UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 1, 2011

Mr. Lawrence J. Weber
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 RE: CONTAINMENT SPRAY NOZZLE SURVEILLANCE REQUIREMENT (TAC NOS. ME4125 AND ME4126)

Dear Mr. Weber:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 314 to Renewed Facility Operating License No. DPR-58 and Amendment No. 298 to Renewed Facility Operating License No. DPR-74 for the Donald C. Cook Nuclear Plant, Units 1 and 2. The amendments consist of changes to the Technical Specifications in response to your application dated June 22, 2010, as supplemented by letter dated January 13, 2011.

The amendments revised the containment spray nozzles obstruction surveillance frequency specified in Surveillance Requirement 3.6.6.5 from a fixed "10 years" to "following maintenance that could result in nozzle blockage."

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,

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. 314 to DPR-58
2. Amendment No. 298 to DPR-74
3. Safety Evaluation

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**UNITED STATES**
**NUCLEAR REGULATORY COMMISSION**
**WASHINGTON, D.C. 20555-0001**

INDIANA MICHIGAN POWER COMPANY

DOCKET NO. 50-315

DONALD C. COOK NUCLEAR PLANT, UNIT 1

AMENDMENT RENEWED FACILITY OPERATING LICENSE

Amendment No. 314
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 June 22, 2010, as supplemented by letter dated January 13, 2011, 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 changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. DPR-58 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 314, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 90 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert J. Pascarelli, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the Renewed Operating License and Technical Specifications

Date of Issuance: June 1, 2011

ATTACHMENT TO LICENSE AMENDMENT NO. 314

TO RENEWED FACILITY OPERATING LICENSE NO. DPR-58

DOCKET NO. 50-315

Replace the following page of Renewed Facility Operating License DPR-58 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 |
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| 3 | 3 |

Replace the following page of Appendix A, Technical Specifications, 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 |
|---|---|
| 3.6.6-2 | 3.6.6-2 |

and radiation monitoring equipment calibration, and as fission detectors in amounts as required.

(4) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument and equipment calibration or associated with radioactive apparatus or components; and

(5) Pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Section 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at steady state reactor core power levels not to exceed 3304 megawatts thermal in accordance with the conditions specified therein.

(2) Technical Specifications

The Technical Specifications contained in Appendix A, and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 314, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Less Than Four Loop Operation

The licensee shall not operate the reactor at power levels above P-7 (as defined in Table 3.3.1-1 of Specification 3.3.1 of Appendix A to this renewed operating license) with less than four reactor coolant loops in operation until (a) safety analyses for less than four loop operation have been submitted, and (b) approval for less than found loop operation at power levels above P-7 has been granted by the Commission by amendment of this license.

(4) Indiana Michigan Power Company shall implement and maintain, in effect, all provisions of the approved Fire Protection Program as described in the Final Safety Analysis Report for the facility and as approved in the SERs dated December 12, 1977, July 31, 1979, January 10, 1981, February 7, 1983, November 22, 1983, December 23, 1983, March 16, 1984, August 27, 1985

SURVEILLANCE REQUIREMENTS (continued)

| | SURVEILLANCE | FREQUENCY |
|---|---|---|
| SR 3.6.6.3 | ----------NOTE----------<br>In MODE 4, only the manual portion of the actuation signal is required.<br>---<br>Verify each automatic containment spray valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal. | 24 months |
| SR 3.6.6.4 | ----------NOTE----------<br>In MODE 4, only the manual portion of the actuation signal is required.<br>---<br>Verify each containment spray pump starts automatically on an actual or simulated actuation signal. | 24 months |
| SR 3.6.6.5 | Verify each spray nozzle is unobstructed. | Following maintenance that could result in nozzle blockage |

**UNITED STATES**
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**WASHINGTON, D.C. 20555-0001**

INDIANA MICHIGAN POWER COMPANY

DOCKET NO. 50-316

DONALD C. COOK NUCLEAR PLANT, UNIT 2

AMENDMENT RENEWED FACILITY OPERATING LICENSE

Amendment No. 298
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 June 22, 2010, as supplemented by letter dated January 13, 2011, 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 changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. DPR-74 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 298, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 90 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert J. Pascarelli, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the Renewed Facility Operating License and Technical Specifications

