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December 16, 2010

AEP-NRC-2010-51
10 CFR 50.90
10 CFR 50.46
10 CFR 50.12

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Donald C. Cook Nuclear Plant Unit 1
Docket No. 50-315
License Amendment Request for Unit 1 Use of Optimized ZIRLO™ Fuel Rod Cladding

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, Indiana Michigan Power Company (I&M), the licensee for Donald C. Cook Nuclear Plant (CNP), hereby requests an amendment to Technical Specification (TS) 4.2.1 which currently states, "Each fuel assembly shall consist of a matrix of Zircalloy or ZIRLO fuel rods..." I&M proposes the following changes: 1) adding Optimized ZIRLO™ to the approved fuel rod cladding materials identified in TS 4.2.1, 2) correcting the current TS spelling of Zircalloy to Zircaloy, which reflects the spelling used consistently by the industry and by the U.S. Nuclear Regulatory Commission. I&M also proposes adding a Westinghouse topical report to the analytical methods used to determine the core operating limits previously reviewed and approved by the NRC as identified in TS 5.6.5b. These changes are consistent with the U.S. Nuclear Regulatory Commission's allowed use of Optimized ZIRLO™ fuel cladding material in Westinghouse and Combustion Engineering Original Equipment Manufacturer (OEM) reactors as issued in Addendum 1-A to Topical Report WCAP-12610-P-A and CENPD-404-P-A, "Optimized ZIRLO™."

To support the change, I&M is also requesting, pursuant to 10 CFR 50.12, an exemption from certain requirements of 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors," and Appendix K to 10 CFR Part 50, "ECCS Evaluation Models" for CNP. The exemption request relates solely to the specific types of cladding material specified in these regulations for use in light water reactors. As written, the regulations presume the use of either Zircaloy or ZIRLO™ fuel rod cladding. The exemption request is required since Optimized ZIRLO™ has a slightly different composition than Zircaloy or ZIRLO™. The exemption request is included as Enclosure 3. The NRC has granted prior approval for use of Optimized ZIRLO™ fuel rod cladding to Entergy Operations Inc. Arkansas Nuclear One, Unit 2 (ML080370014), Waterford Steam Electric Station, Unit 3 (ML080380004), and South Carolina Electric and Gas Company Virgil C. Summer Nuclear Station (ML100110377). The content of I&M's application is similar to the application for these plants.

Enclosure 1 to this letter provides an affirmation statement regarding the information in this letter. Enclosure 2 provides I&M's evaluation of the proposed change. Enclosure 3 provides the

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exemption request as stated above. Enclosure 4 provides the proposed implementation schedule required by 10 CFR 73.54 as regulatory commitments. The attachment to this letter provides the requested change to the TS for CNP Unit 1. Clean copies of the affected TS pages with the proposed changes incorporated will be provided to the NRC Licensing Project Manager upon request.

I&M requests review and approval in accordance with the normal NRC review schedule. Once approved, the amendment will be implemented within 60 days.

Copies of this letter and its enclosures are being transmitted to the Michigan Public Service Commission and Michigan Department of Environmental Quality in accordance with the requirements of 10 CFR 50.91. This letter contains regulatory commitments.

Should you have any questions, please contact Mr. Michael K. Scarpello, Regulatory Affairs Manager, at (269) 466-2649.

Sincerely,

Joel P. Gebbie
Site Vice President

DMB/jmr

Enclosures:

1. Affirmation
2. Indiana Michigan Power Company's Evaluation of Proposed Change
3. Donald C. Cook Nuclear Plant Unit 1 Request for Exemption from the Provisions of 10 CFR 50.46 and 10 CFR Part 50 Appendix K to Allow Use of Optimized ZIRLO™ in Core Reload Applications
4. Regulatory Commitments

Attachment:

