April 16, 2008

Mr. Michael W. Rencheck
Senior Vice President and
Chief Nuclear Officer
Indiana Michigan Power Company
Nuclear Generation Group
One Cook Place
Bridgman, MI 49106

SUBJECT: DONALD C. COOK NUCLEAR PLANT, UNITS 1 AND 2 - ISSUANCE OF AMENDMENTS TO REVISE THE LICENSING BASIS OF ICE CONDENSER ICE FUSION TIME (TAC NOS. MD8089 AND MD8090)

Dear Mr. Rencheck:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 303 to Renewed Facility Operating License No. DPR-58, and Amendment No. 286 to Renewed Facility Operating License No. DPR-74 for Donald C. Cook Nuclear Plant, Units 1 and 2, in response to your application dated February 29, 2008.

The amendments revise the licensing basis of ice condenser ice fusion time, specifying conditions under which plant operation may proceed in less than 5 weeks after ice baskets have been reloaded.

A copy of the associated safety evaluation is also enclosed. A Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

**/RA/**

Peter S. Tam, Senior Project Manager
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-315 and 50-316

Enclosures: 1. Amendment No. 303 to DPR-58
2. Amendment No. 286 to DPR-74
3. Safety Evaluation

cc w/encls: See next page

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INDIANA MICHIGAN POWER COMPANY

DOCKET NO. 50-315

DONALD C. COOK NUCLEAR PLANT, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 303
License No. DPR-58

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Indiana Michigan Power Company (the licensee) dated February 29, 2008, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by addition of a new license condition 2.C.(17), which states:

(17) Ice Condenser Ice Fusion Time Requirement

The licensee is authorized to change the Updated Final Safety Analysis Report (UFSAR) to allow inspection of each ice condenser within 24 hours of experiencing a seismic event greater than or equal to an operating-basis earthquake within the 5-week period after ice basket replenishment has been completed to confirm that adverse ice fallout has not occurred which could impede the ability of the ice condenser lower inlet doors to open. This action would be taken, in lieu of requiring a 5-week waiting period following ice basket replenishment, prior to beginning ascension to power operations, as set forth in the application for amendment dated February 29, 2008, and evaluated in the safety evaluation accompanying Amendment No. 303. The licensee shall update the UFSAR by adding a description of this change, as authorized by this amendment, and in accordance with 10 CFR 50.71(e).

3. This license amendment is effective as of its date of issuance and shall be implemented prior to Unit 1 entering Mode 4 at the end of the 2008 refueling outage.

FOR THE NUCLEAR REGULATORY COMMISSION

**/RA/**

Lois M. James, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the Renewed Operating License

Date of Issuance: April 16, 2008

ATTACHMENT TO LICENSE AMENDMENT NO. 303

RENEWED FACILITY OPERATING LICENSE NO. DPR-58

DOCKET NO. 50-315

Replace the following page of Renewed Facility Operating License No. DPR-58 with the attached revised page. The change area is identified by a marginal line.

| REMOVE | INSERT |
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| 4B | 4B |

(c) Actions to minimize release to include consideration of:
1. Water spray scrubbing
2. Dose to onsite responders

(16) The licensee shall implement and maintain all Actions required by Attachment 2 to NRC Order EA-06-137, issued June 20, 2006, except the last action that requires incorporation of the strategies into the site security plan, contingency plan, emergency plan and/or guard training and qualification plan, as appropriate.

(17) Ice Condenser Ice Fusion Time Requirement

The licensee is authorized to change the Updated Final Safety Analysis Report (UFSAR) to allow inspection of each ice condenser within 24 hours of experiencing a seismic event greater than or equal to an operating-basis earthquake within the 5-week period after ice basket replenishment has been completed to confirm that adverse ice fallout has not occurred which could impede the ability of the ice condenser lower inlet doors to open. This action would be taken, in lieu of requiring a 5-week waiting period following ice basket replenishment, prior to beginning ascension to power operations, as set forth in the application for amendment dated February 29, 2008, and evaluated in the safety evaluation accompanying Amendment No. 303. The licensee shall update the UFSAR by adding a description of this change, as authorized by this amendment, and in accordance with 10 CFR 50.71(e).

D. Physical Protection

The Indiana Michigan Power Company shall fully implement and maintain in effect all provisions of the Commission-approved physical security, training and qualification, and safeguards contingency plans including amendments made pursuant to provisions of the Miscellaneous Amendments and Search Requirements revision to 10 CFR 73.55 (51 FR 27817 and 27822), and the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The combined set of plans[1], which contain Safeguards Information protected under 10 CFR 73.21, is entitled: "Donald C. Cook Nuclear Plant Security Plan, Training and Qualification Plan, and Safeguards Contingency Plan, Revision 1," submitted by letter dated May 10, 2006.