Date of Issuance: June 1, 2011

ATTACHMENT TO LICENSE AMENDMENT NO. 298

TO RENEWED FACILITY OPERATING LICENSE NO. DPR-74

DOCKET NO. 50-316

Replace the following page of Renewed Facility Operating License DPR-74 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 |
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| 3 | 3 |

Replace the following page of Appendix A, Technical Specifications, 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 |
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| 3.6.6-2 | 3.6.6-2 |

radiation monitoring equipment calibration, and as fission detectors in amounts as required.

(4) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument and equipment calibration or associated with radioactive apparatus or components; and

(5) Pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Section 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at steady state reactor core power levels not to exceed 3468 megawatts thermal in accordance with the conditions specified therein and in attachment 1 to the renewed operating license. The preoperational tests, startup and other items identified in Attachment 1 to this renewed operating license shall be completed. Attachment 1 is an integral part of this renewed operating license.

(2) Technical Specifications

The Technical Specifications contained in Appendix A, and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 298, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Additional Conditions

(a) Deleted by Amendment No. 76

(b) Deleted by Amendment No. 2

(c) Leak Testing of Emergency Core cooling System Valves

Indiana Michigan Power Company shall prior to completion of the first inservice testing interval test each of the two valves in series in the

SURVEILLANCE REQUIREMENTS (continued)

| | SURVEILLANCE | FREQUENCY |
|---|---|---|
| SR 3.6.6.3 | ----------NOTE----------<br>In MODE 4, only the manual portion of the actuation signal is required.<br>---<br>Verify each automatic containment spray valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal. | 24 months |
| SR 3.6.6.4 | ----------NOTE----------<br>In MODE 4, only the manual portion of the actuation signal is required.<br>---<br>Verify each containment spray pump starts automatically on an actual or simulated actuation signal. | 24 months |
| SR 3.6.6.5 | Verify each spray nozzle is unobstructed. | Following maintenance that could result in nozzle blockage |

**UNITED STATES**
**NUCLEAR REGULATORY COMMISSION**
**WASHINGTON, D.C. 20555-0001**

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

AMENDMENT NO. 314 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-58

AND AMENDMENT NO. 298 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-74

INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-315 AND 50-316

## 1.0 INTRODUCTION

By letter dated June 22, 2010 (Accession No. ML101880034), as supplemented by letter dated January 13, 2011 (Accession No. ML110250475), Indiana Michigan Power Company requested a revision to the Technical Specifications for the Donald C. Cook Nuclear Plant (CNP), Units 1 and 2, changing the containment spray nozzles obstruction surveillance frequency specified in Surveillance Requirement (SR) 3.6.6.5 from a fixed "10 years" to "Following maintenance that could result in nozzle blockage."

The supplemental letter dated January 13, 2011, contained clarifying information, did not change the scope of the original application or the initial no significant hazards consideration determination, and did not expand the scope of the original *Federal Register* notice dated August 24, 2010 (75 FR 52042).

## 2.0 REGULATORY EVALUATION

The licensee identified applicable regulatory requirements in its application. The regulatory requirements and guidance which the Nuclear Regulatory Commission (NRC) staff considered in assessing the proposed amendment are as follows:

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.36(c)(3), "Surveillance requirements," defines SRs as requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met.

Part 50 of 10 CFR establishes the fundamental regulatory requirements with respect to the domestic licensing of nuclear production and utilization facilities. Specifically, Appendix A,

"General Design Criteria (GDC) for Nuclear Power Plants," to 10 CFR Part 50 provides, in part, the necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety.

