



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

August 25, 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, UNIT 1 - ISSUANCE OF AMENDMENT
RE: USE OF OPTIMIZED ZIRLO™ FUEL ROD CLADDING MATERIAL
(TAC NO. ME5183)

Dear Mr. Weber:

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 316 to Renewed Facility Operating License No. DPR-58 for the Donald C. Cook Nuclear Plant, Unit 1, in response to your application dated December 16, 2010.

The amendment revises Technical Specification (TS) 4.2.1, adding Optimized ZIRLO™ fuel rods to the fuel matrix in addition to Zircaloy or ZIRLO™ fuel rods that are currently in use. The amendment also adds a reference, a previously approved Westinghouse topical report regarding Optimized ZIRLO™ to Section 5.6.5, "Core Operating Limits Report (COLR)."

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 black ink, reading "Peter S. Tam".

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

Docket No. 50-315

Enclosures:

1. Amendment No. 316 to DPR-58
2. Safety Evaluation

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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 RENEWED FACILITY OPERATING LICENSE

Amendment No. 316
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 December 16, 2010, 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. 316, 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 60 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: August 25, 2011

ATTACHMENT TO LICENSE AMENDMENT NO. 316

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

3

INSERT

3

Replace the following pages of Appendix A, Technical Specifications, with the attached revised pages. The revised pages are identified by amendment number and contain a marginal line indicating the area of change.

REMOVE

4.0-1

5.6-3

5.6-4

INSERT

4.0-1

5.6-3

5.6-4

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. 316, 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 four 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

4.0 DESIGN FEATURES

4.1 Site Location

4.1.1 Site and Exclusion Area Boundaries

The site area and exclusion area boundaries are as shown in Figure 4.1-1.

4.1.2 Low Population Zone

The low population zone is all the land within a circle centered on the reactor containment structures and a radius of 2 miles.

4.2 Reactor Core

4.2.1 Fuel Assemblies

The reactor shall contain 193 fuel assemblies. Each assembly shall consist of a matrix of Zircaloy, ZIRLO™, or Optimized ZIRLO™ fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO₂) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions.

4.2.2 Control Rod Assemblies

The reactor core shall contain 53 full length control rod assemblies. The control material shall be silver indium cadmium, as approved by the NRC.

4.3 Fuel Storage

4.3.1 Criticality

4.3.1.1 The spent fuel storage racks are designed and shall be maintained with:

- a. Fuel assemblies having a maximum nominal U-235 enrichment of 4.95 weight percent;
- b. $k_{eff} \leq 0.95$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.7.2 of the UFSAR;
- c. A nominal 8.97 inch center to center distance between fuel assemblies placed in the fuel storage racks;

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

5. LCO 3.1.6, "Control Bank Insertion Limits";
 6. LCO 3.2.1, "Heat Flux Hot Channel Factor ($F_Q(Z)$)";
 7. LCO 3.2.2, "Nuclear Enthalpy Rise Hot Channel Factor ($F_{\Delta H}^N$)";
 8. LCO 3.2.3, "AXIAL FLUX DIFFERENCE (AFD)";
 9. LCO 3.3.1, "Reactor Trip System (RTS) Instrumentation," Functions 6 and 7 (Overtemperature ΔT and Overpower ΔT , respectively) Allowable Value parameter values;
 10. LCO 3.4.1, "RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits"; and
 11. LCO 3.9.1, "Boron Concentration."
- b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:
1. WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," (Westinghouse Proprietary);
 2. WCAP-8385, "Power Distribution Control and Load Following Procedures - Topical Report," (Westinghouse Proprietary);
 3. WCAP-10216-P-A, "Relaxation of Constant Axial Offset Control/ F_Q Surveillance Technical Specification," (Westinghouse Proprietary);
 4. Plant-specific adaptation of WCAP-16009-P-A, "Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment of Uncertainty Method (ASTRUM)," (Westinghouse Proprietary);
 5. WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," (Westinghouse Proprietary);
 6. WCAP-8745-P-A, "Design Bases for the Thermal Overpower ΔT and Thermal Overtemperature ΔT Trip Functions," (Westinghouse Proprietary);
 7. WCAP-13749-P-A, "Safety Evaluation Supporting the Conditional Exemption of the Most Negative EOL Moderator Temperature Coefficient Measurement," (Westinghouse Proprietary); and

