November 17, 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. MA9176 AND MA9178)

Dear Mr. Powers:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 247 to Facility Operating License No. DPR-58 and Amendment No. 228 to Facility Operating License No. DPR-74 for the Donald C. Cook Nuclear Plant, Units 1 and 2. The amendments consist of changes to the Updated Final Safety Analysis Report (UFSAR) in response to your application dated June 8, 2000.

The amendments approve changes to the UFSAR allowing the use of probabilistic risk assessment (PRA) techniques in evaluating the need for tornado generated missile barriers. This action closes Restart Action Matrix 8.2.

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,

/RA/

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. 247 to DPR-58
2. Amendment No. 228 to DPR-74
3. Safety Evaluation

cc w/encls: See next page

November 17, 2000

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Docket Nos. 50-315 and 50-316

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cc w/encls: See next page
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*See Previous Concurrence
ACCESSION NO.: ML003770173

OFFICE	PM:PD3-1	PM:PD3-1	LA:PD3-1	OGC	SC:PD3-1
NAME	CCraig for JLamb	JStang	THarris	MYoung*	CCraig
DATE	11/17/00	11/17/00	11/17/00	11/14/00	11/17/00

OFFICIAL RECORD COPY

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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. 247
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 8, 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 June 8, 2000, and as evaluated in the NRC staff safety evaluation attached to this amendment. The licensee shall update the UFSAR to incorporate the use of probabilistic risk assessment techniques in evaluating the need for tornado-generated missile barriers, as authorized by this license amendment, in the next UFSAR update 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 of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

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

Date of Issuance: November 17, 2000

INDIANA MICHIGAN POWER COMPANY

DOCKET NO. 50-316

DONALD C. COOK NUCLEAR PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 228
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 8, 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 June 8, 2000, and as evaluated in the NRC staff safety evaluation attached to this amendment. The licensee shall update the UFSAR to incorporate the use of probabilistic risk assessment techniques in evaluating the need for tornado-generated missile barriers, as authorized by this license amendment, in the next UFSAR update 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 of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

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

Date of Issuance: November 17, 2000

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 247 TO FACILITY OPERATING LICENSE NO. DPR-58

AND AMENDMENT NO. 228 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 June 8, 2000, the Indiana Michigan Power Company (the licensee) requested amendments to the Operating Licenses DPR-58 and DPR-74 for the Donald C. Cook Nuclear Plant (CNP), Units 1 and 2. The proposed amendments change the CNP Updated Final Safety Analysis Report (UFSAR) concerning the requirements of physical protection against tornado-generated missiles (TGMs) for certain structures, safety-related systems and components (SSCs). The proposed amendments would allow the use of probabilistic risk assessment (PRA) techniques in evaluating the need for tornado-generated missile barriers; this will provide an alternative to installing physical missile protection for those SSCs that are not physically protected from TGMs.

2.0 BACKGROUND

Indiana Michigan Power Company has identified components that are not protected from TGMs. These include external components associated with the emergency diesel generators (ventilation, combustion air intake, and engine exhaust), components associated with switchgear room HVAC (heating, ventilation, and air conditioning) intake systems, walls and roof enclosing the east end of the Fuel Handling Building, and openings in the roof on the east and west end of the Fuel Handling Building.

The licensee proposed to use the Electric Power Research Institute (EPRI) tornado missile methodology contained in EPRI Report NP-2005, Volumes 1 and 2, “Tornado Missile Risk Evaluation Methodology,” August 1981, to assess the need for positive missile protection for specific safety-related plant features. The EPRI methodology is implemented using the computer program TORMIS. TORMIS is used to determine the probability of TGMs striking walls and roofs of buildings on which penetrations or exposed portions of systems or components are located.

In the staff’s safety evaluation of EPRI Report NP-2005, dated October 26, 1983, the staff concluded that the TORMIS methodology is well conceived, well developed, versatile, and utilizes state-of-the-art probabilistic Monte Carlo techniques. At the same time, the staff

concluded that the methodology had limitations for its use and that applicants and licensees using this methodology must consider five plant-specific points and provide appropriate information regarding its use.

The five plant specific points to be considered by licensees using the EPRI methodology are:

1. Data on tornado characteristics should be employed for both broad regions and small areas around the site. The most conservative values should be used in the risk analysis or justification provided for those values selected.