The construction permits for CNP were issued and the majority of construction was completed prior to issuance of 10 CFR 50, Appendix A, General Design Criteria (GDC), in 1971 by the Atomic Energy Commission (AEC). Nevertheless, CNP was designed and constructed to comply with the AEC GDC as proposed on July 10, 1967. The application of the AEC-proposed GDC to the CNP units is contained in the CNP Updated Final Safety Analysis Report as the Plant Specific Design Criteria (PSDC). The current Appendix A of 10 CFR Part 50 GDC differ both in numbering and content from the PSDC for CNP.

CNP PSDC 38 states that all engineered safety features shall be designed to provide such functional reliability and ready testability as is necessary to avoid undue risk to the health and safety of the public. The licensee's proposed revision of the TS to change a test frequency does not directly affect this criterion.

CNP PSDC 60 states that a capability be provided, to the extent practical, to periodically test the delivery capability of the Containment Spray Systems as close to the spray nozzles as possible. The licensee's proposed TS changes do not affect the ability to verify that spray nozzles are not obstructed. Although a calendar-based periodic nozzle flow test would no longer be required, an event- or condition-based test requirement would provide reasonable assurance that the spray nozzles will perform their safety function.

The NRC staff has previously approved a number of similar license amendments. Examples include Amendments 126 and 126 for Braidwood Station, Units 1 and 2 (February 20, 2003, Accession No. ML022880596), Amendments 190 and 179 for Prairie Island Nuclear Generating Plant, Units 1 and 2 (November 6, 2008, Accession No. ML082740226), and Amendment 233 for Arkansas Nuclear One, Unit 1 (July 9, 2008, ML081540218).

## 3.0 TECHNICAL EVALUATION

### 3.1 Background

The CNP Containment Spray System (CSS) provides two full-capacity heat removal systems for the containment, sized to remove reactor residual heat at a rate consistent with the heat generated after ice melt, thereby precluding an increase of containment pressure above design limits. Each of the two containment spray pumps provide 100 percent of the iodine removal capability required in the containment. The spray additive used for iodine removal is sodium hydroxide. Any event producing a rise in containment pressure to approximately 3.0 pounds per square inch gauge will result in actuation of the CSS.

Each of the spray trains provides complete backup for the other. The passive portions of the CSS located within the containment are designed to withstand the post-accident containment environment without loss of performance and to operate without maintenance. All active components of the CSS are located outside the containment, hence are not required to operate in the steam-air environment produced by an accident.

The ramp bottom design spray nozzles are not subject to clogging by particles less than 1/4-inch in maximum dimension, and are designed to produce a mean drop size of approximately 700 microns in diameter with the CSS operating at design conditions and the containment at

design pressure. The nozzles (and headers) are so oriented as to maximize coverage of the total containment volume by a single CSS train.

The spray nozzles are Sprayco 1713A ramp bottom design. They are made from stainless steel, equipped with a 3/8-inch diameter orifice. Each train of the CSS contains 91 nozzles distributed among four spray ring headers in the upper containment, 60 nozzles distributed among 15 spray headers in lower containment and 12 nozzles on a separate spray ring header in the annular region of the containment. In addition, each Residual Heat Removal System spray train/header contains 150 nozzles distributed among 3 ring headers in the upper containment.

Parts of the CSS which are, or are liable to be, in contact with borated water, the sodium hydroxide spray additive, or a mixture of the two are made of stainless steel or an equivalent corrosion-resistant material. The licensee periodically inspects, where practicable, active and passive components of the CSS to demonstrate system readiness. The pressure-containing components are inspected to detect leaks from pump seals, valve packing, flanged joints and safety valves. During operational testing of the CSS pumps, the portions of the system containing pump pressure are inspected to detect leaks.

The containment pressure reducing systems are designed to the extent practical so that the CSS pumps, spray injection valves, spray nozzles, and additive injection valves can be tested periodically and after any component maintenance for operability and functional performance. Permanent test lines for all the containment spray loops are provided.

Currently the CNP TSs require each spray nozzle to be verified unobstructed every 10 years. Performing this surveillance test involves draining the spray headers and admitting low pressure compressed air, with or without a smoke agent, into the headers, or alternatively, by vacuum blower inducing airflow through each nozzle to verify the unobstructed flow condition.