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

8. WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006 (Westinghouse Proprietary).
- c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.
- d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Post Accident Monitoring Report

When a report is required by Condition B or G of LCO 3.3.3, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.

5.6.7 Steam Generator Tube Inspection Report

A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of an inspection performed in accordance with the Specification 5.5.7, Steam Generator (SG) Program. The report shall include:

- a. The scope of inspections performed on each SG,
 - b. Active degradation mechanisms found,
 - c. Nondestructive examination techniques utilized for each degradation mechanism,
 - d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,
 - e. Number of tubes plugged during the inspection outage for each active degradation mechanism,
 - f. Total number and percentage of tubes plugged to date, and
 - g. The results of condition monitoring, including the results of tube pulls and in-situ testing.
-



UNITED STATES
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WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

AMENDMENT NO. 316 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-58

INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-315

1.0 INTRODUCTION

By letter dated December 16, 2010, Indiana Michigan Power Company (I&M), the licensee, submitted an application for license amendment to revise the Technical Specifications (TS). Specifically, the licensee proposed to change TS 4.2.1, "Fuel Assemblies," adding Optimized ZIRLO™ as an acceptable fuel rod cladding material and correcting the TS spelling of "Zircalloy" to "Zircaloy." In the same December 16, 2010, submittal the licensee also requested an exemption from the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors," and Appendix K to 10 CFR 50, "ECCS Evaluation Models," to allow the use of fuel rods clad with Optimized ZIRLO™ in future reload applications; this requested exemption is addressed by a separate licensing action (TAC ME5184).

The Optimized ZIRLO™ cladding, manufactured by Westinghouse Electric Company, is a new version of the ZIRLO™ material and was documented in the NRC-approved Addendum 1-A to Topical Report WCAP-12610-P-A and CENPD-404-P-A, entitled "Optimized ZIRLO" (Reference 2) for Westinghouse and Combustion Engineering (CE) fuel designs. The fuel rod burnup limits were approved to a peak rod average of 62,000 megawatt-days per metric ton of uranium (MWD/MTU) for Westinghouse fuel and 60,000 MWD/MTU for CE fuel. However, the NRC staff requires that licensees using the Optimized ZIRLO™ comply with the conditions and limitations listed in the safety evaluation (SE) dated June 10, 2005 (Reference 3).

2.0 REGULATORY EVALUATION

The regulations in 10 CFR 50.90, "Application for Amendment of License or Construction Permit," allow a licensee to amend or change the original license applications. The regulations in 10 CFR 50.92, "Issuance of Amendment," specify that the NRC staff will be guided by the considerations which govern the issuance of initial licenses to the extent applicable and appropriate in determining whether an amendment will be issued to the applicant. The licensee requests a license amendment to add Optimized ZIRLO™ as an acceptable fuel rod cladding material in the TSs.

Pursuant to 10 CFR 50.12, "Specific Exemptions," the licensee requested an exemption to 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors," that requires, among other items, that "each boiling or pressurized light-water nuclear power reactor fueled with uranium oxide pellets within cylindrical zircaloy or ZIRLO™ cladding must be provided with an emergency core cooling system (ECCS) that must be designed so that its calculated cooling performance following postulated loss-of-coolant accidents conforms to the criteria set forth in paragraph (b) of this section." Appendix K to 10 CFR Part 50, "ECCS Evaluation Models," requires, among other items, that the rate of energy release, hydrogen generation, and cladding oxidation from the metal/water reaction shall be calculated using the Baker-Just equation. The regulations in 10 CFR 50.46, and 10 CFR Part 50, Appendix K, make no provisions for use of fuel rods clad in a material other than zircaloy or ZIRLO™. Since the material specifications of Optimized ZIRLO™ differ from the specification for zircaloy or ZIRLO™, a plant-specific exemption is required to support the reload applications for the Donald C. Cook Nuclear Plant. As stated before, the exemption is addressed under a separate licensing action (TAC ME5184).

