Indiana Michigan
Power Company
Cook Nuclear Plant
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Bridgman, MI 49106
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November 15, 2002

AEP:NRC:2900-04
10 CFR 50, Appendix K

Docket Nos.: 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 Units 1 and 2
SUBMITTAL OF CHANGE TO POWER MEASUREMENT UNCERTAINTY CALCULATION IN SUPPORT OF LICENSE AMENDMENT REQUEST FOR APPENDIX K MEASUREMENT UNCERTAINTY RECAPTURE – POWER UPRATE REQUEST (TAC NO. MB5498)

This letter addresses questions issued in a Nuclear Regulatory Commission (NRC) request for additional information (RAI) and submits a change to a previously-submitted proprietary calculation in support of a proposed increase in the Donald C. Cook Nuclear Plant (CNP) Unit 1 licensed reactor core power level. The attached calculation establishes the thermal power measurement uncertainty for the proposed 1.66 percent power uprate.

By Reference 1, Indiana Michigan Power Company (I&M), the licensee for CNP Unit 1, proposed to amend Facility Operating License DPR-58, including Appendix A, Technical Specifications, to allow a 1.66-percent increase in the licensed core power to 3304 MWt. On October 2, 2002, the NRC issued an RAI (Reference 2) to support the staff's review of the Unit 1 Measurement Uncertainty Recapture (MUR) power uprate license amendment request submitted by Reference 1. In response to questions in Reference 2, I&M provided to the NRC, via Reference 3, a copy of calculation 1-2-O1-03 CALC 2, Revision 1, "Power Calorimetric Accuracy Using the Caldon Check Plus Feedwater Flow Measurement System and a Modified PPC CALM Program," dated September 25, 2002 (Proprietary). Details of the calculation were discussed in a conference call on October 31, 2002. An RAI that specifically focused on the power calorimetric calculation was subsequently issued by the NRC (Reference 4).

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The response to the Reference 4 RAI is provided in Attachment 1 to this letter. Attachment 2 to this letter provides I&M's calculation, 1-2-O1-03 CALC 2, Revision 1, Change Sheet 1, "Power Calorimetric Accuracy Using the Caldon Check Plus Feedwater Flow Measurement System and a Modified PPC CALM Program," dated November 12, 2002 (Proprietary), which incorporates enhancements resulting from the NRC's questions. Attachment 3 provides the application and affidavit for withholding Attachment 2 from public disclosure in accordance with 10 CFR 2.790.

It should be noted that the thermal power uncertainty measurement calculation provided in Attachment 2 to this letter establishes the basis for the core thermal power measurement uncertainty for both Unit 1 and Unit 2, although Reference 1 only requested a power uprate for CNP Unit 1. There are no new commitments made in this submittal.

Should you have any questions, please contact Mr. Brian A. McIntyre, Manager of Regulatory Affairs, at (269) 697-5806.

Sincerely,

J. E. Pollock
Site Vice President

NH/jen

References:

1. Letter from J. E. Pollock, I&M, to NRC Document Control Desk, "License Amendment Request for Appendix K Measurement Uncertainty Recapture – Power Uprate Request," AEP:NRC:2900, dated June 28, 2002

2. Letter from J. F. Stang, NRC, to A. C. Bakken III, I&M, "Donald C. Cook Nuclear Plant, Unit 1 – Request for Additional Information Regarding License Amendment Request, 'Power Uprate Measurement Uncertainty Recapture,' dated June 28, 2002 (TAC No. MB5498)," dated October 2, 2002

3. Letter from J. E. Pollock, I&M, to NRC Document Control Desk, "Donald C. Cook Nuclear Plant Units 1 and 2 – Submittal of Power Measurement Uncertainty Calculation in Support of License Amendment Request for Appendix K Measurement Uncertainty Recapture - Power Uprate Request (TAC No. MB5498)," AEP:NRC:2900-03, dated October 2, 2002

4. Letter from J. F. Stang, NRC, to A. C. Bakken, III, I&M, "Donald C. Cook Nuclear Plant, Unit 1 – Second Request for Additional Information Regarding License Amendment Request, 'Power Uprate Measurement Uncertainty Recapture' (TAC No. MB5498)," dated November 7, 2002

Enclosure:

1. Notarized Oath and Affirmation Statement

Attachments:

1. Response to NRC Request for Additional Information Regarding Power Measurement Uncertainty Calculation
2. Donald C. Cook Nuclear Plant Calculation No. 1-2-O1-03 CALC 2, Revision 1, Change Sheet 1, "Power Calorimetric Accuracy using the Caldon Check Plus Feedwater Flow Measurement System and a Modified PPC CALM Program"
3. Application and Affidavit for Withholding Proprietary Information from Public Disclosure in Accordance with 10 CFR 2.790

c: K. D. Curry – AEP Ft. Wayne, w/o attachments
J. E. Dyer – NRC Region III
MDEQ - DW & RPD, w/o attachments
NRC Resident Inspector
J. F. Stang, Jr. – NRC Washington DC
R. Whale – MPSC, w/o attachments

bc: Without Enclosure/Attachments
G. P. Arent
A. C. Bakken, III
M. J. Finissi
S. A. Greenlee
D. R. Hafer
G. J. Hill
D. W. Jenkins
J. A. Kobyra
B. A. McIntyre
J. E. Newmiller
J. E. Pollock
D. J. Poupard
K. W. Riches
M. K. Scarpello
M. G. Williams
T. K. Woods

AFFIRMATION

I, Joseph E. Pollock, being duly sworn, state that I am Site Vice President of Indiana Michigan Power Company (I&M), that I am authorized to sign and file this request with the Nuclear Regulatory Commission on behalf of I&M, and that the statements made and the matters set forth herein pertaining to I&M are true and correct to the best of my knowledge, information, and belief.

Indiana Michigan Power Company

J E Pollock

J. E. Pollock
Site Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 15 DAY OF November, 2002

DANIELLE M. SCHRADER
Notary Public, Berrien County, MI
My Commission Expires Apr 4, 2004

Danielle M Schrader
Notary Public

My Commission Expires 4-4-04

ATTACHMENT 1 TO AEP:NRC:2900-04

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION
REGARDING THERMAL POWER MEASUREMENT CALCULATION FOR APPENDIX K
MEASUREMENT UNCERTAINTY RECAPTURE –
POWER UPRATE REQUEST

NRC Question 1

The issue of common (ie non-independent) influences must be addressed. Some examples of common influences are listed below:

a. common instrument environments,

b. common Measurement and Testing Equipment related uncertainty, and

c. common source for feed water flow and temperature data (ref. the Caldon caveat in calculation Attachment 8 against using square root sum of the squares for flow and temperature).

Response to Question 1

a. & b. The methodology used at Donald C. Cook Nuclear Plant (CNP) to calculate instrument uncertainty treats uncertainties that are potentially non-independent or insufficiently independent by algebraically combining the errors. The uncertainties for calibration accuracy, Measurement and Test Equipment (MTE), and component drift are algebraically summed (i.e., calibration accuracy + MTE accuracy + drift error) to include the potential dependencies resulting from instruments in a common environment and/or instruments calibrated with the same MTE.

c. Section 2.5 has been added to calculation 1-2-O1-03 CALC 2, Revision 1, Change Sheet (CS)-1, to describe the additional uncertainty of ±0.02% rated thermal power (RTP) due to the dependence of feedwater temperature and mass flow, as identified by Caldon subsequent to submittal of the Unit 1 Measurement Uncertainty Recapture License Amendment Request. Additionally, Section 7.2 has been revised to discuss the effect of the dependence between mass flow and feedwater temperature on the calculation conclusions.

The feedwater mass flow and feedwater enthalpy uncertainties were treated independent of each other in Revisions 0 and 1 of the uncertainty calculation. This was done because the dependencies between the uncertainties due to feedwater temperature and pressure are small when compared to the margin between the calculated uncertainty result and the basis for the power uprate. I&M's methodology documented a conservative calculation of the calorimetric uncertainty using a feedwater mass flow uncertainty assumption that bounded the as-built mass flow uncertainty. This conservative margin bounded the explicit assignation of the margin

based on the dependence between mass flow and feedwater temperature. However, in response to this RAI, I&M has issued CS-1 to Revision 1 of calculation 1-2-O1-03 CALC 2 to more explicitly document the assignment of margin in the calculation. The inclusion of this explicit information in Section 2.5 of the calculation documents that this effect is, in fact, insignificant and did not affect the conclusions or the results of the calculation.