E. Deleted by Amendment No. 80

F. Deleted by Amendment No. 80

G. In all places of this renewed operating license, the reference to the Indiana and Michigan Electric Company is amended to read Indiana Michigan Power Company.

[1]The Training and Qualification Plan and Safeguards Contingency Plan are Appendices to the Security Plan.

INDIANA MICHIGAN POWER COMPANY

DOCKET NO. 50-316

DONALD C. COOK NUCLEAR PLANT, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 286
License No. DPR-74

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Indiana Michigan Power Company (the licensee) dated February 29, 2008, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by addition of a new license condition 2.C.(3)(ee), which states:

(ee) Ice Condenser Ice Fusion Time Requirement

The licensee is authorized to change the Updated Final Safety Analysis Report (UFSAR) to allow inspection of each ice condenser within 24 hours of experiencing a seismic event greater than or equal to an operating-basis earthquake within the 5-week period after ice basket replenishment has been completed to confirm that adverse ice fallout has not occurred which could impede the ability of the ice condenser lower inlet doors to open. This action would be taken, in lieu of requiring a 5-week waiting period following ice basket replenishment, prior to beginning ascension to power operations, as set forth in the application for amendment dated February 29, 2008, and evaluated in the safety evaluation accompanying Amendment No. 286. The licensee shall update the UFSAR by adding a description of this change, as authorized by this amendment, and in accordance with 10 CFR 50.71(e).

3. This license amendment is effective as of its date of issuance and shall be implemented prior to Unit 1 entering Mode 4 at the end of the 2008 refueling outage.

FOR THE NUCLEAR REGULATORY COMMISSION

**/RA/**

Lois M. James, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the Renewed Operating License

Date of Issuance: April 16, 2008

ATTACHMENT TO LICENSE AMENDMENT NO. 286

RENEWED FACILITY OPERATING LICENSE NO. DPR-74

DOCKET NO. 50-316

Replace the following page of Renewed Facility Operating License No. DPR-74 with the attached revised page. The change area is identified by a marginal line.

| REMOVE | INSERT |
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| 5B | 5B |

6. Training on integrated fire response strategy
7. Spent fuel pool mitigation measures

(III) Actions to minimize release to include consideration of:
1. Water spray scrubbing
2. Dose to onsite responders

(dd) The licensee shall implement and maintain all Actions required by Attachment 2 to NRC Order EA-06-137, issued June 20, 2006, except the last action that requires incorporation of the strategies into the site security plan, contingency plan, emergency plan and/or guard training and qualification plan, as appropriate.

(ee) Ice Condenser Ice Fusion Time Requirement

The licensee is authorized to change the Updated Final Safety Analysis Report (UFSAR) to allow inspection of each ice condenser within 24 hours of experiencing a seismic event greater than or equal to an operating-basis earthquake within the 5-week period after ice basket replenishment has been completed to confirm that adverse ice fallout has not occurred which could impede the ability of the ice condenser lower inlet doors to open. This action would be taken, in lieu of requiring a 5-week waiting period following ice basket replenishment, prior to beginning ascension to power operations, as set forth in the application for amendment dated February 29, 2008, and evaluated in the safety evaluation accompanying Amendment No. 286. The licensee shall update the UFSAR by adding a description of this change, as authorized by this amendment, and in accordance with 10 CFR 50.71(e).

D. Physical Protection

The Indiana Michigan Power Company shall fully implement and maintain in effect all provisions of the Commission-approved physical security, training and qualification, and safeguards contingency plans including amendments made pursuant to provisions of the Miscellaneous Amendments and Search Requirements revision to 10 CFR 73.55 (51 FR 27817 and 27822), and the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The combined set of plans[1], which contain Safeguards Information protected under 10 CFR 73.21, is entitled: "Donald C. Cook Nuclear Plant Security Plan, Training and Qualification Plan, and Safeguards Contingency Plan, Revision 1," submitted by letter dated May 10, 2006.

