



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

April 25, 2000

Mr. Robert P. Powers, Senior Vice President  
Indiana Michigan Power Company  
Nuclear Generation Group  
500 Circle Drive  
Buchanan, MI 49107

SUBJECT: DONALD C. COOK NUCLEAR PLANT, UNITS 1 AND 2 - ISSUANCE OF  
AMENDMENTS (TAC NOS. MA8183 AND MA8184)

Dear Mr. Powers:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 244 to Facility Operating License No. DPR-58 and Amendment No. 225 to Facility Operating License No. DPR-74 for the Donald C. Cook Nuclear Plant, Units 1 and 2. The amendments consist of the review and approval of a change to the facility involving an unreviewed safety question in response to your application dated February 18, 2000. The amendments involve the resolution of an unreviewed safety question associated with modifications being made to the auxiliary feedwater (AFW) pump rooms to protect the equipment in the rooms from the environmental effects of a postulated high-energy line break (HELB) in the surrounding areas of the turbine buildings and in the steam supply lines to the turbine-driven auxiliary feedwater pumps (TDAFPs). This will be accomplished by sealing the AFW pump rooms to ensure that the rooms do not communicate with the turbine buildings or each other. Sealing these rooms results in the need to modify the ventilation systems for the AFW pump rooms. These modifications are being made to address deficiencies in the licensee's HELB program identified during the current extended outage. The proposed modifications constitute an unreviewed safety question (USQ) in accordance with 10 CFR 50.59 since the probabilities of malfunction of the new cooling systems for the AFW pump rooms are higher than the failure probabilities associated with the current ventilation equipment. Therefore, NRC staff review and approval are required.

On March 6, 2000, the staff met with the licensee to discuss the application. During the meeting the staff requested additional information from the licensee. By letter dated March 31, 2000, the licensee responded to the request for the additional information.

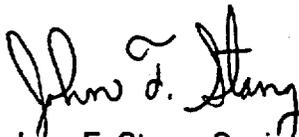
Issuance of this amendment closes Restart Action Matrix item R.3.11.

Mr. R. Powers

-2-

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,

A handwritten signature in cursive script, appearing to read "John F. Stang".

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

Docket Nos. 50-315 and 50-316

Enclosures: 1. Amendment No. 244 to DPR-58  
2. Amendment No. 225 to DPR-74  
3. Safety Evaluation

cc w/encls: See next page

Mr. R. Powers

-2-

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Sincerely,

/RA/

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

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\*See previous concurrence \*\*Subject to changes noted

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| NAME   | JStang   |   | THarris  |   | JHannon  | CMarco  | CCraig <i>DSH/m</i> |
| DATE   | 4/25/00  |   | 4/25/00  |   | 4/24/00  | 4/24/00 | 4/25/00             |

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4/25/00

Mr. R. Powers

-2-

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Sincerely,

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

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| NAME   | JStang   |   | THarris  |   | JHannon | Cmarco  | CCraig   |
| DATE   | / /00    |   | / /00    |   | / /00   | 4/24/00 | / /00    |

Mr. R. Powers

-2-

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Sincerely,

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

Docket Nos. 50-315 and 50-316

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| NAME   | JStang   |   | THarris  |   | JHannon |       | CCraig   |
| DATE   | 4/19/00  |   | / /00    |   | 4/24/00 | / /00 | / /00    |

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Donald C. Cook Nuclear Plant, Units 1 and 2

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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 TO FACILITY OPERATING LICENSE

Amendment No. 244  
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 18, 2000, as supplemented March 31, 2000, 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 to authorize revision of the Updated Final Safety Analysis Report (UFSAR) as set forth in the application for amendment by the licensee, dated February 18, 2000, and as supplemented March 31, 2000, and as evaluated in the staff Safety Evaluation attached to this amendment. The licensee shall update the UFSAR to allow modifications to ventilation systems for the auxiliary feedwater pump rooms as authorized by this license amendment and in accordance with 10 CFR 50.71(e).
3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

*Claudia M. Craig for*

Claudia M. Craig, Chief, Section 1  
Project Directorate III  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Date of Issuance: April 25, 2000



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

INDIANA MICHIGAN POWER COMPANY

DOCKET NO. 50-316

DONALD C. COOK NUCLEAR PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 225  
License No. DPR-74