The proposed revision to these TS would instead require that each spray nozzle be verified unobstructed following activities which could result in nozzle blockage. These activities were characterized as events such as experiencing inadvertent spray system actuation that results in spray water flow through the nozzles, a loss of foreign material control when working within the respective system boundary, or performing major configuration changes.

3.2 Evaluation of the Requested Change

The licensee stated that the CSS piping and components which may be in contact with borated water are made of uncoated stainless steel, which is resistant to corrosion and thus minimizes the potential for time-based accumulation of potential nozzle obstructing corrosion and degraded coating deposits in the supply piping and spray headers.

The licensee stated that due to their location at the top of the containment, introduction of foreign material through the spray nozzles into the headers is unlikely. The licensee argued that because maintenance that could introduce foreign material is by far the most likely cause for obstruction, testing or inspection following maintenance with that potential would suffice to verify the system's capability to perform its safety function. Accordingly, the licensee believes that performing calendar-based nozzle tests is of little value for detecting an obstructed nozzle if there has been no event since the previous test that would likely introduce potentially obstructing materials into the system or carry them to the spray headers. Verifying that the nozzles are not obstructed following maintenance or inadvertent system actuations that could introduce or

transport foreign materials to the spray ring headers (due, for example, to a loss of foreign material control) are more appropriate.

The licensee's requested change to the surveillance test requirement expands on the earlier extension of the test interval from 5 to 10 years based on Generic Letter 93-05, "Line-Item Technical Specifications Improvements to Reduce Surveillance Requirements for Testing During Power Operation," dated September 27, 1993, and the information contained in NUREG-1366, "Improvements to Technical Specifications Surveillance Requirements," dated December 1992. NUREG-1366 documents the review of CSS experience throughout the industry with the conclusion that nearly all spray nozzle obstruction events were related to original construction foreign material left in the system or to accumulation of corrosion products in the piping/headers. Periodic testing to date has revealed what it could of the legacy foreign material within the systems. If system materials of construction do not support accumulation of corrosion or coating products within the system, then the spray nozzles are unlikely to become obstructed as a result of passive weathering with the passage of time. Periodic testing is unlikely to reveal obstructions without there having been a loss of foreign material control during maintenance or a system actuation and water flow that could entrain and transport the foreign material to the headers or nozzles or deposit boric acid crystal residue in the headers.

Performing the nozzle tests involves personnel radiation dose, industrial safety hazards, potential for inadvertent introduction of foreign material into the systems, and potential for improper realignment of the systems after a test. These consequences or the potential for adverse consequences could be reduced if very low value testing is avoided.

3.2.1 The Licensee's Own Experience

In its June 22, 2010, application the licensee stated that the CSS had been modified four times. In 1998, a CNP Unit 1 test line with isolation valves that was believed to be leaking by was removed from service to prevent water from filling a normally empty spray ring and subsequently dripping out of spray nozzles in the annular region of the lower containment. The licensee's inspection inside this spray ring to determine if this condition had resulted in boric acid accumulating inside the pipe led to discovering foreign material that was left behind from the original construction era. In 2000, a full flow test circuit was installed for each pump in the Auxiliary Building. Lastly, in 2002, all four CSS pumps were equipped with a new impeller having one additional vane. These last two modifications were installed during the third 10-year inspection interval to address historical vibration issues.

The inspection performed inside the spray ring for Unit 1, in 1998, confirmed the presence of a highly borated water solution, but no solid crystals of boron. The licensee stated that if water is identified in a CSS spray header, then the condition will be entered into CNP's corrective action program where it is evaluated and corrective action will be taken that includes draining the affected CSS header(s) in containment at the next available opportunity for that train.