[1]The Training and Qualification Plan and Safeguards Contingency Plan are Appendices to the Security Plan.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 303 TO

RENEWED FACILITY OPERATING LICENSE NO. DPR-58

AND AMENDMENT NO. 286 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-74

INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNITS 1 AND 2 (DCCNP-1 AND -2)

DOCKET NOS. 50-315 AND 50-316

## 1.0 INTRODUCTION

By application dated February 29, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML080720062), Indiana Michigan Power Company (the licensee) requested amendments to the Renewed Facility Operating Licenses, revising the licensing basis of DCCNP-1 and -2 for acceptable ice fusion time following normal maintenance of a portion of the ice condenser ice baskets. Specifically, the proposed change, which will be documented in the Updated Final Safety Analysis Report (UFSAR), would allow plant operation during the 5-week period following ice basket maintenance based on conservatisms in the original ice basket seismic testing, the licensee's practical experience with ice fusion gained through decades of ice condenser operation, and design features of the ice condenser. As an additional conservatism, the licensee committed to revise its procedures to specify, in the event of an operating basis earthquake (OBE) or greater seismic disturbance occurring within 5 weeks of loading ice baskets, the ice condenser would be inspected within 24 hours, to ensure that no ice fallout has occurred that could impede proper functioning of the ice condenser lower inlet doors.

The ice fusion issue was discussed in a public meeting at Nuclear Regulatory Commission (NRC) Headquarters on December 12, 2007. The proposed amendment is consistent with that discussion and with the follow-up actions described in the NRC staff's meeting summary dated December 20, 2007 (Accession No. ML073550124).

## 2.0 REGULATORY EVALUATION

Section 1.4 of the DCCNP-1 and -2 UFSAR, "Plant Specific Design Criteria (PSDC) describes the criteria followed in the design of the plant. These PSDCs define the principal criteria and safety objectives for the design of DCCNP-1 and -2. As stated in the UFSAR, DCCNP-1 and -2 were designed and constructed to meet the intent of the Proposed General Design of the Atomic Energy Commission (AEC).

The proposed amendment does not alter or revise the current bounding safety analyses of record in any way. Consequently, DCCNP-1 and -2 will remain in compliance with the applicable regulations and requirements, including the following PSDCs:

PSDC 2, “Performance Standards,” which requires that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as earthquakes.

PSDC 10, “Reactor Containment,” which requires that the reactor containment and associated systems withstand the effects of gross equipment failures, such as large pipe breaks, without loss of required integrity.

PSDC 37, “Engineered Safety Features Basis for Design,” which requires that these systems function to back up the level of safety provided by the core design, the reactor coolant pressure boundary, and their protection systems.

PSDC 49, “Reactor Containment Design Basis,” which requires that the reactor containment structure and any necessary heat removal systems including the ice bed maintain the leakage of radioactive materials below the limits of 10 CFR Part 100.

Other than what may be construed as licensing basis, there is no specific regulation, NRC policy, or guidance document (including Standard Review Plan Sections 6.5.4) that clearly and unambiguously pertain to ice condenser ice fusion time requirements.

## 3.0 TECHNICAL EVALUATION

### 3.1 Ice Condenser Design Features and Ice Bed Issues

In the February 29, 2008, application, the licensee provided a general description of ice condenser design and its operation during a loss-of-coolant accident (LOCA) or a main steamline break accident (MSLB). Since the purpose of the proposed amendment is not to change any design of the ice condenser, the licensee’s general description is not repeated here.

The licensee stated that, as a result of sublimation of ice in the ice bed during normal operation, periodic addition of ice mass is necessary to ensure compliance with the Technical Specifications. At DCCNP-1 and -2, this is accomplished by emptying and refilling select ice baskets during each refueling outage. The population of baskets affected during a given outage is typically 10 to 20 percent of the total.

The term “ice fusion” refers to a condition in which an ice basket freshly loaded with flake ice achieves stability at the operating temperature of the ice condenser, i.e., when the ice freezes or otherwise solidifies such that it tends to stay in the ice basket when agitated. The design of the lower inlet doors, as currently described in the UFSAR, includes sufficient clearance to accommodate ice fallout from baskets of fused ice in the event of a seismic disturbance occurring coincident with a LOCA or MSLB.

If the ice in the baskets was not sufficiently fused during a design-basis earthquake (DBE), it is possible that an excessive amount of ice would fall from the baskets and impair operability of the ice condenser. Excessive ice fallout could potentially block the lower inlet doors, block the floor drains, restrict compression of the shock absorber assemblies, block flow channels, and decrease the ice mass in the ice baskets.

3.2 Brief Chronology of Ice Condenser Issues at DCCNP-1 and -2

As part of the original ice condenser qualification program, seismic testing of fused ice baskets was conducted by Westinghouse to determine the amount of ice fallout from ice baskets subjected to simulated plant time-history seismic disturbances. Test results were reported in Topical Report WCAP-8110, Supplement 9, dated May 1974. The test program did not determine a minimum time requirement for ice fusion.