2. The EPRI study proposes a modified tornado classification, F'-scale, for which the velocity ranges are lower by as much as 25 percent than the velocity ranges originally proposed in the Fujita, F-scale. Insufficient documentation was provided in the studies in support of the reduced F'-scale. The F-scale tornado classification should, therefore, be used in order to obtain conservative results.

3. Reductions in tornado wind speed near the ground due to surface friction effects are not sufficiently documented in the EPRI study. Such reductions were not consistently accounted for when estimating tornado wind speeds at 33 feet above grade on the basis of observed damage at lower elevations. Therefore, users should calculate the effects of assuming velocity profiles with ratios V_0 (speed at ground level) / V_{33} (speed at 33 feet elevation) higher than that in the EPRI study. Discussion of the sensitivity of the results to changes in the modeling of the tornado wind speed profile near the ground should be provided.

4. The assumptions concerning the locations and numbers of potential missiles presented at a specific site are not well established in the EPRI studies. However, the EPRI methodology allows site specific information on tornado missile availability to be incorporated in the risk calculation. Therefore, users should provide sufficient missile courses and dominant tornado paths of travel.

5. Once the EPRI methodology has been chosen, justification should be provided for any deviations from the calculational approach.

In addition to the plant-specific information, limitations for the application of the TORMIS methodology were prescribed in the staff's safety evaluation of EPRI Report NP-2005. These limitations state that the use of EPRI PRAs or any tornado missile probabilistic study be limited to the evaluation of specific plant features where additional costly tornado missile protective barriers or alternative systems are under consideration, and that the user demonstrate that the probability of damage to unprotected essential safety-related features is sufficiently small.

The staff has previously approved licensing actions regarding the use of PRA techniques in evaluating the need for TGM barriers, as documented in (1) "Licensing Basis Change for Evaluating the Need for Tornado Generated Missile Barriers - Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 (TAC NOS. M90621 AND M90622)," dated May 1, 1995; (2) "Amendment No. 90 To Facility Operating License No. NPF-58 - Perry Nuclear Power Plant, Unit 1 (TAC NO. M99447)," dated November 4, 1997; and (3) "Issuance of Amendment - Clinton Power Station Unit 1 (TAC NO. MA4911)," dated February 29, 2000.

3.0 EVALUATION

3.1 SSCs Not Having Physical Protection Against TGMs.

In accordance with the requirements of General Design Criteria (GDC) 2 and 4, nuclear power plants must be designed to withstand the effects of tornado and high wind generated missiles. The guidance and criteria for licensing acceptance for determining whether the GDC requirements governing TGM protection are met are described in Standard Review Plan (SRP) Section 3.5.1.4, "Missiles Generated by Natural Phenomena," and Section 3.5.2, "Structures, Systems, and Components to be Protected from Externally Generated Missiles." The acceptance criteria generally specify that SSCs should be provided with physical TGM protection (barriers) for the maximum credible tornado threat. However, SRP Section 3.5.1.4 also includes acceptance criteria that permit relaxation of the above deterministic guidance, if it can be demonstrated that the probability of damage to the unprotected SSCs is sufficiently low.

SRP Section 2.2.3, "Evaluation of Potential Accidents," establishes the acceptable level of probability of damage resulting from TGMs to the unprotected SSCs. SRP Section 2.2.3, in part, states that the probability of occurrence of the initiating events leading to potential consequences in excess of 10 CFR Part 100 exposure guidelines should be estimated using assumptions that are as representative of the specific site as is practicable. SRP Section 2.2.3 further states that because of low probabilities of the events under consideration, data are often not available to permit accurate calculation of probabilities. The expected rate of occurrence of potential exposures in excess of 10 CFR Part 100 guidelines of approximately $1x10^{-6}$ per year is acceptable if, when combined with reasonable qualitative arguments, the realistic probability can be shown to be lower.

The licensee proposes to revise the UFSAR to allow use of PRA in evaluating the need for physical protection for certain SSCs from TGMs. The revision would provide an alternative to installing physical missile protection for those SSCs that are not physically protected from TGMs.

