February 14, 2002

Mr. A. Christopher Bakken III, Senior Vice President
and Chief Nuclear Officer
Indiana Michigan Power Company
Nuclear Generation Group
500 Circle Drive
Buchanan, MI 49107

SUBJECT: DONALD C. COOK NUCLEAR PLANT, UNIT 1 - ISSUANCE OF AMENDMENT RE: ICE CONDENSER LOWER INLET DOORS (TAC NO. MB3989)

Dear Mr. Bakken:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 265 to Facility Operating License No. DPR-58 for the Donald C. Cook Nuclear Plant, Unit 1. The amendment consists of changes to the Operating License in response to your application dated February 8, 2002, as supplemented February 10, 2002. This request was treated as an emergency amendment in accordance with 10 CFR 50.91(a)(5).

The amendment adds a license condition allowing a one-time limited duration exception from the Technical Specification (TS) Surveillance Requirement (SR) to verify that the opening, closing, and frictional torque of the ice condenser lower inlet doors are within specified limits as required by TS SRs 4.6.5.3.1.b.3, 4.6.5.3.1.b.4, and 4.6.5.3.1.b.5, respectively.

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

Sincerely,

/RA/

John F. Stang, Senior Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-315

Enclosures: 1. Amendment No. 265 to DPR-58
2. Safety Evaluation

cc w/encls: See next page

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<u>DISTRIBUTION</u>

PUBLIC
PDIII-1 Reading
WReckley
JStang
THarris
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WBeckner
GHill(2)
AVegel, RIII
GHammer
CLi
JHannon
EImbro
RHagar
DTerao

*Previously Concurred

OFFICE	PDIII-1/PM	PDIII-1/LA	SPLB/BC(A)*	EMEB/SC*	OGC*	PDIII-1/SC(A)
NAME	JStang	RBouling for THarris	RHagar	DTerao	SUttal	DHood for WReckley
DATE	02/14/02	02/14/02	02/14/02	02/14/02	02/14/02	02/14/02

ADAMS Accession No. ML020430529

Donald C. Cook Nuclear Plant, Units 1 and 2

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INDIANA MICHIGAN POWER COMPANY

DOCKET NO. 50-315

DONALD C. COOK NUCLEAR PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 265
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 8, 2002, as supplemented February 10, 2002, 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 adding paragraph 2.C.(10) to Facility Operating License No. DPR-58 which reads as follows:

   2.C(10) Technical Specification surveillance requirements 4.6.5.3.1.b.3, 4.6.5.3.1.b.4, and 4.6.5.3.1.b.5 need not be performed until prior to ascension into Mode 4 at the completion of the fuel cycle 18 refueling outage. If Unit 1 enters Mode 5 for sufficient duration prior to the fuel cycle 18 refueling outage, I&M will perform the surveillance testing required by TS 4.6.5.3.1.b.3, 4.6.5.3.1.b.4, and 4.6.5.3.1.b.5.

3. This license amendment is effective as of its date of issuance and shall be implemented immediately.

FOR THE NUCLEAR REGULATORY COMMISSION

/R/ D. Hood for

William D. Reckley, Acting Chief, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Operating License

Date of Issuance: February 14, 2002

ATTACHMENT TO LICENSE AMENDMENT NO. 265

TO FACILITY OPERATING LICENSE NO. DPR-58

DOCKET NO. 50-315

Replace the following page of the Facility Operating License with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

REMOVE	INSERT
5	5

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 265 TO FACILITY OPERATING LICENSE NO. DPR-58

INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-315

1.0 INTRODUCTION

By application dated February 8, 2002, as supplemented February 10, 2002, the Indiana Michigan Power Company (the licensee) requested an amendment to the Operating License for the Donald C. Cook Nuclear Plant (D.C. Cook), Unit 1. The proposed amendment would add a license condition allowing a one-time limited duration exception from the Technical Specification (TS) Surveillance Requirement (SR) to verify that the opening, closing, and frictional torque of the ice condenser lower inlet doors are within specified limits as required by TS SRs 4.6.5.3.1.b.3, 4.6.5.3.1.b.4, and 4.6.5.3.1.b.5, respectively. This exception from the TS SRs would be in effect until the next Unit 1 entry into Mode 5 of sufficient duration, which is expected to be the next refueling outage (currently scheduled for May 2002). The licensee requested that the proposed TS change be treated as an emergency amendment as discussed in Section 5.0 of this safety evaluation.

2.0 BACKGROUND

On January 31, 2002, the licensee determined that the procedure used for verifying that the ice condenser lower inlet door opening, closing, and frictional torque does not adequately fulfill the TS SRs and concluded the operability of the doors was indeterminate. Since verification of the door opening, closing, and frictional torque cannot be performed with the unit in Modes 1 through 4, compliance with the TSs would require Unit 1 to be shut down and cooled down. The licensee performed a special test on Unit 2 during its current refueling outage and used the results of that testing to provide reasonable assurance that the Unit 1 doors will perform their intended function. The licensee, therefore, considers it unnecessary to subject the unit to the shutdown and cooldown transient that would be necessary to test the doors. In the event Unit 1 enters Mode 5 for other reasons prior to the next scheduled refueling outage, the licensee will perform the surveillance testing required by TS SRs 4.6.5.3.1.b.3, 4.6.5.3.1.b.4, and 4.6.5.3.1.b.5.