The AEC accepted the DCCNP-1 and -2 ice condenser design in Safety Evaluation Report, Supplement 2 (SSER-2), dated October 1974. Concurrently, on October 25, 1974, the AEC issued the operating license to DCCNP-1. However, neither SSER-2 nor other Safety Evaluation supplements issued by the AEC referenced Supplement 9 of Westinghouse Topical Report WCAP-8110. Further, neither the DCCNP-1 and -2 SER nor its supplements specifically address ice storage time to achieve acceptable ice fusion prior to power ascension.

In November 1974, the AEC issued an SER on Supplement 9 of Topical Report WCAP-8110, stating that ". . . the data presented in WCAP-8110 Supplement 9 are adequate to conclude that land-based plants using ice condenser type containments should begin their initial ascent to power after a minimum of five weeks following ice loading." Despite what the AEC staff stated in the SER, the Westinghouse ice condenser program did not determine a minimum time requirement for ice fusion.

As part of performing its review of the licensee's application for amendment, the NRC staff did a document search in NRC's Official Agency Records (OAR) system and found no document that specifies how WCAP-8110-A, Supplement 9, with a 5-week ice fusion time "requirement" imposed by the AEC staff's SER, would be implemented on plants which had already been licensed (such as DCCNP-1), or on plants whose ice condenser review had already been completed by the AEC (such as DCCNP-2). In short, DCCNP-1 and -2 were licensed to the pre-AEC-review WCAP-8110, Supplement 9; no documentary trail can be found in the AEC or NRC OAR systems linking DCCNP-1 and -2 ice condensers to the post-AEC-review version (i.e., WCAP-8110-A, Supplement 9, with the AEC staff's SER as an integral part of the document).

In a publicly available internal memorandum (S. C. Black to J. A. Grobe, dated December 29, 2000; Accession No. ML 010380251), the NRC staff summarily stated that since the DCCNP-1 and -2 UFSAR references WCAP-8110, Supplement 9, this document has been incorporated into the licensing basis of DCCNP-1 and -2. As such, the NRC staff stated that there needs to be a 5-week ice fusion time after each ice reloading. This summary statement did not take into account the licensing history as depicted in the above paragraph, i.e., the licensee committed to the pre-AEC-review WCAP-8110, Supplement 9, not the post-AEC-review "A" version. After all, on the day the AEC staff issued the SER on WCAP-8110, Supplement 9, DCCNP-1 had already received its operating license, and DCCNP-2 already had its ice condenser design and operation fully approved by AEC. As pointed out in the above paragraph, the AEC staff did not explain how the 5-week ice fusion time "requirement" was to be implemented onto plants that were already licensed, or otherwise, already had their ice condenser designs found acceptable.

In 2007, NRC Inspection Report (IR) 2007-006 (Accession No. ML080250115) identified a potential concern that typical ice condenser maintenance practices at DCCNP-1 and -2 do not ensure compliance with the licensing basis for ice fusion time requirements, in that procedures do not recognize a 5-week storage period for freshly loaded ice baskets prior to power ascension. The IR identified prior instances when the units were returned to service within 5 weeks of loading individual ice baskets. The licensee stated that it performed evaluations of

these instances, and concluded that the ice condensers would have performed their function had a DBE occurred during plant operation within 5 weeks of loading ice.

The licensee held discussions with the other ice condenser plant licensees (Tennessee Valley Authority and Duke Power Company) and Westinghouse regarding the ice fusion concern. The licensee met with the NRC staff on December 12, 2007 (see meeting summary at Accession No. ML073550124), during which the licensee indicated that it has elected to change the licensing basis set forth in the DCCNP-1 and -2 UFSAR.

The NRC staff, in the December 12, 2007, meeting with the licensee, has indicated that it is receptive to the proposal for the licensee to submit an application for amendment to revise the licensing basis for ice condenser ice fusion. Accordingly, the NRC staff finds the licensee's February 29, 2008, application for amendment consistent with the licensee's proposal made in the December 12, 2007, meeting.

3.3 Licensee's Proposed Change to the Licensing Basis

The licensee proposed to revise the licensing basis as described in the UFSAR. The existing text of the UFSAR, Revision 21, Section 5.3.5.9.2, "Lower Inlet Doors," "Design Criteria and Codes," "Interface Requirements," Item b) reads:

> Sufficient clearance is required for the doors to open into the ice condenser. Items considered in this interface are floor clearance, lower support structure clearance and floor drain operation, and sufficient clearance (approximately six inches) to accommodate ice fallout in the event of a seismic disturbance occurring coincident with a LOCA.