The NRC staff reviewed the NRC Inspection Reports for CNP, Units 1 and 2, for the years 2000 through 2010. Although there are no significant findings identified in the reports that would indicate lapses in the Foreign Material Exclusion (FME) program, the NRC staff did identify a condition report (AR 2010-6793) in which the licensee identified that inadvertent flow occurred on the Unit 2 spray header. After attempting to drain the spray header, the licensee resolved the issue by procedurally controlling the water level in the CSS header within containment. Procedure changes were made to 2-OHP-4030-209-007-E and 2-OHP-4030-20-007-W to

prevent recurrence. The licensee also changed procedures 1-OHP-4030-109-007-E and 1-OHP4030-109-007-W to prevent occurrence in Unit 1.

Given that the licensee did not identify any leakage condition on the Unit 2 spray header, the NRC staff determined that additional information was needed to better assess the CSS history and corrective action practices at CNP Unit 2. The NRC staff, by e-mail dated October 18, 2010 (Accession No. ML102910036), requested the following additional information: (1) a description of any events in which active boric acid had been identified in containment for which it appeared to be coming from the Unit 2 containment spray annulus; (2) a summary of the containment spray system's past history at Unit 2 as of the last flow test (performed in 2000); and (3) a description of the corrective action plan in the event of inadvertent fluid flow through the containment spray nozzles.

The licensee responded to the request for additional information via its January 13, 2011, letter. The licensee identified four separate occurrences of boric acid found leaking from a Unit 2 spray nozzle annulus, two of which occurred after the last flow test, in which leak rates varied from a few drops per minute to as much as 2-3 drops per second.

> October 1994 - The licensee stated that errors associated with restoring a clearance used to isolate the spray rings from the rest of the system occurred during pressurized leak testing. Corrective action included procedure changes to direct draining of the system following testing.
>
> May 1997 - The licensee stated it identified a leak by past isolation valves relied upon to isolate the pump test circuit from the rest of the system. Corrective actions included draining the affected CSS spray ring after each pump test until Unit 2 could be placed in a configuration required to support repairs. The repair was to permanently remove from service the portion of the test line which contained the valves that leaked by.
>
> March 2002 - The licensee stated it identified that seat tightness of the spray pump test line isolation valves was not the sole cause for water inadvertently entering the spray rings. At that time, only the outlet side of the heat exchangers (inverted vertical U-tube) was drained to establish its normal operating configuration. The inlet side was filled to the lowest row U-bend. In this condition, negative atmospheric pressure in containment (e.g., running the purge fans during core alterations and/or routine pressure reliefs online) draws water over the heat exchanger U-bend. Once the outlet pipe becomes water solid, this water is siphoned into the lower CSS header. Water level in the Refueling Water Storage Tank (CSS suction) is typically 3 - 5 feet higher than the lowest nozzle in the annulus. Leakage was therefore continuous and the leak rate is a function of the differential pressure across the heat exchanger. This condition was resolved by altering the normal standby condition of the heat exchangers. Now, the heat exchangers are completely drained on both sides prior to exiting a refueling outage in accordance with changes made to the procedure for establishing standby conditions.
>
> May 2009 - The licensee stated that during the Unit 2, Cycle 17 refueling outage (RFO), Emergency Diesel Generator (EDG) load sequence tests, which involve running a CSS pump, were performed after the CSS heat exchangers had been drained for restart. One of the heat exchanger manual isolation valves leaked by and one or more of the tubes filled with liquid because a tell-tale drain had not been established. This established the siphoning condition previously described above. To prevent further leakage, the CSS spray ring in the lower containment was drained two times prior to the Unit 2 refueling

outage (U2C17). The heat exchanger tubes were drained prior to unit start-up from the outage. The procedures for the subject EDG surveillance were revised to direct the opening of a tell-tale drain behind the heat exchanger isolation valve to ensure leak by will not fill any tubes.

These past events in which there was a loss of foreign material control have been evaluated by the NRC staff and the trend of the loss of foreign material control events was analyzed. Based on the licensee's statements in its January 13, 2011, letter, and the findings in the NRC staff's inspection reports, the NRC staff considers the licensee's response to each of these events to have been appropriate and that the current status of the foreign material efforts at CNP is acceptable.

