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AEP-NRC-2016-73  
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

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 an enclosure to this letter, the Unit 1 and Unit 2 Large Break and Small Break LOCA Analyses-of-Record PCT values and error assessments for calendar year 2015.

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

Sincerely,

Michael K. Scarpello  
Regulatory Affairs Manager

JMT/ml

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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ADD2  
NRR

## ENCLOSURE TO AEP-NRC-2016-73

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

#### Abbreviations:

|        |   |
|--------|---|
| ADAMS  | Agencywide Documents Access and Management System           |
| CNP    | Donald C. Cook Nuclear Plant                                |
| °F     | Degrees Fahrenheit  |
| ECCS   | Emergency Core Cooling System                               |
| EM     | Evaluation Model  |
| 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   |
| NRC    | Nuclear Regulatory Commission                               |
| PCT    | Peak Cladding Temperature                                   |
| RHR    | Residual Heat Removal                                       |
| SB     | Small Break   |
| SGTP   | Steam Generator Tube Plugging                               |
| 10 CFR | Title 10 of the Code of Federal Regulations                 |
| 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

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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.

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 for the calendar year 2015. 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)  |                 |                     |                   |
| $F_Q = 2.15$                     | $F_{dH} = 1.55$ | $SGTP = 10\%^{(a)}$ | 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. Evaluation of TCD and Peaking Factor Burndown  | 384°F(a)  |
|    | 2. Revised Heat Transfer Multiplier Distributions | -55°F     |
|    | 3. Error in Burst Strain Application              | 85°F      |
|    | 4. Decay Group Uncertainty Factors Errors         | -29°F     |
| B. | PLANNED PLANT MODIFICATION EVALUATIONS            |           |
|    | 1. Plant Evaluations associated with TCD          | -381°F(a) |
| C. | NEW 10 CFR 50.46 ASSESSMENTS                      |           |
|    | 1. None   | 0°F       |
| D. | OTHER   | 0°F       |

LICENSING BASIS PCT + MARGIN ALLOCATIONS

PCT = 2132°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 2.5% and maximum  $F_{dH}$  reduced to 1.545).

CNP UNIT 1

LOCA Peak Clad Temperature Summary for Appendix K Small Break

|                                |          |          |                          |
|--------------------------------|----------|----------|--------------------------|
| Evaluation Model: NOTRUMP      |          |          |                          |
| F <sub>Q</sub> =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      |     |
| 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 = 1725°F

CNP UNIT 2

LOCA Peak Clad Temperature Summary for ASTRUM Best Estimate Large Break

Evaluation Model: ASTRUM (2004)

$F_Q = 2.335$      $F_{dH} = 1.644$      $SGTP = 10\%^{(a)}$     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) |
| C. | NEW 10 CFR 50.46 ASSESSMENTS                      |           |
|    | 1. None   | 0°F       |
| D. | OTHER   | 0°F       |

LICENSING BASIS PCT + MARGIN ALLOCATIONS

PCT = 1967°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% and maximum  $F_{dH}$  reduced to 1.61).

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: April 25, 2011                               |

Notes: 3600 MWt

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