The licensee proposed to revise this paragraph by adding the following new text:

> Original ice basket qualification testing (Reference 6) [Reference 6 is WCAP-8110, Supplement 9] has shown that freshly loaded ice is considered fused after five weeks following ice loading. During periods of plant operation within five weeks of ice bed maintenance, an alternate method of ice fusion qualification is relied upon (Reference X) [Reference X refers to the NRC staff's safety evaluation supporting the proposed amendment]. Conservatisms in the original qualification testing, qualitative evaluation of operating experience in actual ice condensers, and design features of the ice condenser provide reasonable assurance that the ice condenser lower inlet doors will not be blocked by a seismic disturbance during this limited period. Additionally, in the event of an earthquake (OBE or greater) that occurs within five weeks following ice basket loading, plant procedures require a visual inspection of applicable areas of the ice condenser within 24 hours to ensure that opening of the ice condenser lower inlet doors is not impeded by any ice fallout that resulted from the seismic disturbance.

During its review of the UFSAR change against the requirements of 10 CFR 50.59, the licensee recognized that the interface requirements for the ice condenser lower inlet doors will no longer be met solely by the original qualification testing, but will also rely on conservatisms in the original ice basket seismic testing, the licensee's practical experience with ice fusion gained through decades of ice condenser operation, and design features of the ice condenser. Accordingly, and upon issuance of the requested amendment, the licensee will implement procedural requirements that, in the event of an OBE or greater seismic disturbance within

5 weeks of loading ice baskets, the ice condenser would be inspected within 24 hours to ensure that no ice fallout has occurred that could impede proper functioning of the ice condenser lower inlet doors.

3.4 NRC Staff Evaluation of the Proposed UFSAR Revision

3.4.1 Ice Fusion

The term “ice fusion” refers to a condition in which an ice basket freshly loaded with flake ice achieves stability at the operating temperature of the ice condenser, i.e., when the ice freezes or otherwise solidifies such that it tends to stay in the ice basket when agitated. The licensee stated that the design of the lower inlet doors, as currently described in the UFSAR, includes sufficient clearance to accommodate ice fallout from baskets of fused ice in the event of a seismic disturbance occurring coincident with a LOCA or MSLB.

If the ice in the baskets was not sufficiently fused during a DBE, it is possible that an excessive amount of ice would fall from the baskets and impair operability of the ice condenser. Excessive ice fallout could potentially block the lower inlet doors, block the floor drains, restrict compression of the shock absorber assemblies, block flow channels, or decrease the ice mass in the ice baskets.

As stated in Section 3.2, the basis of the 5-week ice fusion time “requirement” was derived from the original seismic qualification of ice condenser ice baskets conducted by Westinghouse in 1974, even though determination of a minimum ice fusion time was not an objective of the test program. Instead, the results of acceptable ice fallout tests conducted on ice baskets loaded for periods of 6 to 7 ½ weeks were used by the AEC staff to establish a “preoperational limit for minimum storage time” of ice baskets prior to initial power ascension.

As a result of a recent review of the test results documented in WCAP-8110, Supplement 9, the licensee has concluded that the 5-week ice fusion time selected as the licensing basis is conservative and that the ice condenser design has substantial margin with respect to ice fallout. The licensee described the following areas of over-conservatism:

- The test baskets floated freely in the lattice frames and were not fixed at one end as would be the case in an actual ice condenser. The floating end would have exacerbated the movement resulting from application of a given seismic excitation, which would have tended to amplify the ice fallout in the test compared to fallout from an actual plant event.

- The test basket was only 6-foot tall and had an open top, whereas an actual ice condenser basket typically has four vertically stacked 12-foot sections, with only the uppermost section having an open top. The majority of ice fallout during the tests occurred from the open top of the basket. The NRC staff agrees that extrapolating test results of a 6-foot test model to a 48-foot actual basket would certainly exaggerate the amount of ice fallout; the amount of ice fallout from a 48-foot basket would definitely be much less than 8 times what would fall out from a 6-foot model.

- The test baskets were each sequentially excited using seismic time histories from four different ice condenser plants, with the cumulative ice loss during the test sequence being used for comparison against the target criterion. This is a conservative approach in that the amount of ice loss after the first excitation cycle for each basket is not representative of a basket receiving its first seismic disturbance. The ability of the ice

condenser baskets to meet the fallout criterion for cumulative seismic time histories indicates substantial margin in the design and suggests significant conservatism in the 5-week ice fusion time allowance.