2.1 Description of Ice Condenser Lower Inlet Doors

There are 48 ice condenser lower inlet doors. The doors are essentially pairs of insulated panels vertically hinged to a frame that has a center post. The doors are normally held closed against the door seal by the differential pressure produced by the higher density cold air of the ice condenser. The closed doors form a barrier to air flow through the ice condenser

compartment during normal plant operation. The closed doors also provide continuation of thermal insulation around the lower section of the crane wall to minimize heat input that would promote sublimation and mass transfer of ice in the condenser compartment. In the event of a loss-of-coolant accident (LOCA), which would cause a pressure increase in the containment lower compartment, the pressure on the doors would cause them to open, venting air and steam from the containment lower compartment into the ice condenser compartment.

2.2 Current Requirements

TS SRs 4.6.5.3.1.b.3, 4.6.5.3.1.b.4, and 4.6.5.3.1.b.5 require that the ice condenser lower inlet doors be demonstrated operable during shutdown at least once per 18 months by:

- Testing each one of the doors and verifying that the torque required to open each door is less than 195 inch-pounds when the door is 40 degrees open. This torque is defined as the "door opening torque" and is equal to the nominal door torque plus a frictional torque component. (TS 4.6.5.3.1.b.3)

- Testing each one of the doors and verifying that the torque required to keep each door from closing is greater than 78 inch-pounds when the door is 40 degrees open. This torque is defined as the "door closing torque" and is equal to the nominal door torque minus a frictional torque component. (TS 4.6.5.3.1.b.4)

- Calculation of the frictional torque of each door tested in accordance with TS 4.6.5.3.1.b.3 and TS 4.6.5.3.1.b.4. The calculated frictional torque shall be less than or equal to 40 inch-pounds. (TS 4.6.5.3.1.b.5)

2.3 Basis for Current TS Requirements

Performance of TS SRs 4.6.5.3.1.b.3, 4.6.5.3.1.b.4, and 4.6.5.3.1.b.5 provides assurance that ice condenser lower inlet doors will operate under all design-basis conditions to assure the steam and fluid released during a design-basis accident (DBA) will be diverted through the ice condenser bays for heat removal, and that excessive sublimation of the ice bed will not occur because of warm air intrusion. The SRs are consistent with TS 4.6.7.3.1.b.3 of NUREG 0452 and SR 3.6.16.5 of NUREG 1431.

2.4 Surveillance Procedure History

During the extended Unit 1 and Unit 2 outages that occurred between 1997 and 2000, the licensee determined that there were inadequacies in ice condenser surveillance procedures, including the procedure for verifying inlet door torque pursuant to TS SRs 4.6.5.3.1.b.3, 4.6.5.3.1.b.4, and 4.6.5.3.1.b.5. Accordingly, the ice condenser surveillance procedures were completely rewritten. The rewritten procedures considered measurement uncertainty and establishment of a qualification process for personnel performing the surveillance tests to demonstrate proficiency with the test methods. The results from the last surveillance test performed on the Unit 1 doors using the rewritten procedures showed that the door opening force measurements were less than the door closing force measurements. This condition potentially would have resulted in the operability of the doors being indeterminate. The licensee

failed to recognize this condition. In January 2002, the NRC Resident Inspector observing inlet door surveillance activities during the Unit 2 refueling outage posed several questions to the licensee regarding the TS test methodology. It was also noted that the recorded door opening force measurements were less than the door closing force measurements and the validity of the test results was questioned. The test methodology was subsequently determined to be inadequate. Given that the methodology was common to both Units 1 and 2, the Unit 1 ice condenser lower inlet doors were declared inoperable on January 31, 2002.

3.0 EVALUATION

3.1 Ice Condenser Lower Inlet Door Testing

3.1.1 Licensee's Previous Testing Methodology

The test methodology previously used to determine compliance with the TS SRs involved locating the door at the 40-degree position using a test fixture. A spring scale was then placed on the test fixture and positioned against the face of the door. The door was then opened approximately 1 inch to relieve the load on the spring scale. The door was then released, allowing it to return to the 40-degree position. A closing force was measured. The door was then returned to rest on the extension arm of the test fixture. The spring scale was then used to move the door slightly open from its rest position. This spring scale reading was then recorded as the opening force. The forces were converted to torque by multiplying each force by a 27-inch moment arm. Several concerns have been identified with this methodology including:

1. Use of the test fixture resulted in a moment arm that varied from the procedurally intended 27-inch moment arm. The door position also varied from the procedurally intended 40-degree door position depending on the specific door hardware and test fixture installation technique. The moment arm distance tended to be 27 inches or less and the door position tended to be greater than 40 degrees.

2. Due to inconsistencies in the methodology, previous opening force testing did not provide an accurate measure of door opening force.

As a result of these issues, the closing force measured in previous testing sometimes exceeded the measured opening force, which is contrary to intuition when considering frictional torque.

3.1.2 Previous Testing Data

The licensee provided the as-left surveillance data from tests performed on Unit 2 (April 2000) and Unit 1 (November 2000). The licensee stated that those portions of the methodology used by past surveillance are now considered to produce an indeterminate measure of compliance with the TS SRs. Specifically, the past tests did not consistently achieve a 40-degree open door position and did not consistently achieve a constant scale position on the door in relationship to the door hinge. The previous test methodology resulted in small angular variations (up to 5 degrees) in the door position for each door. The position of the spring scale when measured from the center of the hinge varied from 27 inches down to approximately 24.5 inches. The licensee states that both of these test variations will affect the torque values derived for each door. In addition, the previous opening torque test method and sequence, as

described earlier, is now judged by the licensee to be inadequate in that it did not provide an accurate measure of opening force/torque. (However, the licensee states that, in actuality, it may be a measure of the closing torque.) Since the frictional torque is determined by dividing the difference between the opening and closing torque by two, the frictional torque data is therefore also not considered to be valid. Although, the previous tests may not have adequately evaluated the closing force/torque against the TS criteria and did not provide an accurate measurement of door opening torque and frictional torque, the licensee states that data from the tests performed can still be used to draw conclusions about the condition of the doors and their ability to function to mitigate DBAs.