NRC Question 2

Figure 4.2 and Table 4.2 show the use of several parameters and calculations that influence the core thermal power calculation, but for which no uncertainty allowance is provided. Please justify that there is no uncertainty associated with these parameters and calculations, or account for the associated uncertainties.
Note that there are two issues for each parameter or calculation: 1) establishing what uncertainty value is appropriate, and 2) accounting for the effect of each uncertainty upon the overall uncertainty in the core thermal power evaluation. The parameters in question are:

a. *net heat loss,*
b. *steam quality (both the value for main steam and the value for the blowdown flow from each steam generator, and*
c. *steam table data (both the uncertainties involved in the Plant Process Computer calculations that generate the steam table values and the uncertainties inherent in the steam tables themselves).*

Response to Question 2

Indiana Michigan Power Company (I&M) calculation 1-2-O1-03 CALC 2, Revision 1, CS–1, has been revised to document the impacts of net heat loss accuracy, steam quality uncertainty, and American Society of Mechanical Engineers (ASME) steam table accuracy, as discussed below. The combined effect of these uncertainties does not impact the calculation conclusions and the Leading Edge Flow Meter (LEFM™) calorimetric accuracy remains bounded by ±0.31% RTP.

The additions to the calculation made to evaluate such quantities as the uncertainty of the steam tables, net heat loss and steam quality measurement were undertaken at the request of the NRC. The methodology used in Revision 0 and Revision 1 of the calculation is consistent with I&M's Instrumentation and Controls (I&C) engineering guidelines and standard industry methodology, which evaluate creditable sources of uncertainty and error. The error and/or uncertainties in the ASME steam tables, net heat loss determination, and steam quality measurement have been considered potentially creditable sources of uncertainty that would have an insignificant effect on the overall uncertainty of reactor thermal power. I&M's calculation 1-2-O1-03 CALC 2,

Revision 1, CS-1, explicitly documents that these effects are, in fact, insignificant and do not affect any of the conclusions or results of the calculation.

a. Section 2.6 has been added to calculation 1-2-O1-03 CALC 2, Revision 1, CS-1, to document the impact of net heat loss accuracy on the calculation conclusions. Additionally, Section 7.2 has been revised to discuss the effect of net heat loss accuracy on the calculation conclusions.

b. Section 2.7 has been added to calculation 1-2-O1-03 CALC 2, Revision 1, CS-1, to document that steam quality uncertainty has a negligible effect on the calculation conclusions.

   The CNP Plant Process Computer (PPC) program for individual steam generator thermal power accounts for blowdown flow as energy "not available to be converted to steam" in each steam generator. In this manner, the energy of the blowdown fluid is removed from the feedwater energy available for creating main steam in the steam generator, rather than being subtracted as an exiting energy stream from the steam generator. Consequently, the steam generator thermal power calculation uses the saturated liquid enthalpy to account for blowdown as follows:

$$SGTP = m_{FW}(h_{stm} - h_{FW}) - m_{BD}(h_{stm} - h_{BD})$$

   where,

   SGTP is the steam generator thermal power
   m_{FW} is feedwater mass flow
   h_{stm} is the enthalpy of vapor at the corresponding steam generator pressure and quality
   h_{FW} is the enthalpy of compressed liquid at the corresponding feedwater temperature and pressure
   m_{BD} is blowdown mass flowrate
   h_{BD} is the enthalpy of saturated liquid at the corresponding steam generator pressure

   As indicated in the above relationship for determining steam generator thermal power, steam quality is incorporated in the blowdown component of the thermal power calorimetric calculation.

c. The measurement uncertainty calculation and PPC steam table software code both utilize the algorithms described in the ASME Steam Tables, Sixth Edition (1967).

   Section 2.8 has been added to calculation 1-2-O1-03 CALC 2, Revision 1, CS-1, to document the effect of ASME steam table accuracy on feedwater, steam and blowdown enthalpy, and on PPC steam table implementation. Additionally, Section 7.2 has been revised to discuss the effect of steam table accuracy on the calculation conclusions.

ATTACHMENT 3 TO AEP:NRC:2900-04

INDIANA MICHIGAN POWER COMPANY
APPLICATION AND AFFIDAVIT FOR
WITHHOLDING PROPRIETARY INFORMATION FROM
PUBLIC DISCLOSURE IN ACCORDANCE WITH 10 CFR 2.790

Application for Withholding of Proprietary Information from Public Disclosure:

Indiana Michigan Power Company (I&M) requests that the proprietary information described below be withheld from public disclosure.