The licensee stated that anecdotal information from decades of ice condenser maintenance suggests freshly loaded ice in ice baskets fuses well before 5 weeks following loading. Specifically, during ice basket loading, flake ice is pneumatically conveyed from the ice machines and storage bins through up to several hundred feet of 4-inch diameter pipe and flexible hose. This process results in the ice particles entering the baskets having surface wetness, indicating that the as-loaded ice temperature is very close to the nominal solution freezing point of 0 degree Fahrenheit (by comparison, the ambient temperature in the ice condenser is typically approximately 15 degrees Fahrenheit). The licensee provided evidence that the wet flake ice fuses rapidly, stating that freshly blown loose ice falling onto the floor of the ice condenser during ice basket maintenance must be removed within 8 to 10 hours or else it freezes into a solid mass. The NRC staff agrees that the licensee's empirical observation points to the fact that the wet flake ice used in filling ice baskets freeze solid in a matter of hours, not in 5 weeks under experimental conditions as depicted in WCAP-8110, Supplement 9.

The NRC staff reviewed the analysis the licensee presented on ice fusion. The licensee's experience with ice behavior in its ice condensers appears to demonstrate that there is excessive conservatism in the 5-week ice fusion time "requirement." As discussed above, the 5-week ice fusion time "requirement" for newly added ice was based on conditions which bear little resemblance to the actual conditions at DCCNP-1 and -2. At DCCNP-1 and -2, ice fusion is expected to occur in a matter of hours such that fallout as result of an OBE is an immaterial concern. The licensee's proposed inspection within 24 hours after an OBE provides added assurance that ice condenser performance will not be hampered by ice fallout.

### 3.4.2 Effect of Ice Fallout on Ice Condenser Performance

The licensee cited UFSAR Section 14.3.4.5.4.1.3, which states that adequate performance of the ice condenser is further ensured by the lower inlet door design incorporating a low pressure fail open characteristic. Even if it is postulated that the doors were held stationary along the bottom edge by fallen ice, they would structurally fail open (i.e., the door gaskets, the door panels and the door hinges would fail at a pressure below that at which any of the surrounding containment structures would be challenged) at a differential pressure sufficiently low to allow venting from the lower compartment well within the limits of pressure capability of the structures. The licensee stated that redundancy in flow paths in the ice condenser also provides reasonable assurance that the ice condenser would perform its function even if some lower inlet doors were partially degraded. This inherent redundancy is further enhanced by the nature of typical ice bed maintenance, which affects less than 20 percent of the ice baskets, spread somewhat uniformly throughout the ice condenser, during a given outage. As a result of this practice, only the lower inlet doors located below or in close proximity to replenished ice baskets would be susceptible to excessive ice fallout during a seismic disturbance.

To demonstrate this theory, the licensee used concrete vibrators to vibrate out a few feet of ice from several ice baskets in the DCCNP-2 ice condenser during a recent outage to simulate the actual fallout pattern on the floor due to a postulated seismic disturbance. By combining the observed fallout patterns of several individual baskets, the licensee determined that the lower inlet doors would likely stay above the ice fallout throughout their swing path.

The NRC staff reviewed the design of the lower inlet doors, and agrees with the licensee that the doors would require a large amount of ice to block their free movement. This large amount is not likely shaken loose from the ice baskets even in an OBE. The NRC staff also agrees with

the licensee that the lower inlet doors would fail open, should they become blocked by fallen ice, to permit inlet of the steam air mixture released by a LOCA or MSLB.

3.4.3 Restricting the Compression of Shock Absorber Assemblies

The licensee also evaluated the potential effect on the lower door shock absorber assemblies by vibrating DCCNP-2 ice baskets as described above. The licensee determined that the ice accumulation was minor and surmised that it would not significantly affect the function of the shock absorbers to dissipate the kinetic energy of the lower inlet door generated during a large break LOCA or MSLB.

The NRC staff reviewed the design of the lower door shock absorber assemblies, and agrees that, based on the reasonable assumption that little ice will be shaken loose from the ice baskets, the ice accumulation would not significantly affect the design function of the shock absorbers to dissipate the kinetic energy of the lower inlet door generated during a large break LOCA or MSLB.

3.4.4 Blocking of Floor Drains

The licensee stated that, as discussed in the UFSAR, the impact of floor drain blockage by excessive ice fallout would be negligible. There are a total of 21 ice condenser floor drains among the 24 ice condenser bays. The ice condenser design is such that for blockage of any floor drain, water would flow to adjacent bays and eventually would spill over the lower inlet door openings if necessary. Additionally, ice on the floor of the ice condenser would be quickly melted by steam entering the ice condenser, which would clear the drain path before a substantial water level developed. The licensee thus surmised that there would be no adverse impact on the ice condenser function for blockage of the floor drains from fallout of ice in the ice baskets.

The NRC staff agrees that any ice on the floor of the ice condenser will quickly melt in the post-LOCA or post-MSLB environment. This fact, plus the availability of multiple floor drains, will assure that the floor drains will not be blocked to hamper the design function of the ice condenser.