3.1.3 Similarity of Unit 1 and Unit 2

The licensee stated that between early 1998 and late 2000, an ice condenser restoration project was completed for both Unit 1 and Unit 2. This project included the thawing of both ice condensers and inspection, repair, replacement, and refurbishment of structural components. With regard to the lower inlet doors or lower inlet door area, significant work included replacement of the previous foam wedge style shock absorbers with collapsible metal air boxes and a redesign of the lower inlet door seal channel. The licensee has determined that neither of these modifications had any impact on door torque. The licensee stated that the redesign of the seal channel resulted in replacement of the former carbon steel channel, having an uneven face area, with a stainless steel channel that provided a better fit between the seal and door skin. The lower inlet doors were not removed from their hinges at any time during the restoration project. The majority of the lower inlet door springs were disconnected during the refurbishment to facilitate project activities such as movement of material through the lower inlet doors. The door springs were later reattached and adjusted. In some cases, door springs were replaced and spring clips were realigned and refurbished. Several spring swivel pins were also replaced or refurbished. The lower inlet door hinge arm-to-hinge frame clearances were checked and where necessary, adjustments were made. These adjustments were made to several of the doors in both units. The licensee stated that the work performed during the restoration projects improved the performance of the doors and that there are no significant differences associated with the scope for the lower inlet doors for the Unit 1 and Unit 2 ice condensers. The lower inlet doors and hardware (hinges and springs) are identical between Unit 1 and Unit 2. The licensee stated that it was reasonable to expect, based on the scope of the ice condenser restoration project activities, that both units' lower inlet doors would be in a similar state of repair and functional readiness at the time the units restarted in June and December of 2000 (Unit 2 and Unit 1, respectively). The licensee also stated that the operating and maintenance practices for the two ice condensers and containments are essentially the same. Therefore, the licensee concludes that it is reasonable to expect that the condition and functional readiness of the Unit 1 and Unit 2 ice condenser doors are similar at the present point in time based on consideration of operating and maintenance practices.

As a result of the Unit 2 lower inlet door initial opening torque test failures during January 2002, examinations of the doors were reperformed to determine their condition. These examinations did not reveal any degradation of the doors, hardware, or associated structures that would impair their function. Therefore, the licensee stated that it is reasonable to conclude that the Unit 1 ice condenser lower inlet doors will be in a similar condition.

3.1.4 Discussion of New Testing Methodology

In early February 2002, the licensee developed and implemented a new methodology for performing the ice condenser lower inlet door 40-degree surveillance tests in Special Procedure 12-MHP-SP-LID, Revision 1. The licensee stated in the February 8, 2002, application that development of the new test methodology included a review of industry experience and refinement of those methodologies. The new procedure for measuring the lower inlet door opening and closing forces is summarized as follows:

1. The door is positioned at approximately the 40-degree position using a template placed on the floor.

2. A spring scale (with two sliding indicators, one on either side of the pointer) is placed against the door at a predetermined position and the door is balanced using the spring scale.

3. The two sliding indicators are placed against the scale pointer.

4. The force on the spring scale is gradually increased to the point where door movement in the open direction is detected (by visual observation). The reading on the spring scale at this point is the opening force.

5. The force on the spring scale is gradually released until door movement in the closed direction is detected (again based on visual observation). The reading on the spring scale at this point is the closing force. (These steps are repeated two additional times for each door)

6. The friction force is the difference between the maximum and minimum force, divided by two (2).

7. Torque is calculated by multiplying the forces by the moment arm. The moment arm is a known dimension based upon the use of a predetermined position for the location of the spring scale.

The licensee stated that all personnel that participated in the implementation of the new methodology completed task-specific training, including the physical demonstration of the above techniques prior to the performance of the special procedure.

3.1.5 Summary of New Data

The licensee provided the following data obtained from the performance of Special Procedure 12-MHP-SP-LID, Revision 1, for the Unit 2 inlet doors:

- The opening torque for each door met the TS acceptance criteria (< 195 inch-pounds). The maximum opening torque recorded for any door was 183.6 inch-pounds. The average opening door torque was 152.6 inch-pounds and the standard deviation was 14.3 inch-pounds. In summary, all doors met the acceptance criteria for opening torque, and the data was consistent based on the calculated standard deviation. The opening torque for any door was always greater than the closing torque for the door.

- The closing torque for each door met the TS acceptance criteria (> 78 inch-pounds). The minimum closing torque recorded for any door was 113.4 inch-pounds. The average closing torque was 132.3 inch-pounds and the standard deviation was 10.3 inch-pounds. In summary, all the doors met the acceptance criteria for closing torque, and the data was consistent based on the calculated standard deviation.

- The maximum hinge frictional torque for each door met the TS acceptance criteria (< 40.0 inch-pounds). The maximum frictional torque recorded for any door was 27.0 inch-pounds. The average frictional torque was 10.1 inch-pounds and the standard deviation was 6.3 inch-pounds. In summary, all the doors met the acceptance criteria for frictional torque, and the data was consistent based on the calculated standard deviation.

3.1.6 Licensee's Analysis Methodology

The licensee used a methodology to draw conclusions regarding the current status of the Unit 1 ice condenser lower inlet doors. The data for Unit 2 using the revised test method was reviewed to establish a correction torque value which was applied to closing torque data acquired using previous methodology. Unit 1 closing torque data was adjusted using this corrected torque value. The adjusted closing torque data was compared to the TS closing torque acceptance limits. Twice the average and twice the maximum friction torque from the Unit 2 data was applied to the Unit 1 closing torque data to obtain corrected opening torque values. The resulting values were compared to the TS opening torque acceptance limits.