Donald C. Cook Nuclear Plant Unit 1 Proposed Technical Specification Markups for Optimized ZIRLO™

c: J. T. King, MPSC
S. M. Krawec, AEP Ft. Wayne, w/o enclosures
MDNRE – WHMD/RPS
NRC Resident Inspector
M. A. Satorius, NRC Region III
P. S. Tam, NRC Washington DC

Enclosure 1 to AEP-NRC-2010-51

AFFIRMATION

I, Joel P. Gebbie, being duly sworn, state that I am Site Vice President of Indiana Michigan Power Company (I&M), that I am authorized to sign and file this request with the Nuclear Regulatory Commission on behalf of I&M, and that the statements made and the matters set forth herein pertaining to I&M are true and correct to the best of my knowledge, information, and belief.

Indiana Michigan Power Company

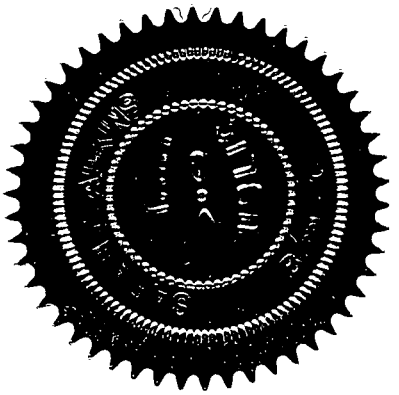
Joel P. Gebbie
Site Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 16th DAY OF December, 2010

Notary Public

My Commission Expires 9/9/11



Enclosure 2 to AEP-NRC-2010-51

INDIANA MICHIGAN POWER COMPANY'S EVALUATION
License Amendment Request – Evaluation of the Proposed Technical Specification Change(s) to Sections 4.2.1 and 5.6.5b.

1.0 DESCRIPTION

This license amendment request (LAR) is a request to amend the Technical Specifications (TS) for Donald C. Cook Nuclear Plant (CNP) Unit 1.

The proposed change will revise the TS to allow the use of Optimized ZIRLO™ fuel rod cladding material. Acceptable fuel rod cladding material is identified in CNP TS 4.2.1, Reactor Core Fuel Assemblies. The proposed change would revise TS 4.2.1 to add Optimized ZIRLO™ to the approved fuel rod cladding materials and TS 5.6.5b to add Westinghouse Electric Company LLC (Westinghouse) topical report WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™," to the analytical methods used to determine the core operating limits previously reviewed and approved by the NRC. The proposed change will also alter the spelling of Zircaloy.

An exemption from certain requirements of 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors" and Appendix K to 10 CFR Part 50, "ECCS Evaluation Models" is needed to support this change. The exemption request is included as Enclosure 3.

2.0 PROPOSED CHANGE

The proposed change will revise CNP TS 4.2.1 by adding Optimized ZIRLO™ as an acceptable fuel rod cladding material. Additionally TS 5.6.5b is being revised to add WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™," to the list of documents previously reviewed and approved by the NRC. The proposed change will also alter the spelling of Zircaloy to be consistent with the spelling used by the industry and by the U.S. Nuclear Regulatory Commission.

3.0 BACKGROUND

Optimized ZIRLO™ was developed to meet the needs of longer operating cycles with increased fuel discharge burnup and fuel duty. Optimized ZIRLO™ provides a reduced corrosion rate while maintaining the benefits of mechanical strength and resistance to accelerated corrosion from abnormal chemistry conditions. In addition, fuel rod internal pressures (resulting from the increased fuel duty, use of integral fuel burnable absorbers, and corrosion/temperature feedback effects) have become more limiting with respect to fuel rod design criteria. Reducing the associated corrosion buildup and thus minimizing temperature feedback effects provides additional margin to the fuel rod internal pressure design criterion.

Optimized ZIRLO™ fuel cladding is different from standard ZIRLO™ in two respects: 1) the tin content is lower; and 2) the microstructure is different. This difference in tin content and

microstructure can lead to differences in some material properties and I&M will confirm that Westinghouse provides irradiated data and validates fuel performance models ahead of burnups achieved in batch application.