3.0 TECHNICAL EVALUATION

By Reference 3, the NRC staff finds Addendum I to WCAP-12610-P-A and CENPD-404-P-A (Reference 2) acceptable, provided that licensees referencing this topical report will need to comply with the conditions and limitations listed in Section 5.0 of the June 10, 2005 SE (Reference 3). Specifically, the licensee must address 10 conditions and limitations delineated in Section 5.0 of the topical report.

3.1 Conditions and Limitations

In its December 16, 2010, application the licensee has documented compliance with these 10 conditions and limitations and has committed to ensuring compliance for future reloads. With the exception of Conditions 6 and 7, the NRC staff has reviewed the licensee's compliance with each of the ten SE conditions and limitations and finds each acceptable.

Conditions 6 and 7 of the SE relate to validating in-reactor performance and fuel performance models based on lead test assembly (LTA) data ahead of batch application. I&M stated the following regulatory commitments in response to Condition 6:

I&M will confirm that Westinghouse will continue to provide additional data from the Optimized ZIRLO™ lead test assembly (LTA) programs to the NRC after new data for the higher burnup/fluences become available. I&M will confirm that as higher burnups/fluences are achieved for Optimized ZIRLO™ clad fuel rods that the requirements of this condition will be met as it applies to CNP Unit 1.

In response to SE condition 7, I&M has stated the following regulatory commitment:

I&M will confirm that as higher burnups/fluences are achieved for Optimized ZIRLO™ clad fuel rods that the requirements of this condition will be met as it applies to CNP Unit 1.

The LTA measured data and favorable results from visual examinations of once- and twice-burned LTAs confirmed that the current fuel performance models are applicable for Optimized ZIRLO™ fuel rods. The licensee stated that Westinghouse will continue to provide additional data from the Optimized ZIRLO™ LTA programs to the NRC after new data for higher burnup and fluence become available. In addition, the licensee evaluated the data of two cycles of operation and has used the updated creep model to predict the growth and creep in fuel rod performance. The licensee provided the favorable results to the NRC staff. The licensee will continue to confirm the model adequacy as higher burnups and fluences are achieved for Optimized ZIRLO™ fuel rods.

Based upon information contained in References 4, 5, 6, and 7, the NRC staff finds that the licensee's compliance with SE Condition 6 and 7 is acceptable. Therefore, the NRC staff concludes that the Optimized ZIRLO™ fuel design is acceptable for use in CNP Unit 1 to a peak rod average burnup limit of 62 GWD/MTU.

3.2 Technical Specifications (TS) Revisions

3.2.1 Section 4.2.1, "Fuel Assemblies"

The licensee proposed to add Optimized ZIRLO™ as an acceptable fuel rod cladding material and correct the spelling of Zircaloy in the CNP Unit 1 TSs. The new sentence is stated as follows:

"...Each assembly shall consist of a matrix of Zircaloy, ZIRLO™, or Optimized ZIRLO™ fuel rods..."

Based on the fact that Optimized ZIRLO™ fuel was previously approved and that the licensee had specifically addressed the 10 conditions and limitations delineated in the approved topical report (see Section 3.1 above), the NRC staff concludes that this revision is acceptable.