The torque values for the Unit 2 tests using Special Procedure 12-MHP-SP-LID, Revision 1, are nominal values. The licensee considers the use of nominal values to be valid because the surveillance measurement uncertainties are randomly distributed. Consequently, the measurement uncertainties are not expected to affect the derivation of statistical parameters used to describe distribution of this data. Collection of force data during each door test consisted of three individual measurements for each parameter on each door. The three values were then averaged to reduce the effect of random variations in performance of the test. Since the initial averaging might smooth the data set and make it appear more consistent than it really is, the licensee performed a statistical review using the raw data to justify the use of three-point average values. Use of the individual data points resulted in only minimal changes to data set averages and maximum values. Standard deviation values also changed only slightly such that using initially averaged data created no significant smoothing effects. For

example, a comparison of the two methods for the hinge friction torque from the 2002 Unit 2 testing showed the maximum value to be 27 inch-pounds vice 28.5 inch-pounds and the standard deviation to be 5.9 inch-pounds vice 6.0 inch-pounds.

The maximum hinge frictional torque determined for Unit 2 in 2002 is a reasonable bounding value for use in calculating each Unit 1 door opening torque. The licensee determined that In lieu of using the maximum torque, an alternate statistical approach would be to use the mean value plus two or three standard deviations (2- or 3-sigma). In this case, the maximum hinge torque is well above 2-sigma and only slightly below 3-sigma. Therefore, the licensee determined that use of the maximum value is considered reasonable. The licensee also assessed the effect of using a slightly more conservative 3-sigma approach.

As stated above, the licensee determined that the closing torque data from the April 2000 Unit 2 as-left surveillance show a good correlation with the recent Unit 2 data. The April 2000 maximum and minimum closing torque are 173.1 inch-pounds and 130.4 inch-pounds, compared to maximum and minimum closing torque of 162.0 and 113.4 inch-pounds measured recently with the improved methodology. The standard deviations of the closing torque data for the previous and revised Unit 2 closing torque data are also similar and 10.3 inch-pounds and 9.7 inch-pounds, respectively. The methodology for determining closing torque in April 2000 involved allowing the door to fall into the spring scale from approximately 1 inch off the spring scale tip. Therefore, the previous methodology measured the force to both stop the door as it moved closed and hold the door. In contrast, the recently developed methodology for measuring closing force simply measures the force at which door movement commences in the closed direction. The licensee expected that the data for the previous testing would have slightly higher values of closing torque, which was the case. Therefore, the licensee determined that the Unit 2 closing torque data compiled in April 2000 can be considered an accurate indicator of the condition of the doors. Given that the Unit 2 closing torque data for the previous and revised methods correlate, and given that the previous closing torque data is slightly biased as a result of the technique used to collect the data, as described above, the licensee developed a correction torque value which could be applied to closing torque data collected using the previous methodology. Based on the averages, the closing torque using the previous test method is higher than those using the revised testing method by 12.3 inch-pounds. To perform this correction, the Unit 1 closing torque data is adjusted by applying the 12.3 inch pound correction torque value. The existing Unit 1 closing torque data indicates a minimum closing torque value of 104.6 inch-pounds, compared to the TS acceptance criteria of > 78 inch-pounds. When the 12.3 inch pound correction torque value is applied to the Unit 1 data, a minimum closing torque of 92.3 inch-pounds results. Therefore, the licensee determined that the corrected closing torque data for Unit 1 meets the TS acceptance criteria.

As noted previously, the average and maximum friction torque values from the Unit 2 data using the revised test method were 10.1 inch-pounds and 27.0 inch-pounds. As defined by the TS surveillance criteria for the lower inlet doors, the hinge frictional torque (Tf) is:

Tf = 0.5(opening torque - closing torque)

Therefore, opening torque can be predicted given a closing torque and a friction torque. The opening torque is equal to the closing torque plus twice the frictional torque. Given the average and maximum frictional torque values of 10.1 inch-pounds and 27.0 inch-pounds from the

corrected Unit 2 test data, and the corrected average and maximum closing torque for Unit 1 of 117.6 inch-pounds (129.9 - 12.3) and 164.3 inch-pounds (176.6 - 12.3), respectively, results in the following predicted opening torque values for Unit 1:

- Average closing torque and average friction torque: (117.6 inch-pounds) + [(2) x (10.1 inch-pounds)] = 137.8 inch-pounds opening torque, which meets the TS acceptance criteria of < 195 inch-pounds.

- Average Closing Torque and Maximum Friction Torque: (117.6 inch-pounds) + [(2) x (27.0 inch-pounds)] = 171.6 inch-pounds opening torque which meets the TS acceptance criteria of < 195 inch-pounds.

- Maximum Closing Torque and Average Friction Torque: (164.3 inch-pounds) + [(2) x (10.1 inch-pounds)] = 184.5 inch-pounds which meets the TS acceptance criteria of < 195 inch-pounds.

- Maximum Closing Torque and Maximum Friction Torque: (164.3 inch-pounds) + [(2) x (27.0 inch-pounds)] = 218.3 inch-pounds which does not meet the TS acceptance criteria of < 195 inch-pounds.