Optimized ZIRLO™ is described in Westinghouse topical report WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™," dated July 2006 (Reference 5). The staff's Safety Evaluation (SE) for Optimized ZIRLO™ dated June 10, 2005 (ML051670395) requires that licensees referencing Addendum 1-A to implement Optimized ZIRLO™ comply with the ten (10) conditions and limitations listed within the SE. These conditions and limitations are addressed in Section 4.0.

4.0 TECHNICAL ANALYSIS

Addendum 1-A to Westinghouse topical report WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", provides the details and results of material testing of Optimized ZIRLO™ compared to standard ZIRLO™ as well as the material properties to be used in various models and methodologies when analyzing Optimized ZIRLO™.

The NRC SE for the topical report contains ten conditions and limitations. I&M will comply with these conditions and limitations as follows:

1. *Until rulemaking to 10 CFR Part 50 addressing Optimized ZIRLO™ has been completed, implementation of Optimized ZIRLO™ fuel clad requires an exemption from 10 CFR 50.46 and 10 CFR Part 50 Appendix K.*

   RESPONSE: The exemption from 10 CFR 50.46 and 10 CFR 50 Appendix K is requested by Enclosure 3 of this LAR.

2. *The fuel rod burnup limit for this approval remains at currently established limits: 62 GWd/MTU for Westinghouse fuel designs and 60 GWd/MTU for CE fuel designs.*

   RESPONSE: For any fuel using Optimized ZIRLO™ fuel cladding, the maximum fuel rod burnup limit for Westinghouse fuel designs will continue to be 62 GWd/MTU until such time that a new fuel rod burnup limit is approved for use.

3. *The maximum fuel rod waterside corrosion, as predicted by the best-estimate model, will be [proprietary limits included in topical report and proprietary version of safety evaluation] of hydrides for all locations of the fuel rod.*

   RESPONSE: The maximum fuel rod waterside corrosion for the fuel product using Optimized ZIRLO™ fuel cladding will be confirmed to be less than [proprietary hydride limits included in the topical report and the proprietary version of the safety evaluation] for all locations of the fuel rod. Confirmation of these modified limits for Optimized ZIRLO™ fuel cladding will be required as part of the core reload process.

4. *All the conditions listed in previous NRC SE approvals for methodologies used for standard ZIRLO™ and Zircaloy-4 fuel analysis will continue to be met, except that the*

use of Optimized ZIRLO™ cladding in addition to standard ZIRLO™ and Zircaloy-4 cladding is now approved.

RESPONSE: The fuel analysis of Optimized ZIRLO™ fuel rod cladding will continue to meet all conditions associated with approved methods. For Donald C. Cook Unit 1, this is a current requirement, and confirmation of these conditions will be required as part of the core reload process.

5. *All methodologies will be used only within the range for which ZIRLO™ and Optimized ZIRLO™ data were acceptable and for which the verifications discussed in Addendum 1 and responses to RAIs [Requests for Additional Information] were performed.*

RESPONSE: The application of ZIRLO™ and Optimized ZIRLO™ in approved methodologies will be made consistent with the approach accepted in WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™," dated July 2006. For CNP Unit 1, this is a current requirement, and confirmation of these conditions will be required as part of the core reload process.

6. *The licensee is required to ensure that Westinghouse has fulfilled the following commitment: Westinghouse shall provide the NRC staff with a letter(s) containing the following information (Based on the schedule described in response to RAI #3):*

   a. *Optimized ZIRLO™ LTA [Lead Test Assembly] data from Byron, Calvert Cliffs, Catawba, and Millstone.*

      i. *Visual*
      ii. *Oxidation of fuel rods*
      iii. *Profilometry*
      iv. *Fuel rod length*
      v. *Fuel assembly length*

   b. *Using the standard and Optimized ZIRLO™ database including the most recent LTA data, confirm applicability with currently approved fuel performance models (e.g., measured vs. predicted).*