The licensee performed a PRA using the methodology described in EPRI Report NP-2005, "Tornado Missile Risk Evaluation Methodology," to determine the risks associated with postulated TGM strikes on the above cited SSCs. Results of the PRA indicated that the probability of potential exposures in excess of 10 CFR 100 guidelines occurring as a result of TGM strikes on these SSCs is approximately $1.477x10^{-7}$ per year for Unit 1 and $1.481x10^{-7}$ per year for Unit 2. These results satisfy the guidance described in SRP Section 2.2.3 and SRP Section 3.5.1.4 for the exclusion of the cited SSCs from having additional physical protection against TGMs.

Based on its review, the staff finds that the above licensee's approach to determining TGM targets not required to have physical protection against TGMs is consistent with the guidance described in SRP Section 2.2.3 and SRP Section 3.5.1.4, and therefore, is acceptable.

3.2 PRA Techniques Used to Determine the Need for Physical Protection Against TGMs

The licensee proposes to add a new section, Section 1.4.1.5.5, "Probabilistic Methodology for Determining Risk from Tornado Generated Missiles," to the UFSAR. This proposed new

section, in part, describes the EPRI methodology, also known as “TORMIS,” used for the CNP probabilistic missile strike analysis.

TORMIS is a methodology accepted by the staff for determining the probability of TGM striking targets (i.e., walls and roofs of buildings on which penetrations or exposed portions of systems/components are located). However, the staff’s acceptance of an application using TORMIS is subject to appropriate resolution of five specific concerns as identified in the safety evaluation described in the Background section above. These specific concerns are related to the assumptions used in the input parameters for the risk analysis (e.g., locations and numbers of potential missiles presented at a specific site, wind speed, wind speed near the ground, etc.). The licensee addressed each of the concerns as discussed below.

The licensee addressed the five plant-specific points for the application of TORMIS in its submittal:

Point 1

"Data on tornado characteristics should be employed for both broad regions and small regions around the site. The most conservative value should be used in the risk analysis or justification provided for those values selected."

CNP Approach to Point 1

Based on broad regional data, the probability of tornadoes with wind speed greater than 73 miles per hour (the minimum wind speed for a Fujita F1 tornado) occurring at the site is 3.74×10^{-4} per year. The local (small) regional data indicates the probability of wind speeds greater than 73 miles per hour occurring at the site is 2.99×10^{-4} per year. The more conservative broad regional information is used in the CNP evaluation. The staff finds this to be conservative and, therefore, acceptable.

Point 2

"The EPRI study proposes a modified tornado classification, F'-scale, for which the velocity ranges are lower by as much as 25 percent than the velocity ranges originally proposed in the Fujita F-scale. Insufficient documentation was provided in the studies in support of the reduced F'-scale. The F-scale tornado classifications should therefore be used in order to obtain conservative results."

CNP Approach to Point 2

Fujita F-scale wind speed intensities from WASH-1300, "Technical Basis for Interim Regional Tornado Criteria," are used in the CNP evaluation. WASH-1300 does not specify wind speeds for F6 scale tornadoes. Therefore, the licensee used a wind speed range of 313 - 360 mph for the F6 scale tornado to include consideration of the highest wind speeds in Regulatory Guide 1.76, "Design Basis Tornado for Nuclear Power Plants." The staff finds this to be acceptable.

Point 3

"Reductions in tornado wind speed near the ground due to surface friction are not sufficiently documented in the EPRI study. Such reductions were not consistently accounted for when estimating tornado wind speeds at 33 feet above grade based on observed damage at lower elevations. Therefore, users should calculate the effect of assuming ground velocity profiles with ratios V_0 (speed at ground level)/V_{33} (speed at 33 feet elevation) higher than used in the EPRI study. Discussions of sensitivity of the results of the changes in the modeling of the tornado wind speed profile near the ground should be provided."

CNP Approach to Concern 3

For the licensee, the tornado wind field parameters were selected so that the ratio of velocity at ground level to that at 33 feet is 0.82. The following provides an explanation of why this is a conservative approach and how it compares to the concept discussed in the staff's safety evaluation of using a higher ratio of V_0/V_{33}.