To determine which specific doors would not meet the TS acceptance criteria under the case where the maximum frictional torque is applied to the corrected closing torque data, the torque relationships above can be solved for closing torque values required to exceed the TS acceptance criteria:

(closing torque) - (12.3 inch-pounds) + (2) x (27.0 inch-pounds) < 195 inch-pounds

Solving for closing torque in the equation above reveals that when the maximum friction torque is applied to the closing torque data, any Unit 1 door which has a recorded closing torque in excess of 153.3 inch-pounds will not meet the TS acceptance criteria. A review of the Unit 1 data indicates that the following five doors have closing torque values > 153.3 inch-pounds:

4 Right	208.2 inch-pounds opening torque
7 Right	201.5 inch-pounds opening torque
7 Left	198.1 inch-pounds opening torque
21 Right	213.8 inch-pounds opening torque
23 Right	218.3 inch-pounds opening torque

However, the licensee states that this is not an expected condition since the highest friction torque does not correspond to doors with the highest closing torque.

The licensee also evaluated the more extreme case where the maximum frictional torque from the revised method Unit 2 data is applied to the maximum Unit 1 (uncorrected) closing torque data. Similarly, the torque relationships above can be solved for the Unit 1 recorded closing torque values required to exceed the TS acceptance criteria:

(closing torque) + (2) x (27.0 inch-pounds) < 195 inch-pounds

Solving for closing torque in the equation above reveals that when the maximum friction torque is applied to the maximum Unit 1 closing torque data, any door which has a recorded closing torque in excess of 141.0 inch-pounds will not meet the TS acceptance criteria. A review of the Unit 1 data indicates that the following eight doors have closing torque values > 141.0 inch-pounds:

2 Left	195.8 inch-pounds opening torque
4 Right	220.5 inch-pounds opening torque
6 Right	203.2 inch-pounds opening torque
7 Right	213.8 inch-pounds opening torque
7 Left	210.4 inch-pounds opening torque
15 Right	195.8 inch-pounds opening torque
21 Right	226.1 inch-pounds opening torque
23 Right	230.6 inch-pounds opening torque

The licensee further evaluated a more conservative case where, based on individual tests of each door, a worst-case hinge friction of 28.7 inch-pounds was determined, with the mean plus 3-sigma value calculated to be 31.4 inch-pounds. Using the largest hinge friction value (31.4 inch-pounds) with each of the individual door tests on Unit 1 indicated that 17 doors would exceed the TS limit of 195 inch-pounds opening force. However, the design-basis analysis of record limit of 252 inch-pounds was not exceeded in any instance. Limiting the door opening torque to less than 252 inch-pounds assures operation of the doors under all DBAs.

In order to establish the performance of the Unit 1 lower inlet doors, the licensee has established similarity of the doors between the units and has evaluated the test data from Unit 2 to establish a correction to the Unit 1 opening, closing, and frictional torque. The NRC staff agrees that the doors of both units are similar in key respects since the designs, the reworking of the doors in recent years, and the maintenance performed has been identical. Using this information, the licensee has established corrections to be applied to the Unit 1 door performance.

3.1.7 NRC Staff’s Analysis

To review the performance of the Unit 1 lower inlet doors, the staff evaluated the inlet door torque data using the licensee’s previous test method for both Units 1 and 2 and the revised test method for Unit 2. As discussed above, the licensee has developed a correction torque value to be applied to the Unit 1 torque values based on the average Unit 2 closing torque difference between the previous test method data and the revised test method data. Based on the above evaluation performed by the licensee, the Unit 1 closing torque was corrected by -12.3 inch-pounds, which results in all of the estimated closing torque values meeting the TS limit. The Unit 1 opening torque was then estimated by a variety of progressively conservative methods, as discussed above. This results in a maximum of five doors exceeding the TS opening torque value of 195 inch-pounds, as discussed above. As stated above, when applying the 3-sigma Unit 2 friction torque to the Unit 1 open torque, a more conservative estimate of 17 doors exceeding 195 inch-pounds results. While these 17 doors may conservatively have opening torque in excess of the TS limit, they are within the 252 inch-pound upper value used in the limiting case design-basis analysis. This is a reasonably conservative approach since the previous Unit 2 closing torque data is much more similar to and consistent with the current Unit 2 closing data, whereas, opening data between the methods indicate much

less similarity and consistency. However, if an alternate approach is used which would involve determining a torque correction based on the average Unit 2 opening torque difference between the previous test method data and the revised test method data, a larger correction of +39.2 inch-pounds to the opening torque values would result. This, together with application of the limiting Unit 2 frictional torque to the opening torque potentially results in many more doors that would exceed the TS opening torque limit of 195 inch-pounds. However, in all cases, none exceed the 252 inch-pound upper value assumed in the analysis.

The NRC staff reviewed the frictional torque data, which the licensee has applied to the Unit 1 opening and closing torque values that were determined using the previous test method. In general, the distributions of the frictional torque data sets are not well represented by normal distribution functions (i.e., a significant number of torque values are well outside the expected range of torque values for a normal distribution). The common application of two-standard deviations to reasonably bound a parameter does not appear to be appropriate in this case. Therefore, the licensee’s application of the limiting and three-standard deviation Unit 2 frictional torque values to the Unit 1 opening and closing torque values that were determined using the previous test method is appropriate to provide reasonable bounds on the expected Unit 1 door performance.

3.1.8 Door Torque Results versus Analysis of Record

The licensee conducted a review to determine whether the lower inlet door surveillance test inadequacies could have any impact on the results of the containment minimum recirculation sump water inventory analysis that was used to support D.C. Cook Units 1 and 2 License Amendment Nos. 234 and 217, dated December 13, 1999. To accomplish this, the analysis was reviewed to determine if any of its underlying assumptions could be affected by the test inadequacies. This review determined that, in the analysis, the force required to initially open the lower inlet door from the closed position, and to open the lower inlet doors to 40 degrees is significantly greater than the corresponding TS 4.6.5.3.1.b acceptance criteria. Consequently, the licensee concluded that the lower inlet door surveillance test inadequacies do not affect the results of the containment minimum recirculation sump water inventory analysis. The details of the review that support this conclusion are provided below.