Confirmation of the approved models' applicability up through the projected end of cycle burnup for the Optimized ZIRLO™ fuel rods must be completed prior to their initial batch loading and prior to the startup of subsequent cycles. For example, prior to the first batch application of Optimized ZIRLO™, sufficient LTA data may only be available to confirm the models' applicability up through 45 GWd/MTU. In this example, the licensee would need to confirm the models up through the end of the initial cycle. Subsequently, the licensee would need to confirm the models, based upon the latest LTA data, prior to re-inserting the Optimized ZIRLO™ fuel rods in future cycles. Based upon the LTA schedule, it is expected that this issue may only be applicable to the first few batch implementations, since sufficient LTA data up through the burnup limit should be available within a few years.

RESPONSE: Westinghouse has provided the NRC with information related to test data and models in the letters referenced in Section 8 of this enclosure.

LTA measured data and favorable results from visual examinations of once and twice-burned LTAs confirm, for at least two cycles of operation, that the current fuel performance models are applicable for Optimized ZIRLO™ fuel rods. Westinghouse has stated that it will continue to provide additional data from the Optimized ZIRLO™ LTA programs to the NRC after new data for higher burnup/fluence become available. I&M will confirm that as higher burnups/fluences are achieved for Optimized ZIRLO™ clad fuel rods, the requirements of this condition will be met as it applies to CNP Unit 1.

7. *The licensee is required to ensure that Westinghouse has fulfilled the following commitment: Westinghouse shall provide the NRC staff with a letter containing the following information (Based on the schedule described in response to RAI #11):*

   a. *Vogtle growth and creep data summary reports.*

   b. *Using the standard ZIRLO™ and Optimized ZIRLO™ database including the most recent Vogtle data, confirm applicability with currently approved fuel performance models (e.g., level of conservatism in W [Westinghouse] rod pressure analysis, measured vs. predicted, predicted minus measured vs. tensile and compressive stress).*

Confirmation of the approved models' applicability up through the projected end of cycle burnup for the Optimized ZIRLO™ fuel rods must be completed prior to their initial batch loading and prior to the startup of subsequent cycles. For example, prior to the first batch application of Optimized ZIRLO™, sufficient LTA data may only be available to confirm the models' applicability up through 45 GWd/MTU. In this example, the licensee would need to confirm the models up through the end of the initial cycle. Subsequently, the licensee would need to confirm the models, based upon the latest LTA data, prior to re-inserting the Optimized ZIRLO™ fuel rods in future cycles. Based upon the LTA schedule, it is expected that this issue may only be applicable to the first few batch implementations since sufficient LTA data up through the burnup limit should be available within a few years.

RESPONSE: Westinghouse has provided the NRC with information related to test data and models in the letters referenced in Section 8 of this enclosure.

Currently, the data from two cycles of operation has been evaluated, and the fuel rod creep models from fuel rod design codes have been used to predict the growth and creep performance of the samples. This information was provided to the NRC in the most recent informational letter from Westinghouse (Reference 4). 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.

8. *The licensee shall account for the relative differences in unirradiated strength (YS [Yield Strength] and UTS [Ultimate Tensile Strength]) between Optimized ZIRLO™ and*

standard ZIRLO™ in cladding and structural analyses until irradiated data for Optimized ZIRLO™ have been collected and provided to the NRC staff.

a. For the Westinghouse fuel design analyses:

i. The measured, unirradiated Optimized ZIRLO™ strengths shall be used for BOL analyses.

ii. Between BOL up to a radiation fluence of 3.0 x 10^{21} n/cm^2 (E>1MeV), pseudo-irradiated Optimized ZIRLO™ strength set equal to linear interpolation between the following two strength level points: At zero fluence, strength of Optimized ZIRLO™ equal to measured strength of Optimized ZIRLO™ and at a fluence of 3.0 x 10^{21} n/cm^2 (E>1MeV), irradiated strength of standard ZIRLO™ at the fluence of 3.0 x 10^{21} n/cm^2 (E>1MeV) minus 3 ksi.