3.4.5 Blocking of Flow Channels

The licensee argued that any fallout from the ice baskets to the flow channels would be loose ice. This ice would not pose any significant resistance to the flow of air and steam through the ice condenser in that it would be quickly displaced and melted by the high temperature blowdown from a LOCA or MSLB. Therefore, the impact of ice fallout on ice condenser flow channel blockage would be negligible.

The NRC staff agrees that any ice on the flow channels of the ice condenser will quickly melt in the post-LOCA or post-MSLB environment. Thus, the flow channels will not be blocked by ice fallout to hamper the design function of the ice condenser.

3.4.6 Decrease of Ice Mass in the Ice Baskets

The license argued that any fallout from the ice baskets would remain within the ice condenser. Although the fallout ice, expected to be a very small portion of the total, would no longer be in the ice baskets, its mass would remain available to absorb energy from a LOCA or MSLB, but in a less efficient configuration for heat absorption.

The NRC staff agrees that ice fallout from the ice basket, regardless of quantity, is not a mechanism to reduce ice inventory in the ice condenser. Therefore, the required quantity of ice will continue to be present to ensure that the ice condenser design function is carried out in a LOCA or MSLB.

3.4.7 Low Probability of a LOCA or MSLB Occurring Coincident with a Seismic Disturbance

Although the licensee did not request this amendment as a risk-informed change under the guidance of Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," the licensee did provide an insight into the very small potential risk associated with the proposed change. The licensee envisioned that one of the following four scenarios would result during the 5-week period following ice basket maintenance: (1) No seismic disturbance, LOCA, or MSLB occurs; (2) A seismic disturbance occurs without a coincident LOCA or MSLB occurring; (3) A LOCA or MSLB occurs without a seismic disturbance occurring; and (4) A seismic disturbance occurs coincident (or nearly coincident) with a LOCA or MSLB.

The licensee argued that in the first three scenarios, there would be no impact as a result of the proposed change. In the first two scenarios, the ice condenser would not be called upon to perform an accident mitigation function. In the third scenario, although the ice condenser would be called upon to mitigate an accident, absent a seismic disturbance, there would be no motive force to dislodge less-than-fully-fused ice and the ice condenser would function as designed.

The licensee stated that the new licensing basis of eliminating the requirement for a wait period for ice fusion would only be called into play in the unlikely event that the fourth scenario occurred. Using plant-specific inputs for relevant initiating event frequency and seismic hazard data, the licensee conservatively calculated the conditional probability of a LOCA or MSLB occurring within a 24-hour period following an OBE, or greater seismic disturbance, during a 5-week period following ice bed maintenance to be less than 2E-08. This extremely low probability of occurrence is below the threshold where events are typically considered significant.

The NRC staff did not evaluate this issue from the probabilistic perspective. The NRC noted the licensee's risk insight and agrees that the probability of a LOCA or MSLB occurring within a 24-hour period following an OBE is extremely low. The NRC staff will rely solely upon its deterministic evaluation presented above in Section 3.4.1 – 3.4.6.

3.5 Summary of NRC Staff Evaluation

As explained in Section 3.2 above, the original ice condenser basket seismic qualification, and the AEC's review of the same, led to a 5-week storage time "requirement" for freshly loaded ice baskets prior to power ascension. However, conservatisms in the original testing and anecdotal evidence from ice condenser experience suggest that freshly loaded, wet flake ice will adequately solidify in the ice baskets much sooner (i.e., in hours) than 5 weeks. In addition, design features of the ice condenser are such that the lower inlet doors and other ice condenser appurtenances will not be blocked or otherwise hampered by ice fallout from a seismic event up to the OBE.

The licensee's proposed change to the DCCNP-1 and -2 licensing basis would permit ascent to power operation within the 5-week period following ice basket loading. Should a seismic disturbance occur within this period, there is a very small risk that the ice condenser may experience greater ice fallout from freshly loaded (i.e., less than 5 weeks) ice baskets than predicted by the original ice condenser qualification testing. This risk is mitigated by design

features of the ice condenser, which are such that the ice condenser would perform its intended function even following ice fallout from a seismic event. The risk would be further limited by plant procedures that the licensee will implement that require prompt inspection of applicable portions of the ice condenser following an OBE or greater seismic disturbance.