License Amendment Nos. 234 and 217 were based in part on an analysis of the water level in the emergency core cooling sump following a postulated LOCA. This analysis was documented in an attachment to the licensee’s application for the amendment, dated October 1, 1999. The attachment consisted of Fauske and Associates, Inc. (FAI), report FAI/99-77, Revision 2, "Containment Sump Level Evaluation for the D. C. Cook Plant," dated September 1999. Subsequent to that amendment, the units were modified to route essential service water (ESW) pump flow through the containment spray heat exchanger during normal operations to assure acceptable minimum ESW pump flow is maintained. Accordingly, a new containment minimum recirculation sump water inventory analysis was performed. The modification resulted in a very small reduction in the minimum sump water levels for the limiting Mode 1 case. The new analysis is documented in FAI report FAI/01-67, "Evaluation of Proposed Change to Containment Spray Heat Exchanger Configuration in D. C. Cook," dated September 2001. This analysis modified the prior analysis of record, FAI/99-77, Revision 2, to address the change in ESW operation. However, the portion of the FAI/99-77, Revision 2, analysis involving performance of the lower inlet doors was unaffected by FAI/01-67. Therefore, FAI/99-77, Revision 2, was used as the basis for the review to determine the impact of the lower inlet door

surveillance test inadequacies. The FAI/99-77, Revision 2, analysis assumes lower inlet door opening and closing characteristics that result in 40-degree opening and closing torque values that are significantly larger than the TS 4.6.5.3.1.b acceptance criteria. Specifically, the analysis uses the uppermost lower inlet door opening characteristic curve shown on Figure 3 of FAI/99-77, Revision 2, Appendix C, "Ice Condenser Door Opening." This figure shows the total differential pressure across the lower inlet doors as a function of the percent of full door port area. The total differential pressure across the lower inlet doors is given in units of pounds per square foot (psfd), and equals the difference between the lower compartment pressure (P_{LC} in Figure 2 of FAI/99-77, Revision 2, Appendix C) and the ice condenser inlet plenum pressure (P_I in Figure 2 of FAI/99-77, Revision 2, Appendix C). As stated in FAI/99-77, Revision 2, Appendix C, a 40-degree open lower inlet door corresponds to 35 percent of the full door flow area. As shown on Figure 3 of FAI/99-77, Revision 2, Appendix C, this corresponds to a total differential pressure of 0.889 psfd. Figure 2 of FAI/99-77, Revision 2, Appendix C, shows the average pressure on the lower inlet doors is equivalent to

$P_{AV} – P_I$ where P_{AV} is the average of P_{LC} and P_I

Therefore, the torque acting on a lower inlet door is

$$T = (P_{AV} - P_I) \times A_{LID} \times \frac{W_{LID}}{2}$$

Since the average pressure on the lower inlet doors ($P_{AV} – P_I$) is half of the total differential pressure across the lower inlet doors ($P_{LC} – P_I$), the lower inlet door torque is related to Figure 3 in FAI/99-77, Revision 2, Appendix C by

$$T = \frac{(P_{LC} - P_I)}{2} \times A_{LID} \times \frac{W_{LID}}{2}$$

This opening torque value is significantly higher than the maximum TS-allowed opening torque, which is 195 inch-pounds. The analysis assumes that all of the lower inlet doors open the same way. The analysis also uses this same curve for determining how the lower inlet doors close when the pressure difference across the lower inlet doors decreases. Use of such high opening and closing torque values assures that the lower inlet door flow area is smaller than would be expected, and this is the appropriate direction of conservatism to minimize the ice melt rate. Regarding the initial opening torque, the recirculation sump water level analysis is also conservative relative to the TS 4.6.5.3.1.b acceptance criterion. The nominal initial opening pressure for the lower inlet doors was modeled as 0.01 psi (1.44 psf). This value is conservatively higher than the cold air head of 1 psf holding the lower inlet door closed (Updated Final Safety Analysis Report (UFSAR), Section 5.3.3.5.3). The analysis model corresponds to a lower inlet door opening torque of which is significantly greater than the TS 4.6.5.3.1.b maximum allowable value of 675 inch-pounds.

In summary, the Table 3 as-left Unit 1 lower inlet door closing force data, in conjunction with the door hinge friction data from Table 1, provides a method to predict the opening torque values for Unit 1. Based on reasonable scenarios which combine either maximum closing torque and average friction torque or average closing torque and maximum friction torque, the doors would meet the TS 4.6.5.3.1.b acceptance criteria of < 195 inch-pounds opening torque. For the worst case and unlikely scenario of combining the maximum closing torque and the maximum friction torque, the data shows that as many as five doors may not meet the TS acceptance limit

for opening torque. However, the values that would result from combining the maximum closing torque and the maximum friction torque would not invalidate the results of the containment sump analysis.

Both the Unit 1 and the Unit 2 ice condenser systems, including the lower inlet doors, were subjected to similar refurbishment prior to the current operation cycles. During the current operating cycles, both the ice condenser and containment systems have been subjected to similar maintenance and operational activities. Prior to the start of each unit operating cycle, the lower inlet doors were tested using an invalid test methodology. Based upon the corollaries drawn from the application, the NRC staff finds that the licensee's application of the recent Unit 2 inlet door torque measurement data to the Unit 1 doors provides reasonable assurance that the Unit 1 doors are capable of performing their intended safety function within acceptable limits, and is therefore, acceptable.