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Indiana Michigan Power Company (the licensee) dated February 18, 2000, as supplemented March 31, 2000, 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 to authorize revision of the Updated Final Safety Analysis Report (UFSAR) as set forth in the application for amendment by the licensee, dated February 18, 2000, and as supplemented March 31, 2000, and as evaluated in the staff Safety Evaluation attached to this amendment. The licensee shall update the UFSAR to allow modifications to ventilation systems for the auxiliary feedwater pump rooms as authorized by this license amendment and in accordance with 10 CFR 50.71(e).
3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

*Claudia M. Craig*

Claudia M. Craig, Chief, Section 1  
Project Directorate III  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Date of Issuance: April 25, 2000



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 244 TO FACILITY OPERATING LICENSE NO. DPR-58  
AND AMENDMENT NO. 225 TO 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 application dated February 18, 2000, as supplemented March 31, 2000, the Indiana Michigan Power Company (the licensee) requested amendments for the Donald C. Cook Nuclear Plant, Units 1 and 2. The proposed amendments involve the resolution of an unreviewed safety question associated with modifications being made to the auxiliary feedwater (AFW) pump rooms to protect the equipment in the rooms from the environmental effects of a postulated high-energy line break (HELB) in the surrounding areas of the turbine buildings and in the steam supply lines to the turbine-driven auxiliary feedwater pumps (TDAFPs). This will be accomplished by sealing the AFW pump rooms to ensure that the rooms do not communicate with the turbine buildings or each other. Sealing these rooms results in the need to modify the ventilation systems for the AFW pump rooms.

The proposed modifications constitute an unreviewed safety question (USQ) in accordance with 10 CFR 50.59 since the probabilities of malfunction of the new cooling systems for the AFW pump rooms are higher than the failure probabilities associated with the current ventilation equipment. Therefore, Nuclear Regulatory Commission (NRC) staff review and approval is required.

The NRC and the licensee met on March 6, 2000, to discuss the license amendment. During the meeting the staff requested additional information from the licensee. By letter dated March 31, 2000, the licensee responded to the request for the additional information. The March 31, 2000, letter was within the scope of the original *Federal Register* notice and did not change the Commission's no significant hazards consideration determination.

2.0 EVALUATION

During the current extended outage for the Cook Units, the licensee performed Enhanced System Ready Reviews (ESRRs). During these reviews the licensee discovered that the current configuration of the AFW pump rooms did not protect the AFW pumps from a HELB in the area. The AFW pumps must respond following a HELB in accordance with the accident

analysis in the Updated Final Safety Analysis Report (UFSAR). Based on this discovery, the licensee proposes to modify the AFW pump rooms to protect the equipment in the rooms from the environmental effects of a HELB in the surrounding areas of the turbine buildings and in the steam supply lines to the TDAFPs. This will be accomplished by sealing the AFW pump rooms to ensure that the rooms do not communicate with the turbine buildings or each other.

The licensee's UFSAR describes that the AFW system functions to ensure safe shutdown of the facility following specific analyzed transients and accidents by supplying water to the steam generators for heat removal from the reactor coolant system. These events include transients and accidents as the result of a HELB in the turbine building and the TDAFP rooms. The AFW pump rooms are located in the turbine buildings and the equipment in these rooms has not been environmentally qualified in accordance with 10 CFR 50.49 to withstand the environmental conditions expected for postulated breaks and cracks in high-energy piping. Therefore, prior to restart of a unit at D. C. Cook the licensee is required to make modifications to the AFW pump rooms to assure that the AFW system can perform its intended function following HELB events that could impact the AFW equipment.

The current AFW pump room ventilation systems do not provide an adequate level of protection from the environmental effects of certain HELB events postulated to occur in the turbine buildings or in the TDAFP rooms. The dynamic effects of these HELB events, including pipe whip and jet impingement effects, are of no concern based on the relative location of the high-energy lines to AFW system components. However, the steam and high temperature environments created by the HELB events were not adequately considered by the licensee. In the original HELB program the licensee credited the fire dampers installed in the motor-driven auxiliary feedwater pump (MDAFP) and TDAFP room ventilation systems to provide protection from a HELB event occurring in the turbine buildings outside of the rooms. Following the ESRRs, the licensee identified several reasons why the fire dampers do not provide adequate protection of the AFW pumps from a HELB.