iii. During subsequent irradiation from 3.0 x 10^{21} n/cm^2 up to 12 x 10^{21} n/cm^2, the differences in strength (the difference at a fluence of 3 x 10^{21} n/cm^2 due to tin content) shall be decreased linearly such that the pseudo-irradiated Optimized ZIRLO™ strengths will saturate at the same properties as standard ZIRLO™ at 12 x 10^{21} n/cm^2.

b. For the CE fuel design analyses, the measured, unirradiated Optimized ZIRLO™ strengths shall be used for all fluence levels (consistent with previously approved methods).

RESPONSE: The fuel analysis of Optimized ZIRLO™ clad rods will use the yield strength and ultimate tensile strength as modified per Conditions 8.a.i, 8.a.ii, and 8.a.iii until such time that irradiated data for Optimized ZIRLO™ strengths have been collected and provided to the NRC. 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. CNP Unit 1 uses a Westinghouse fuel design, and therefore, condition and limitation 8.b does not apply.

9. *As discussed in response to RAI #21, for plants introducing Optimized ZIRLO™ that are licensed with LOCBART or STRIKIN-II and have a limiting PCT that occurs during blowdown or early reflood, the limiting LOCBART or STRIKIN-II calculation will be rerun using the specified Optimized ZIRLO™ material properties. Although not a condition of approval, the NRC staff strongly recommends that, for future evaluations, Westinghouse updates all computer models with Optimized ZIRLO™ specific material properties.*

RESPONSE: This condition and limitation does not apply for CNP because CNP Unit 1 is not licensed with LOCBART or STRIKIN-II LOCA methodology.

10. *Due to the absence of high temperature oxidation data for Optimized ZIRLO™, the Westinghouse coolability limit on PCT during the locked rotor event shall be [proprietary limits included in topical report and proprietary version of safety evaluation].*

RESPONSE: The Westinghouse limit on PCT during the locked rotor event will be assessed relative to the proprietary PCT limits included in the topical report and the proprietary version of the safety evaluation as part of the core reload design process.

5.0 REGULATORY SAFETY ANALYSIS

5.1 No Significant Hazards Consideration

I&M has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed change would allow the use of Optimized ZIRLO™ clad nuclear fuel in the reactors. The NRC approved topical report WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™," prepared by Westinghouse Electric Company LLC (Westinghouse), addresses Optimized ZIRLO™ and demonstrates that Optimized ZIRLO™ has essentially the same properties as currently licensed ZIRLO™. The fuel cladding itself is not an accident initiator and does not affect accident probability. Use of Optimized ZIRLO™ fuel cladding has been shown to meet all 10 CFR 50.46 acceptance criteria and, therefore, will not increase the consequences of an accident.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

Use of Optimized ZIRLO™ clad fuel will not result in changes in the operation or configuration of the facility. Topical Report WCAP-12610-P-A and CENPD-404-P-A demonstrated that the material properties of Optimized ZIRLO™ are similar to those of standard ZIRLO™. Therefore, Optimized ZIRLO™ fuel rod cladding will perform similarly to those fabricated from standard ZIRLO™, thus precluding the possibility of the fuel becoming an accident initiator and causing a new or different type of accident.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The proposed change will not involve a significant reduction in the margin of safety because it has been demonstrated that the material properties of the Optimized ZIRLO™ are not significantly different from those of standard ZIRLO™. Optimized ZIRLO™ is expected to perform similarly to standard ZIRLO™ for all normal operating and accident scenarios, including both loss of coolant accident (LOCA) and non-LOCA scenarios. For LOCA scenarios, where the slight difference in Optimized ZIRLO™ material properties relative to standard ZIRLO™ could have some impact on the overall accident scenario, plant-specific LOCA analyses using Optimized ZIRLO™ properties will be performed prior to the use of fuel assemblies with fuel rods containing Optimized ZIRLO™. These LOCA analyses will demonstrate that the acceptance criteria of 10 CFR 50.46 will be satisfied when Optimized ZIRLO™ fuel rod cladding is implemented.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, I&M concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92 (c), and, accordingly, a finding of no significant hazards consideration is justified.