The proprietary information for which withholding is requested is contained in Attachment 2 to this I&M submittal, AEP:NRC:2900-04, dated November 15, 2002. Attachment 2 is titled, "Cook Nuclear Plant Calculation No. 1-2-O1-03 CALC 2, Revision 1, Change Sheet 1 – Power Calorimetric Accuracy Using the Caldon Check Plus Feedwater Flow Measurement System and a Modified PPC CALM Program."

The affidavit provided following this application sets forth the basis by which the information may be withheld from public disclosure by the Nuclear Regulatory Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR Section 2.790 of the Commission's regulations.

Joseph E. Pollock
Site Vice President

Affidavit for Withholding of Proprietary Information from Public Disclosure:

Affidavit of Joseph E. Pollock

1. I am Site Vice President of Donald C. Cook Nuclear Plant (CNP), Indiana Michigan Power Company (I&M), and as such, have the responsibility of reviewing the proprietary information sought to be withheld from public disclosure in connection with I&M's submittal AEP:NRC:2900-04, dated November 15, 2002, and am authorized to apply for its withholding on behalf of I&M.

2. I am making this affidavit in conformance with the provisions of 10 CFR 2.790 of the regulations of the Nuclear Regulatory Commission (NRC) and in conjunction with I&M's application for withholding, which accompanies this affidavit.

3. I have knowledge of the criteria used by I&M in designating information as proprietary or confidential.

4. Pursuant to the provisions of 10 CFR 2.790(b)(4), the following is being furnished for consideration by the NRC in determining whether the information sought to be withheld from public disclosure should be withheld.

   (i) The information sought to be withheld from public disclosure is owned by I&M and has been held in confidence by I&M.

   (ii) The information is of a type that would customarily be held in confidence by I&M. The information consists of analysis methodology details, analysis results, supporting data, and aspects of system design, relative to an analysis that provides a competitive advantage to I&M.

   (iii) The information is transmitted to the NRC in confidence, and under the provision of 10 CFR 2.790, it is to be received in confidence by the NRC.

   (iv) The information sought to be protected is not available in public sources to the best of my knowledge and belief.

   (v) The proprietary information sought to be withheld is contained in Attachment 2 to this I&M submittal, AEP:NRC:2900-04, dated November 15, 2002. Attachment 2 is titled, "Cook Nuclear Plant Calculation No. 1-2-O1-03 CALC 2, Revision 1, Change Sheet 1 – Power Calorimetric Accuracy Using the Caldon Check Plus Feedwater Flow Measurement System and a Modified PPC CALM Program."

   This information enables I&M to:

   (a) Justify a proposed license amendment with equipment and system performance, evaluation, and analysis information.

(b) Enhance cost-effective plant operation by justifying future operation at an uprated power level.

5. Public disclosure of this information is likely to cause harm to I&M because it would allow other companies in the nuclear industry to benefit from the results of a significant analysis program without requiring commensurate expense, or allowing I&M to recoup a portion of its expenditures, or benefit from the sale of the information as described below.

   The activity that is the subject of the calculation is not specific to CNP, but rather is an activity that potentially affects the nuclear plants of other utilities.

   The calculation and development of the calculation methodology was funded solely by I&M.

   The cost to I&M of the calculation and development of the calculation methodology was substantial.

   The methodology can easily be adapted to other nuclear plants evaluating Measurement Uncertainty Recapture power uprates.

   The subject information could only be duplicated by other companies or groups of companies at a similar expense to that incurred by I&M.

   I&M may elect to recover a portion of the costs of this methodology development by making the information available to other utilities on a cost-sharing basis. Public disclosure of the information at this time would prevent implementation of this strategy.

I, Joseph E. Pollock, being duly sworn, state that I am the person who subscribed my name to the foregoing statement, and that the matters and facts set forth in the statement are true to the best of my knowledge, information and belief.

Joseph E. Pollock
Site Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 15 DAY OF November, 2002

Danielle M Schrader
Notary Public

My commission expires: 4-4-04

DANIELLE M. SCHRADER
Notary Public, Berrien County, MI
My Commission Expires Apr 4, 2004