The licensee evaluated several options either to environmentally qualify the AFW pump room equipment or to protect the equipment from the environmental effects of postulated HELB events. The licensee has chosen to modify the AFW pump rooms to protect the equipment in the rooms from the environmental effects of a postulated HELB. This will be accomplished by sealing the AFW pump rooms to ensure that the rooms do not communicate with the turbine buildings or each other. Sealing these rooms results in the need to modify the ventilation systems for the AFW pump rooms. The proposed modifications to the AFW pump rooms incorporate essential service water (ESW) cooled refrigeration-cycle room coolers that will be designed to ensure that the train failure scenarios and design basis accident mitigation functions for AFW are preserved as described in the UFSAR. The new design incorporates room coolers that are safety-related, Seismic Class I, self-contained, refrigeration-cycle package unit coolers. The room coolers include a fan that passes air through a pre-cooler coil that will use ESW as a cooling medium, followed by an after-cooler refrigerant condenser coil that rejects heat to the ESW system. These room coolers use a standard design, which has been successfully used at other nuclear power plants in safety-related applications, including safety-related pump rooms. Nuclear power plants using similar refrigeration-cycle package unit coolers in safety-related pump rooms include Duane Arnold Energy Center and Palo Verde Nuclear Generating Station.

The proposed modifications have been designed to ensure that the train failure scenarios and design basis accident mitigation functions for AFW system are preserved as described in the UFSAR. This has been accomplished by maintaining strict train separation for the MDAFPs and train independence for the TDAFPs. Specifically, the support services (ESW and electrical power) for the new room coolers are from the same train as the associated MDAFP electrical power supply. The room coolers for the TDAFP have complete train redundancy such that cooling continues to be provided on the loss of either train of power or ESW.

The design also has taken into account that critical ESW parameters support operability of the new room coolers. Considerations include ESW flow and temperature ranges, and verification that cooler flow passages are larger than expected debris in the ESW system.

The changes related to the modifications have been designed and will be installed such that full compliance will be maintained with applicable aspects of the design and licensing bases as described in the UFSAR and in compliance with applicable rules and regulations. This is controlled by plant procedures used in the development of design changes and associated 10 CFR 50.59.

The staff has audited the licensee's design package for the proposed modifications against the UFSAR. The results of the audit verified that the modifications have been designed in accordance with the current design and licensing basis as described in the UFSAR and in accordance with applicable rule and regulations. In addition, the modifications will be subject to future inspection. This inspection will provide further verification that the modifications have been made in accordance with the current design and licensing basis.

The effects of the AFW pump room modifications have been evaluated by the licensee in accordance with 10 CFR 59.59. This evaluation considered both direct and indirect effects of the modification on the ability of the AFW system to perform its intended function. The modifications to the AFW pump room and the installation of the new room coolers in and of themselves do not constitute an unreviewed safety question in accordance with 10 CFR 50.59. Thus, the modifications do not result in direct effects to the AFW system. The modifications, however, introduce a new intersystem connection where the potential failure of ESW has an indirect effect on the AFW system. The change from the fan damper design to the room coolers presents a more complex function to perform the room cooling and ultimately results in an minimal increase in the probability of failure of the room cooling function. In accordance with 10 CFR 50.59 this constitutes an unreviewed safety question and therefore the proposed modifications require prior NRC review and approval.

The staff's evaluation has focused on the potential impact of the new dependency of the AFW system on the ESW system, which has been created by the proposed modifications in the AFW rooms. With the modifications implemented, a loss of ESW would have an impact on the functionality of the AFW pumps. AFW provides feedwater from the condensate storage tank to steam generators to allow continued heat removal from the primary system when main feedwater is not unavailable. The AFW system is important for initiating events such as loss of offsite power, transient-caused reactor trip, loss of main feedwater, and steam generator tube rupture.