Based on the above review, the NRC staff finds the revision to the DCCNP-1 and -2 licensing basis pertaining to ice condenser ice fusion time acceptable. The NRC staff's approval is conveyed by a new Licensing Condition 2.C.(17) to DPR-58 (for DCCNP-1) and to 2.C.(3)(ee) to DPR-74 (for DCCNP-2), stating:

> The licensee is authorized to change the Updated Final Safety Analysis Report (UFSAR) to allow inspection of each ice condenser within 24 hours of experiencing a seismic event greater than or equal to an operating-basis earthquake within the 5-week period after ice basket replenishment has been completed to confirm that adverse ice fallout has not occurred which could impede the ability of the ice condenser lower inlet doors to open. This action would be taken, in lieu of requiring a 5-week waiting period following ice basket replenishment, prior to beginning ascension to power operations, as set forth in the application for amendment dated February 29, 2008, and evaluated in the safety evaluation accompanying Amendment No. [303 for DCCNP-1, 286 for DCCNP-2]. The licensee shall update the UFSAR by adding a description of this change, as authorized by this amendment, and in accordance with 10 CFR 50.71(e).

## 4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Michigan State official was notified of the proposed issuance of the amendments. The State official had no comments.

## 5.0 FINAL NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

Commission's regulation at 10 CFR 50.92(c) states that the Commission may make a final determination that a license amendment involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) result in a significant reduction in a margin of safety.

The NRC staff reviewed the no significant hazards consideration (NSHC) evaluation provided by the licensee in its application, which had been published by the NRC staff in 73 FR 13253 (March 12, 2008). The NRC staff has made a final determination that NSHC consideration is involved for the proposed amendment and that the amendment should be issued as allowed by the criteria contained in 10 CFR 50.91. The NRC staff's final determination is presented below:

(1) Does the proposed change involve a significant increase in the probability of occurrence or consequences of an accident previously evaluated?

Response: No.

The previously evaluated accidents of concern regarding the proposed change to licensing basis requirements for the ice condenser are a loss of coolant accident (LOCA) and a main steam line break (MSLB) in containment. The ice condenser will not initiate a

previously evaluated accident and provides no function until mitigation of a LOCA or MSLB in containment is required. Therefore, a change to the ice condenser design or licensing basis does not significantly impact the probability of occurrence of an accident previously evaluated.

Following the proposed amendment, the licensing basis would allow plant operation to continue during the five weeks following ice loading with procedural requirements to inspect the ice condenser within 24 hours following an OBE or greater seismic disturbance. With these changes, the ice condenser is still expected to perform its mitigation function under all circumstances following a LOCA or MSLB. Therefore, the proposed amendment does not involve a significant increase in the consequences of an accident previously evaluated.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

(2) Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed amendment does not change the design function or operation of any system, structure, or component (SSC). The proposed amendment does not affect the capability of the ice condenser or other SSCs to perform their function. As a result, no new failure mechanisms, malfunctions, or accident initiators are created. Therefore, the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

(3) Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The proposed amendment involves no change in the capability of an SSC. Under the proposed amendment, the ice condenser would remain fully capable of performing its design function under credible circumstances. Therefore, there is no significant reduction in a margin of safety as a result of the proposed amendment.

## 6.0 ENVIRONMENTAL CONSIDERATION

The amendments change the requirements with respect to use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The NRC staff has previously issued proposed findings that the amendments involve no significant hazards consideration and there has been no public comment on such finding (73 FR 13253). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

## 7.0 CONCLUSION

The staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: Peter Tam
Don Harrison

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Donald C. Cook Nuclear Plant, Units 1 & 2
cc:

Attorney General
Department of Attorney General
525 West Ottawa Street
Lansing, MI 48913

Township Supervisor
Lake Township Hall
P.O. Box 818
Bridgman, MI 49106

U.S. Nuclear Regulatory Commission
Resident Inspector's Office
7700 Red Arrow Highway
Stevensville, MI 49127

Kimberly Harshaw, Esquire
Indiana Michigan Power Company
One Cook Place
Bridgman, MI 49106

Mayor, City of Bridgman
P.O. Box 366
Bridgman, MI 49106

Special Assistant to the Governor
Room 1 - State Capitol
Lansing, MI 48909

James M. Petro, Jr.
Regulatory Affairs Manager
Indiana Michigan Power Company
Nuclear Generation Group
One Cook Place
Bridgman, MI 49106

Michigan Department of Environmental Quality
Waste and Hazardous Materials Div.
Hazardous Waste & Radiological Protection Section
Nuclear Facilities Unit
Constitution Hall, Lower-Level North
525 West Allegan Street
P. O. Box 30241
Lansing, MI 48909-7741

Joel P. Gebbie, Plant Manager
Indiana Michigan Power Company
Nuclear Generation Group
One Cook Place
Bridgman, MI 49106

Mark A. Peifer, Site Vice President
Indiana Michigan Power Company
Nuclear Generation Group
One Cook Place
Bridgman, MI 49106