulator water temperature, is less than or equal to 100°F and ESW temperature cooler than the minimum RWST temperature allowed by TS. This provides additional operating flexibility when system conditions permit use of the CTS HX flow path. CNP procedure changes have been made restricting the use of ESW flow through the CTS HXs, thereby preventing plant conditions from being outside the bounds of the analyzed scenarios.

In order to assure that unit operation remains bounded by LBLOCA analysis Scenario 1 and Scenario 2 for each unit, the following compensatory measures have been implemented:

1) Restrict the SGTP limit to 1 percent,
2) Prevent ESW flow to the CTS HXs during Modes 1 through 4 when the ultimate heat sink temperature is less than 70°F and containment lower compartment average air temperature is greater than 100°F (other methods are available for achieving the 2000 gpm minimum flow for the ESW pumps).

Table 1: Major Differences between Scenarios 1 and 2

Parameter	Scenario 1	Scenario 2
SGTP, percent	15	1
Maximum Accumulator Water Temperature, °F	100	120
Minimum Containment Spray Temperature, °F	32	70

Affected Evaluation Models

1981 Westinghouse LBLOCA Evaluation Model with BASH

Estimated Effect

The impact on PCT was estimated using plant-specific BASH-EM calculations. As indicated in the PCT accounting in Attachment 2, Table 2, for CNP Unit 1, the effect of the change to the increased containment spray temperature and accumulator temperature with reduced SGTP is a 16°F benefit as indicated in Attachment 2, Table 2. The change to the increased containment spray temperature and accumulator temperature with reduced SGTP for CNP Unit 2 resulted in a penalty of 27°F as indicated on Attachment 2, Table 4.

The overall change to the Unit 1 and Unit 2 LBLOCA analysis is classified as significant in accordance with 10 CFR 50.46(a)(3)(i). By Reference 3, I&M submitted a schedule for reanalysis of the Unit 2 LBLOCA analysis-of-record. By Reference 4, I&M submitted a schedule for reanalysis of the Unit 1 LBLOCA analysis-of-record. I&M provided an updated schedule for the Unit 1 and Unit 2 LBLOCA reanalyses by Reference 5. This schedule remains unchanged as documented in Attachment 3. The Unit 1 and Unit 2 LBLOCA reanalyses are underway using the ASTRUM methodology. I&M plans to keep the compensatory measures in place for each unit until the reanalyses using ASTRUM are approved by the Nuclear Regulatory Commission and the transition from the BASH-EM is complete.

Conclusion

This transmittal satisfies the 30-day reporting requirement of 10 CFR 50.46(a)(3)(ii). Attachment 2 demonstrates that the PCT values remain within the 2200°F PCT limit specified in 10 CFR 50.46(b)(1).

References

1. Letter from S. D. Simpson, I&M, to NRC Document Control Desk, "Donald C. Cook Nuclear Plant Units 1 and 2, Annual Report of Loss-of-Coolant Accident Evaluation Model Changes," submittal AEP:NRC:7046-02, Accession Number ML072540683, dated August 31, 2007.
2. Letter from N. J. Liparulo, Westinghouse Electric Corporation, to R. C. Jones Jr., Nuclear Regulatory Commission (NRC), "1994 Annual Notification of Changes to the Westinghouse Small Break LOCA ECCS Evaluation Model and Large Break LOCA ECCS Evaluation Model, Pursuant to 10 CFR 50.46 (a)(3)(ii)," submittal NTD-NRC-95-4409, dated February 22, 1995.
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," submittal AEP:NRC:4046-01, Accession Number ML050040216, dated December 28, 2004.
4. Letter from Joseph N. Jensen, I&M, to U. S. NRC Document Control Desk, "Donald C. Cook Nuclear Plant Unit 1, Thirty-day Report of Loss-of-Coolant Accident Evaluation Model Changes," submittal AEP:NRC:5046, Accession Number ML051300368, dated April 29, 2005.
5. Letter from Joseph N. Jensen, I&M, to U. S. NRC Document Control Desk, "Donald C. Cook Nuclear Plant Unit 1, Thirty-day Report of Loss-of-Coolant Accident Evaluation Model Change," submittal AEP:NRC:6046-01, Accession Number ML063530324, dated December 7, 2006.