In response to the third item requested, the licensee stated that the CNP system operating procedures minimize the possibility of inadvertent fluid flow into the CSS nozzles by maintaining the CSS heat exchanger U-tubes in a dry state. In the event of inadvertent fluid flow through the containment spray nozzles, this flow would be identified by operators on routine weekly containment tours. An Action Request (AR) would be created in the Corrective Action Program when leakage is detected. This will enable scheduling the appropriate maintenance in accordance with the Work Control Program. Corrective actions generated in response to the AR have historically included periodic draining of the affected portion of the system in containment if repairs cannot be made online. The NRC staff concluded that the licensee's response is consistent with the inspection reports and condition reports that were evaluated.

The licensee stated that, in addition, if the repair activities to eliminate inadvertent fluid flow through the containment spray nozzles cannot be performed online, then draining of the spray ring header is scheduled, using the Work Control process to limit the potential for evaporation of solution. Periodic draining is intended to minimize the potential for water to evaporate, preventing deposits of boric acid precipitate that could possibly impede flow.

3.2.2 Industry Experience and Failure Mechanisms

The NRC staff evaluated industry experience by searching the Licensee Event Report database, which indicates that spray systems of similar design are highly reliable (i.e., not susceptible to spray nozzle obstructions). The NRC staff found that, with a few exceptions, once successfully tested after construction, containment spray nozzles have not been subject to blockage, except for a very few exceptions. In the case of one pressurized water reactor (PWR) no longer operating, a chemical added to the inner surface of a spray system pipe to eliminate a corrosion problem detached and the loose material blocked some spray nozzles. Spray piping that is corrosion-resistant avoids this failure mechanism and this experience is not applicable to CNP. The licensees at other PWRs have found debris, identified as left from original construction, in the spray nozzle headers; the fraction of blockage was not significant and the spray systems remained functional. After the initial nozzle testing, debris in the piping and headers has nearly always been discovered by visual inspection, not by subsequent periodic air flow tests.

3.2.3 Justification for the Proposed Change

The NRC staff reviewed the proposed changes for compliance with 10 CFR 50.36, and for agreement with the guidance established in NUREG-1431, Revision 3, "Standard Technical Specifications Westinghouse Plants" dated March 2004. The NRC staff needs to make a determination that proposed changes maintain adequate safety. The NRC staff also assures

that changes that result in relaxation (less restrictive condition) of current TS requirements require detailed justification.

In this amendment application the licensee proposed to modify the containment spray nozzle surveillance frequency to improve the capability for preventing blockages in the spray nozzles. In determining the acceptability of such changes, the NRC staff reviewed the licensee's proposed change and supporting analysis against the requirements of 10 CFR 50.36, using as generic guidance the Improved Standard Technical Specifications.

Demonstrating that each spray nozzle is unobstructed provides assurance that the spray coverage of the containment, in combination with the containment coolers, is sufficient to limit the post-accident containment pressure and temperature to less than the design values. Industry experience indicates that the containment spray systems of similar design are highly reliable and not subject to plugging after testing following startup. Both Unit 1 and Unit 2 CSSs were demonstrated to be operable prior to initial plant startup. Since then, four successful air or smoke tests have been performed on Unit 1 and three on Unit 2. The CNP Unit 1 and Unit 2 containment spray nozzles were last verified to be unobstructed in February 2009 and May 2000, respectively.

However, the NRC staff acknowledges that air flow tests, which were not affected by the construction material discovered at both Unit 1 and Unit 2, may not be highly reliable in identifying foreign material inside the spray headers. The NRC staff has determined that reasonable assurance that CSS spray headers are clear of foreign materials is provided by the visual inspections performed which led to the removal of all foreign materials at spray headers for both Unit 1 and Unit 2. The licensee stated that no maintenance activities which may impact the CSS spray headers have been identified since the removal of foreign materials in 2000.