5.2 Applicable Regulatory Requirements/Criteria

The proposed changes have been evaluated to determine whether applicable regulations and requirements continue to be met. I&M has determined that the proposed change to allow the use of Optimized ZIRLO™ fuel rod cladding material requires exemptions from 10 CFR 50.46, acceptance criteria for emergency core cooling systems for light-water nuclear power reactors, and 10 CFR 50, Appendix K, ECCS Evaluation Models. Enclosure 3 provides the basis and justification for relief from these regulations.

The proposed change does not require relief from any other regulatory requirements and does not affect conformance with any CNP Plant Specific Design Criterion differently than described in the Updated Final Safety Analysis Report.

6.0 ENVIRONMENTAL CONSIDERATION

The proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 PRECEDENTS

The NRC has allowed use of Optimized ZIRLO™ fuel cladding material in Westinghouse fueled reactors as issued for Entergy Operations Inc. Arkansas Nuclear One, Unit 2 (ML080370014) and Waterford Steam Electric Station, Unit 3 (ML080380004) and South Carolina Electric and Gas Company Virgil C. Summer Nuclear Station (ML100150861).

8.0 REFERENCES

1. Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A "Optimized ZIRLO™," LTR-NRC-07-1, January 4, 2007. (ADAMS Accession No. ML 070100385)

2. Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A "Optimized ZIRLO™," LTR-NRC-07-58, November 6, 2007. (ADAMS Accession No. ML073130556)

3. Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A "Optimized ZIRLO™," LTR-NRC-07-58 Rev. 1, February 5, 2008. (ADAMS Accession No. ML080390451)

4. Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "SER Compliance of WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," LTR-NRC-08-60, December 30, 2008. (ADAMS Accession No. ML090080380)

5. Westinghouse Topical Report, "WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A; "Optimized ZIRLO™,"' dated July 2006

Enclosure 3 to AEP-NRC-2010-51

DONALD C. COOK NUCLEAR PLANT UNIT 1 REQUEST FOR EXEMPTION FROM THE PROVISIONS OF 10 CFR 50.46 AND 10 CFR PART 50 APPENDIX K TO ALLOW USE OF OPTIMIZED ZIRLO™ IN CORE RELOAD APPLICATIONS

Purpose

Indiana Michigan Power (I&M) requests an exemption from the provisions of 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," and Appendix K to 10 CFR Part 50, "ECCS Evaluation Models" to allow the use of Optimized ZIRLO™ fuel rod cladding in future core reload applications for Donald C. Cook Nuclear Plant (CNP) Unit 1. The regulation, 10 CFR 50.46, contains acceptance criteria for the emergency core cooling system (ECCS) for reactors that have fuel rods fabricated either with Zircaloy or ZIRLO™. Appendix K to 10 CFR Part 50, Paragraph I.A.5, requires the Baker-Just equation to be used to predict the rates of energy release, hydrogen concentration, and cladding oxidation for the metal-water reaction. The Baker-Just equation assumed the use of a zirconium alloy different than Optimized ZIRLO™. Therefore, an exemption to 10 CFR 50.46 and 10 CFR Part 50, Appendix K is required to support the use of Optimized ZIRLO™ fuel rod cladding. The exemption request relates solely to the specific cladding material specified in these regulations (i.e., fuel rods clad with Zircaloy or ZIRLO™). This request will provide for the application of the acceptance criteria of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 to fuel assembly designs utilizing Optimized ZIRLO™ fuel rod cladding.