3.2 Design-Basis Accidents

During review of the licensee's February 8, 2002, application, the NRC staff determined that the application did not contain adequate information to allow the staff to make a decision on the acceptance of the license amendment. In a phone conversation with the licensee on February 8, 2002, the NRC staff stated it needed additional information concerning the potential effect of degraded ice condenser lower inlet doors and the impact on DBA analyses. By supplemental letter dated February 10, 2002, the licensee provided the requested additional information. The licensee analyzed two postulated failures of the lower inlet doors during an SBLOCA and a large-break LOCA (LBLOCA). In addition the licensee discussed the effects of mal-distribution from lower inlet door failures. The impact of the containment performance of a main steamline break is bounded by that of a LOCA.

3.2.1 Small-Break Loss-of-Coolant Accident

The significant design-basis issue for an SBLOCA is to assure that there is sufficient recirculation sump water level to preclude vortexing of the emergency core cooling system pumps during the recirculation phase. The water volume needed for minimum recirculation sump water level is equivalent to approximately 20 percent of the TS 3.6.5.1 value for minimum allowable ice mass. This 20-percent valve is the amount of ice that must be melted to assure the minimum required sump water level is achieved following an SBLOCA. For the following two cases, the licensee postulated a worst case for potential impact on the minimum recirculation sump water level during the limiting SBLOCA.

First, for a single lower inlet door failing to open, the worst case for sump inventory would be no steam flow to the ice column immediately behind the affected door. This situation would reduce the available ice mass by 1/48 or about 2.1 percent. Since 20 percent of the TS 3.6.5.1 value for minimum ice mass must be melted to assure the minimum required sump water level, 80 percent of the TS-required ice mass does not have to be melted. Since one door failure results in a loss of 2.1 percent of the ice mass, a loss of 80 percent of the ice mass would require 38 doors to fail.

Secondly, for one or more lower inlet doors opening prematurely, the worst case for sump inventory would be for all steam to flow to the ice column immediately behind the affected doors or to the upper compartment via the bypass flow area. The size of the SBLOCA would be sufficiently small that the lower inlet door pressure differential would be insufficient to open the other doors. The containment pressure would increase gradually to the safety injection signal, which would initiate the containment equalization (CEQ) fan. The CEQ fans provide sufficient head to open the remaining lower inlet doors and preclude containment spray (CTS) actuation. Without CTS taking water from the sump, sufficient water inventory would be in the sump.

3.2.2 Large-Break Loss-of-Coolant Accident

During the initial licensing of D.C. Cook Units 1 and 2, in answering questions by the Advisory committee on Reactor Safeguards, the licensee analyzed that the failure of two doors to open would have about a 1-percent change in operating deck differential pressure and essentially no change in the containment pressure. The significant design-basis issue for an LBLOCA is to assure that containment pressure can be maintained. The design of the lower inlet door assembly is such that the door assembly would fail at a pressure below the design pressure of the loop subcompartment boundaries, essentially acting like a rupture disk. In the case of an LBLOCA, the blowdown force is so strong that the small deviation of the door testing torque experienced in Unit 1 would not affect the peak containment pressure because the lower inlet doors will be opened rapidly and fully even with this deviation of the door testing torque or with the rupture of the door.

The failure of one or more lower inlet doors to open would result in reduction of the vent area for the lower containment loop subcompartments. The reduction of the vent area would tend to increase the peak loop subcompartment pressures and potentially cause mal-distribution into the ice bed. For peak pressure of a loop subcompartment, the licensee analyzed a worst case that no inlet doors were providing venting relief. The resultant increase of pressure differential in the loop subcompartment and adjacent loop subcompartment was approximately 10 percent. The structure elements in the subcompartment have at least a 25 percent excess capacity and would continue to perform their function. Therefore, the structure integrity can be maintained.

3.2.3 Mal-distribution

The licensee evaluated the effects of mal-distribution from lower inlet door failures. Under the current licensing basis, Section 5.3.3.5.3 of the UFSAR states that the lower inlet doors are designed to distribute steam to the ice condenser to limit mal-distribution to less than 150-percent maximum peak-to-average mass flow into the ice condenser, resulting from postulated DBAs that cause the doors to open. For this analysis, the maximum variation in flow area due to door parameter tolerances is used. The resulting mal-distribution characteristic is a function of break sizes. For the most critical break size of 6 inches, the calculated mal-distribution is less than 150 percent, with some margin. Failure of a single door (e.g., failing to open or opening with improper proportioning characteristics) could result in a 5-percent increase in the peak mal-distribution, or could cause a maximum mal-distribution of about 146 percent. The possible deviation from the TS requirement for door torque testing would not be significantly worse than the case analyzed above.

Performance of TS 4.6.5.3.1.b.1 ensures that the doors will initially open in response to an SBLOCA, but as a result of the indeterminate surveillances for TS SRs 4.6.5.3.1.b.3, 4.6.5.3.1.b.4, and 4.6.5.3.1.b.5, the opening, closing, and hinge frictional torque might vary from one door to another. If multiple doors behave erratically as a result of indeterminate surveillances, the 150-percent design limit defined in the UFSAR may or may not be met (i.e., depending on the extent of malfunction of doors, one or more doors may pass more than 150 percent of $1/48^{th}$ of the total flow). However, the important factor is the distribution of flow through the ice bed rather than the flow through the doors. If the ice bed behind each door is physically segregated from the ice bed behind the other doors (i.e., no crossflow considered), then there are 48 parallel flow paths. Each flow path has several resistors in series (i.e., the lower inlet door, the turning vanes, the ice bed, and the intermediate and upper deck doors (or built-in bypass area)). While this particular concept has not been explicitly analyzed, the pressure drop across the lower inlet door is relatively small compared to the design pressure drop through the ice condenser, so the effect of varying door resistance is tempered by its relatively small contribution to the overall pressure drop. The effect on maldistribution through the ice bed would not be significantly affected by a variation in door resistance. In reality, the flow paths are not segregated and cross flows due to both the pressure profile and the natural affinity of steam for ice will further smooth flow distribution through the ice bed. Even a maximum mal-distribution could be slightly higher than 150 percent and would not be sufficient to challenge the containment recirculation sump water inventory for an SBLOCA or the peak containment pressure for an LBLOCA.