The NRC staff notes that the licensee's FME program is governed by approved procedures which ensure that appropriate precautions are taken to minimize the inadvertent and uncontrolled introduction of foreign materials into plant systems and components. FME training is required for all personnel performing work planning, maintenance, modifications, repairs, and testing or inspections on plant equipment and components. Breached fluid or piping systems are required to be covered when not being directly accessed for inspection or maintenance. FME procedures also delineate program requirements for maintaining cleanliness of plant systems and components.

One postulated mechanism of blockage of the spray nozzles is corrosion products. The CNP piping, ring headers, and nozzles are constructed of stainless steel. Thus, clogging by rust or other corrosion products is unlikely. However, the licensee recognizes that the potential exists for nozzle blockage caused by solid boric acid accumulation in the spray lines or nozzles due to evaporated borated water. Should there be inadvertent fluid flow through the nozzles, such as the result of spurious actuation, the licensee would evaluate testing and methods for determining the nozzles remain unobstructed as required by the proposed TS surveillance.

The other possible mechanism for nozzle blockage is foreign material in the system. The CNP containment spray nozzles are Sprayco model 1713A. Due to its location at the top of the containment, introduction of foreign material into the spray header via the open nozzles is unlikely. Foreign material introduced as a result of maintenance is the most likely cause for obstruction. Verification that no foreign material has entered the system following maintenance in which foreign material exclusion control is questioned will be performed to confirm that the nozzles will remain free from blockage. Should a loss of FME integrity occur, the condition

would be entered into the plant's corrective action program. Resolution of the condition would include a recovery plan to retrieve the foreign material and an engineering evaluation of the impact on system integrity and acceptability for continued operation. The recovery plan considers, among other things, measures to mitigate further spread of the foreign material, evaluation of possible equipment damage caused by the material, and a determination of the need for additional inspections or disassembly. The potential for unidentified nozzle obstruction is very low due to the licensee's FME program.

3.2.4 Summary of Technical Evaluation

Based on the NRC staff's review and assessment of the applicable information provided by the licensee, the NRC staff concludes that the design of the CNP, Units 1 and 2, CSS systems provide reasonable assurance that the potential for nozzle obstruction is acceptably low. The licensee's FME control program provides reasonable protection from the introduction of foreign materials into open piping during maintenance or testing, and requires post-maintenance verification of system cleanliness and freedom from foreign materials. In addition, the NRC staff's review of industry-wide experience indicated that the licensee's proposed change is acceptable. Based on the considerations described above, the NRC staff has concluded that the proposed change to SR 3.6.6.5 is in compliance with applicable regulatory requirements, regulatory guidance, and is, therefore, acceptable.

## 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 ENVIRONMENTAL CONSIDERATION

The amendments change 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 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 Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration and there has been no public comment on such finding (75 FR 52042). 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.

## 6.0 CONCLUSION

The Commission 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: Roberto Torres, NRR

Date: June 1, 2011

June 1, 2011

Mr. Lawrence J. Weber
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 RE: CONTAINMENT SPRAY NOZZLE SURVEILLANCE REQUIREMENT (TAC NOS. ME4125 AND ME4126)

Dear Mr. Weber:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 314 to Renewed Facility Operating License No. DPR-58 and Amendment No. 298 to Renewed Facility Operating License No. DPR-74 for the Donald C. Cook Nuclear Plant, Units 1 and 2. The amendments consist of changes to the Technical Specifications in response to your application dated June 22, 2010, as supplemented by letter dated January 13, 2011.

The amendments revised the containment spray nozzles obstruction surveillance frequency specified in Surveillance Requirement 3.6.6.5 from a fixed "10 years" to "following maintenance that could result in nozzle blockage."

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/**
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. 314 to DPR-58
2. Amendment No. 298 to DPR-74
3. Safety Evaluation

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**ADAMS ACCESSION NUMBER: ML11112A123**

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| NAME | PTam | BTully | RDennig* | REIliott | LSubin | RPascarelli |
| DATE | 5/10/11 | 5/10/11 | 4/8/11* | 5/24/11 | 5/18/11 | 06/01/11 |

*Safety evaluation transmitted by memo of this date.

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