ATTACHMENT 2 TO AEP:NRC:7046-03

DONALD C. COOK NUCLEAR PLANT (CNP) UNIT 1 AND UNIT 2 LARGE BREAK LOSS-OF-COOLANT ACCIDENT (LOCA) PEAK CLAD TEMPERATURE (PCT) SUMMARY

TABLE 1

CNP UNIT 1
LARGE BREAK LOCA
Scenario 1

Evaluation Model: BASH

$F_Q = 2.15$ $F_{\Delta H} = 1.55$ SGTP = 15% Break Size: $C_d = 0.4$

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

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. Rebaseline Using PAD 4.0	+57°F
	3. LOCBART Pellet Volumetric Heat Generation Rate Error	+11°F
B.	PLANNED 50.59 PLANT CHANGE EVALUATIONS	
	1. Reduced Containment Spray Temperature	+23°F
	2. 15x15 Upgrade Fuel	-59°F
C.	New 10 CFR 50.46 ASSESSMENTS	0°F
D.	OTHER	0°F
E.	LICENSING BASIS PCT + MARGIN ALLOCATIONS	PCT = 2059°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.

TABLE 2

CNP UNIT 1
LARGE BREAK LOCA
Scenario 2

Evaluation Model: BASH			
$F_Q = 2.15$	$F_{\Delta H} = 1.55$	SGTP = 15%[2]	Break Size: $C_d = 0.4$
Operational Parameters: RHR System Cross-Tie Valves Closed, 3250 MWt Reactor Power[3]			

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. Rebaseline Using PAD 4.0	+57°F
	3. LOCBART Pellet Volumetric Heat Generation Rate Error	+11°F
B.	PLANNED 50.59 PLANT CHANGE EVALUATIONS	
	1. 15x15 Upgrade Fuel	-59°F
C.	New 10 CFR 50.46 ASSESSMENTS	
	1. Increased Accumulator Water Temperature Evaluation[2]	-16°F
D.	OTHER	0°F
E.	LICENSING BASIS PCT + MARGIN ALLOCATIONS	PCT = 2020°F

2. Margin allocation C.1 utilized a reduced SGTP of 1 percent.
3. 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
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[4]			

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[5]	+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
E.	LICENSING BASIS PCT + MARGIN ALLOCATIONS	PCT = 2139°F

4. 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.
5. Includes 9°F penalty due to rebaselining of the limiting LOCBART calculation.

TABLE 4

CNP UNIT 2
LARGE BREAK LOCA
Scenario 2

Evaluation Model: BASH			
$F_Q = 2.335$	$F_{\Delta H} = 1.644$	SGTP = 15%[6]	Break Size: $C_d = 0.6$
Operational Parameters: RHR System Cross-Tie Valves Closed, 3413 MWt Reactor Power[7]			

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
B.	PLANNED 50.59 PLANT CHANGE EVALUATIONS	
	1. Cycle 13 ZIRLO Fuel Evaluation	-50°F
C.	New 10 CFR 50.46 ASSESSMENTS	
	1. Increased Accumulator Water Temperature Evaluation[6]	+27°F
D.	OTHER	0°F
E.	LICENSING BASIS PCT + MARGIN ALLOCATIONS	PCT = 2108°F

6. Margin allocation C.1 utilized a reduced SGTP of 1 percent.
7. 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.

ATTACHMENT 3 TO AEP:NRC:7046-03

REGULATORY COMMITMENTS

The following table identifies those actions committed to by Indiana Michigan Power Company (I&M) in this document. Any other actions discussed in this submittal represent intended or planned actions by I&M. They are described to the Nuclear Regulatory Commission (NRC) for the NRC's information and are not regulatory commitments.

Commitment	Date
A new Unit 1 large break loss-of-coolant accident (LBLOCA) analysis will be provided.	December 2007
A new Unit 2 LBLOCA analysis will be provided.	March 2009