The licensee's application indicates that the new dependency of the AFW system on the ESW system would result in an increase in core damage frequency (CDF) of  $3.1 \times 10^{-6}/\text{yr}$ , as

compared to the baseline CDF of  $7.06 \times 10^{-5}/\text{yr}$ . However, the baseline CDF did not include the contributions from external initiating events. The licensee performed simple assessments on the risk impact from fire and earthquake, and concluded that the risk contribution from external initiating events would be much smaller than that of internal initiating events. The licensee indicated that important procedural enhancements were identified during a review of the operating procedure relevant to a loss of ESW. These enhancements would reduce the risk associated with potential reactor coolant pump seal failures. The licensee's analysis showed that if these procedural improvements were credited separately, their safety benefit would surpass the increase in risk due to the new dependency. In addition, if the operator action to open the doors to the motor-driven AFW pump rooms given a loss of ESW were credited, the risk increase due to the new dependency would be even smaller. The licensee will modify the current operating procedures to take advantage of these enhancements. The licensee also provided the result of an analysis regarding the risk impact of eliminating the HELB concern. The result was a risk decrease of about  $3.2 \times 10^{-5}/\text{yr}$  greater than the estimated risk increase due to the new dependency. Therefore, the licensee concluded that the overall risk impact on CDF would be a decrease. Likewise, the licensee's analysis of the impact on large early release frequency (LERF) indicated that the overall risk impact on LERF would result in a decrease.

The staff evaluated the licensee's risk analysis performed in support of the proposed license amendment. The staff did not intend to validate the licensee's quantitative results; instead, the staff's evaluation was aimed at understanding and evaluating the engineering justifications to support the requisite components critical to the overall conclusion. This approach was more logical given the particular circumstances involving this license amendment. These particular circumstances included: (1) the quality of the licensee's probabilistic risk assessment (PRA), which has not been updated since the development of the original individual plant examination (IPE), could not be fully addressed without substantial time and resources by both the staff and the licensee; (2) the licensee's alternate approach to the updated quality PRA, so-called simple event-tree approach.

The staff's evaluation finds these engineering justifications fully support the results of the licensee's risk analysis. Examples that support the low risk impact of the new dependency include: (1) the low frequency of loss of ESW, which is supported by plant design and operating history; (2) the operability of the turbine-driven AFW pump for the Station Blackout coping duration of 4 hours given a loss of ESW; and (3) the potential operator action to maintain, or recover, the operability of the motor-driven AFW pumps within one hour given a loss of ESW. In addition, the staff finds that eliminating the plant vulnerability to HELB would have a substantial positive safety impact. The licensee's risk analysis indicated that this positive safety impact exceeded the negative impact stemming from the new dependency. The staff finds, conservatively, that the potential risk increase due to the new dependency would be substantially compensated by the risk decrease due to elimination of the HELB vulnerability. Another significant contributor to the overall decision making is the licensee's procedural improvements mentioned above that would improve plant safety. The licensee indicated that these improved procedures alone would more than compensate the risk increase due to the new dependency created by the proposed modifications. Based on these, the staff finds that overall, the proposed modifications would have a negligible impact on the risk, if not a positive safety impact.

In summary, the staff evaluated the licensee's risk analysis performed in support of this license amendment. The licensee used a PRA approach to resolve the USQ identified in accordance

with 10 CFR 50.59 involving the modifications associated with AFW pump rooms. The licensee provided sufficient information to support the staff evaluation of their risk analysis. The staff's evaluation, which is based mainly on the licensee's engineering justifications in support of the risk analysis, finds that the overall impact of the proposed modifications on risk would be negligible, if not a safety enhancement, in terms of CDF and LERF. The licensee's proposed application meets the intent of the guidelines set forth in the Regulatory Guide 1.174<sup>1</sup>; therefore, the staff concludes that PRA insights and findings support the proposed license amendment.

### 3.0 SUMMARY

The staff has reviewed the licensee's proposed amendment and supporting documentation. Based on the above, the staff finds that the AFW pump room modifications provide enhanced protection for the AFW system against high-energy line break events. Although the modifications are identified by the licensee as resulting in a minimal increase in the probability of a malfunction of the rooming cooling for the AFW pump rooms, the staff has determined this small increase to be acceptable. The AFW pump room modifications are being performed in accordance with the licensing and design basis, and applicable NRC rules and regulations. Therefore, the staff finds that the AFW pump room modifications restore compliance with the licensing and design basis and provide reasonable assurance that these modifications result in no undue risk to the health and safety of the public.

The licensee shall update the UFSAR to allow modifications to ventilation systems for the auxiliary feedwater pump rooms as set forth in the application for amendment by the licensee, dated February 18, 2000, and as supplemented March 31, 2000.

### 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

These 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. The 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 (65 FR 10116). 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.

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<sup>1</sup>RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," July 1998

## 6.0 CONCLUSION

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

Principal Contributor: Ian Jung  
John Stang

Date: April 25, 2000