3.2.2 Section 5.6.5, "Core Operating Limits Report (COLR)"

The licensee proposed to add the approved Westinghouse topical reports, WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," and Addendum 1-A to WCAP-12610-P-A and CENPD-404-P-A, "Optimized ZIRLO," dated July 2006 to the list of references for the COLR. Based on the fact that the subject reports were previously approved, the NRC staff concludes that this revision is acceptable.

3.3 Exemption to Regulations

As explained in Section 2.0 above, the regulations in 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors," and 10 CFR Part 50, Appendix K, "ECCS Evaluation Models," make no provisions for use of fuel rods clad in a material other than zircaloy or ZIRLO™. Since the material specifications of Optimized ZIRLO™ differ from the specification for zircaloy or ZIRLO™, a plant-specific exemption is needed to permit Amendment No. 316, which this safety evaluation supports, to be effective. The exemption is issued separately from, but concurrently with this safety evaluation and Amendment No. 316.

3.4 Summary of Technical Evaluation

The NRC staff has reviewed the licensee's proposed amendment of the TS. Based on the evaluation set forth above, the NRC staff concludes that the Optimized ZIRLO™ fuel design is acceptable for CNP-1 to a peak rod average burnup limit of 62,000 MWD/MTU, and the associated TS revisions are 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

NRC's requirements at 10 CFR §51.21 provides that all licensing and regulatory actions require an environmental assessment except those identified in §51.20(b) as requiring an environmental impact statement, those identified in §51.22(c) as categorical exclusions, and those identified in §51.22(d) as other actions not requiring environmental review. Accordingly, the NRC staff published an environmental assessment on (76 FR 52356) for the subject amendment. Among other things, this environmental assessment updated the CNP-1 environmental record to accommodate an extended fuel burnup limit of 62,000 MWD/MTU.

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

7.0 REFERENCES

1. Letter from I&M to NRC, "License Amendment Request for Unit 1 Use of Optimized ZIRLO Fuel Rod Cladding," December 16, 2010, Agencywide Documents Access and Management System (ADAMS) Accession No. ML103630358
2. WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO," July 2006, ADAMS Accession No. ML062080569
3. Letter from H. N. Berkow, NRC to J. A. Gresham, Westinghouse Electric Company, "Final Safety Evaluation for Addendum 1 to Topical Report WCAP-12610-P-A and CENPD-404-P-A, Optimized ZIRLO" June 10, 2005. ADAMS Accession No. ML051670403
4. Letter from Westinghouse to NRC, "SER Compliance with WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A 'Optimized ZIRLO™', (Proprietary)" LTR-NRC-07-1, January 4, 2007, ADAMS Accession No. ML070100389.

5. Letter from Westinghouse to NRC, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A 'Optimized ZIRLO™' (Proprietary)" LTR-NRC-07-58, November 2007, ADAMS Accession No. ML073130562.
6. Letter from Westinghouse to NRC, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A 'Optimized ZIRLO™', (Non-Proprietary)" LTR-NRC-07-58, Rev. 1, February 2008, ADAMS Accession No. ML080390452.
7. Letter from Westinghouse to U.S. Nuclear Regulatory Commission, "SER Compliance of WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A 'Optimized ZIRLO™' (Proprietary/Non-Proprietary)," LTR-NRC-08-60, December 30, 2008, ADAMS Accession No. ML090080380

Principal Contributor: Andrew J. Proffitt, NRR

Date: August 25, 2011

August 25, 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, UNIT 1 - ISSUANCE OF AMENDMENT
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Sincerely,

/RA/

Peter S. Tam, Senior Project Manager
Plant Licensing Branch III-1
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Docket No. 50-315

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****NLO w/Comments**

OFFICE	LPL3-1/PM	LPL3-1/LA	SNPB/BC (A)	ITSB/BC	OGC**	LPL3-1/BC
NAME	PTam	BTully	AAttard*	RElliot	LSubin	RPascarelli
DATE	8/3/11	6/21/11	06/01/11	08/18/11	8/10/11	08/25/11

*Safety evaluation transmitted by memo of this date.

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