Based on the above, the NRC staff finds that the insufficient door testing will not affect the peak containment pressure. The small effects of the subcompartment pressure differential are within the structure design margin. There will be sufficient containment recirculation sump water inventory for an SBLOCA. The design-basis maximum mal-distribution of 150 percent could be exceeded slightly, but would be insignificant to impact the containment recirculation sump water inventory for an SBLOCA or the peak containment pressure for an LBLOCA. Therefore, the NRC staff concludes that the compliance of all the containment design criteria in 10 CFR Part 50, Appendix A, are not affected.

4.0 SUMMARY

Based on the above evaluation, the NRC staff finds that the licensee has provided adequate information to demonstrate that the Unit 1 ice condenser doors will perform their intended function even with the indeterminate status of the doors' operability. Therefore, the NRC staff finds the continued operation of D.C. Cook Unit 1 until the next scheduled refueling outage or outage in which the unit is taken to Mode 5 for a sufficient duration, at which time the licensee will perform the required TS surveillance on the ice condenser lower inlet doors, is acceptable.

5.0 EMERGENCY CIRCUMSTANCES

The Commissions regulations at 10 CFR 50.91 contain provisions for issuance of an amendment involving no significant hazards consideration where the Commission finds that emergency circumstances exist, in that failure to act in a timely way would result in the shutdown of a nuclear plant and that the time does not permit the Commission to publish a *Federal Register* notice allowing 30 days for prior public comment. The emergency exists in this case in that the proposed amendment is needed to prevent shut down of D.C. Cook Unit 1.

The NRC staff has determined that the licensee could not reasonably have foreseen the problem that led to this amendment request. The problem was an inadequate TS surveillance procedure recently identified by the NRC Resident Inspector.

Accordingly, the Commission has determined that emergency circumstances exist pursuant to 10 CFR 50.91(a)(5) and could not have been avoided, that the submittal of information was timely, and that the licensee did not intentionally create the emergency condition.

6.0 FINAL NO SIGNIFICANT HAZARDS CONSIDERATIONS DETERMINATION

The Commission's regulations at 10 CFR 50.92(c) state 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 the margin of safety. The NRC staff has made a final determination that no significant hazards 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 final determination is presented below:

1. The proposed change does not involve a significant increase in the probability of occurrence or consequences of an accident previously evaluated.

   Probability of Occurrence of an Accident Previously Evaluated

   The proposed change is a one-time limited duration exemption that will allow continued operation of D.C. Cook Unit 1 until the next entry into Mode 5 of sufficient duration without performance of surveillance testing on the ice condenser inlet door opening torque and closing torque, and calculation of frictional torque. These doors perform a largely passive function and should not actuate (open) unless an accident occurs. The doors do not affect any accident initiators or precursors. There are no new failure modes for the doors created by this proposed change. These doors do not interact with any system whose failure or malfunction can initiate an accident. Therefore, the probability of occurrence of an accident previously evaluated is not significantly increased.

   Consequences of an Accident Previously Evaluated

   The ice condenser lower inlet doors function to mitigate an accident by opening to allow steam and gases from a LOCA to enter the ice condenser. The special test performed by the licensee on Unit 2 has provided reasonable assurance that the Unit 1 door opening torque, closing torque, and frictional torque are within the established design criteria, and would meet the TS surveillance test criteria. As a result, there is reasonable assurance the doors will continue to perform their required functions until the next Unit 1 entry into Mode 5 of sufficient duration. Therefore, the consequences of an accident previously evaluated are not significantly increased.

2. The proposed change would not create the possibility of a new or different kind of accident from any accident previously evaluated.

   The proposed change allows operation of the unit throughout the remainder of its operating cycle without performance of certain TS surveillance requirements. Those surveillance requirements provide verification that the opening torque, closing torque, and frictional torque of the ice condenser lower inlet doors are acceptable. There are no new failure modes for the ice condenser doors created by the one-time limited duration exemption from the surveillance tests. The special test performed by the licensee has provided a level of assurance that the doors will continue to operate in their designed manner. The doors do not interact with any system whose failure or malfunction can initiate an accident. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. The proposed change does not involve a significant reduction in a margin of safety.

   The margins of safety applicable to the proposed change are those associated with the limits on values for opening torque, closing torque, and frictional torque values specified in the TS surveillance requirement for the inlet doors. Since the special test performed by the licensee on Unit 2 provides reasonable assurance of compliance with these limits for Unit 1, the applicable safety margin will be maintained. The proposed change does not reduce the capability of the doors to perform the design function required by the accident and safety analyses, nor does the proposed change impact the operational characteristics of the doors. Therefore, the proposed change does not involve a significant reduction in margin of safety.

In summary, based upon the above evaluation, the NRC staff has concluded that the proposed change involves no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of no significant hazards consideration is justified.

7.0 STATE CONSULTATION

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

8.0 ENVIRONMENTAL CONSIDERATION

The amendment changes the requirements with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 or change the surveillance requirements. The staff has determined that the amendment involves 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 Commission has made a final finding that the amendment involves no significant hazards consideration. Accordingly, the amendment meets 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 amendment.

9.0 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 amendment will not be inimical to the common defense and security or to the health and safety of the public.

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