As discussed in the EPRI study (volume II, section II.E) the standard "synthesized" tornado missile (TORMIS) computer code model of the wind speeds was determined to be non-conservative at near-ground elevations when it was compared against several other wind field models. Therefore, the report performed sensitivity studies by varying several parameters to increase and decrease near-ground velocities. These were documented in EPRI Report NP-2005, Figure II-12. The recommendation of the report was to use parameters that increase the near-ground wind fields of the synthesized wind field model so that the rotational velocity at the ground is increased to 225 miles per hour. This results in a value V_0/V_{33} of 225/300 = 0.75. The TORMIS computer code used for the licensee analysis included these parameters. It was noted in a review of several other plants' submittals that a value of V_0/V_{33} of 0.82 was used in their analysis and subsequently approved by the staff. The V_0/V_{33} value of 0.82 used in the licensee analysis resulted in a velocity at ground level of 246 miles per hour (246/300 = 0.82). This parameter selection has been previously accepted by the staff for the Perry Nuclear Power Plant in the SER associated with Amendment No. 90, issued on November 4, 1997. Therefore, the staff finds this acceptable.

Point 4

"The assumptions concerning the locations and numbers of potential missiles presented at a specific site are not well established in the EPRI studies. However, the EPRI methodology allows site-specific information on tornado missile availability to be incorporated in the risk calculation. Therefore, users should provide sufficient information to justify the assumed missile density based on specific missile sources and dominant tornado paths of travel."

CNP Approach to Point 4

The population of missiles used in the analysis was based on a physical walk-down of non-safety-related buildings, trailers, fencing, trees, and parking lots within a 2000-foot radius of the plant. Also included were missiles from plant buildings with siding not designed for tornado winds. This walk-down by the licensee resulted in a potential missile population used in the PRA in excess of 55,000 objects. This value represented a conservative estimate of the number of potential missiles present at the time of the physical walk-down. It does not

represent a limit on the number of potential missiles that may be present within the walk-down area. The number and location of potential missiles present are only limited by the results of the probabilistic analysis and the proposed acceptance limit (1×10^{-6} per reactor per year). This is a normal missile density compared to some other plants (25,000 - 69,000) that use the TORMIS methodology. The staff considers this missile density to be acceptable.

Point 5

"Once the EPRI methodology has been chosen, justifications should be provided for any deviations from the calculational approach."

CNP Approach to Point 5

No exceptions have been taken from the EPRI methodology except items noted under Points 1 through 4, above.

Based on its review of the five plant-specific points for the application of TORMIS, the staff finds that the licensee has assumed conservative values and provided justification for its selection of the value for each of the concerns identified in the safety evaluation for TORMIS. Therefore, the staff finds that the addition of this new Section 1.4.1.5.5 to the UFSAR satisfies staff guidance and is acceptable.

Summary

Based on its review and the evaluation described in the above, the staff finds that the licensee's proposed changes to the CNP UFSAR concerning requirements of additional physical protection for SSCs against TGMs, and the addition of the new Section 1.4.1.5.5, "Probabilistic Methodology for Determining Risk from Tornado Generated Missiles," to the UFSAR to describe the EPRI methodology used for the CNP probabilistic missile strike analysis, are acceptable.

The staff concludes that the licensee's use of the EPRI tornado missile methodology contained in EPRI NP-2005, Volumes 1 and 2, "Tornado Missile Risk Evaluation Methodology," August 1981, and its results are appropriate. Additionally, the staff concludes that the licensee includes qualitative conservatism such that the acceptance criteria of 1×10^{-6} for all tornado missiles striking all unprotected systems or components required to operate following a tornado is appropriate.

Based on the above, the staff concludes that the use of the methodology contained in EPRI Report NP-2005 to analyze tornado missiles for limited portions of the plant that are unprotected and are identified by the licensee in its UFSAR meets the acceptance criteria for the probability of exposures in excess of 10 CFR 100 guidelines due to postulated TGM strikes of less than 1×10^{-6} per year per unit. In addition, the licensee satisfactorily addressed the items in the staff's safety evaluation, dated October 26, 1983, related to TORMIS methodology. The staff further concludes that the proposed changes in the licensing basis meet the requirements of General Design Criteria 2 and 4 with respect to protection against TGMs for plant-specific equipment.

As described in the licensee's letter dated June 8, 2000, following NRC approval, the licensee will update the UFSAR to change the design basis described in the UFSAR by adding a description of the methodology utilized for determining the systems and components that are considered to require protection from tornado missiles, as authorized by this amendment and in accordance with 10 CFR 50.71(e).

4.0 STATE CONSULTATION

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

5.0 ENVIRONMENTAL CONSIDERATION

These amendments change the requirements with respect to installation or use of a facility component located within the restricted area. 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 43049). 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 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 Contributors: D. Shum
J. Lamb

Date: November 17, 2000