Background

Optimized ZIRLO™ was developed to meet the needs of longer operating cycles with increased fuel discharge burnup and fuel duty. Optimized ZIRLO™ provides a reduced corrosion rate while maintaining the benefits of mechanical strength and resistance to accelerated corrosion from abnormal chemistry conditions. In addition, fuel rod internal pressures (resulting from the increased fuel duty, use of integral fuel burnable absorbers, and corrosion/temperature feed back effects) have become more limiting with respect to fuel rod design criteria. Reducing the associated corrosion buildup and thus minimizing temperature feedback effects, provides additional margin to the fuel rod internal pressure design criterion.

Technical Specification (TS) changes for CNP Unit 1 are required to allow the use of Optimized ZIRLO™ fuel rod cladding for core reload applications. The request for these TS changes are provided in Enclosure 2 to this letter.

Technical Justification of Acceptability

Westinghouse Electric Company, LLC (Westinghouse) topical report WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™" (Reference 1), provides the details and results of material testing of Optimized ZIRLO™ compared to standard ZIRLO™ as well as the material properties to be used in various models and methodologies when analyzing Optimized ZIRLO™. The NRC Safety Evaluation (SE) (Reference 2) for the topical report contains ten conditions and limitations. The first condition requires an exemption from 10 CFR 50.46 and 10 CFR Part 50, Appendix K (which is being requested via this enclosure). Westinghouse has provided the NRC with information related to test data and models (References 3, 4, 5, and 6) to address conditions and limitations 6 and 7.

CNP Unit 1 is currently licensed with the ASTRUM LOCA methodology; therefore, condition and limitation 9 will not apply because CNP is not licensed with LOCBART or STRIKIN-II. The

remaining conditions and limitations will be addressed by the proposed CNP Unit 1 TS changes and evaluations required to support core reload activities.

The reload evaluations will ensure that acceptance criteria are met for insertion of assemblies with fuel rods clad with Optimized ZIRLO™ under 10 CFR 50.59 requirements. These assemblies will be evaluated using NRC approved methods and models to address the use of Optimized ZIRLO™ fuel rod cladding.

Justification for Exemption

10 CFR 50.12, "Specific exemptions," states that the NRC may grant exemptions from the requirements of the regulations of this part provided three conditions are met. The three conditions are: 1) the exemption is authorized by law; 2) the exemption will not present an undue risk to the health and safety of the public; and 3) the exemption is consistent with the common defense and security.

The requested exemption to allow the use of Optimized ZIRLO™ fuel rod cladding material rather than Zircaloy or ZIRLO™ for core reload applications at CNP Unit 1 satisfies these criteria as described below.

1. This exemption is authorized by law

   As required by 10 CFR 50.12 (a)(1), this requested exemption is "authorized by law." The selection of a specified cladding material in 10 CFR 50.46 and implied in 10 CFR Part 50, Appendix K, was adopted at the discretion of the NRC consistent with its statutory authority. Additionally, the NRC has the authority under Section 50.12 to grant exemptions from the requirements of Part 50 upon showing proper justification. Further, it should be noted that, by submitting this exemption request, I&M does not seek an exemption from the acceptance and analytical criteria of 10 CFR 50.46 and 10 CFR Part 50, Appendix K. The intent of the request is solely to allow the use of criteria set forth in these regulations for application to the Optimized ZIRLO™ fuel rod cladding material.

2. This exemption will not present an undue risk to public health and safety

   The reload evaluations will ensure that the applicable acceptance criteria are met for the insertion of assemblies with fuel rods clad with Optimized ZIRLO™. Fuel assemblies using Optimized ZIRLO™ fuel rod cladding will be evaluated using NRC approved analytical methods and plant specific models to address the changes in the cladding material properties. The safety analyses for CNP Unit 1 are supported by the applicable site specific TSs. Reload cores are required to be operated in accordance with the operating limits specified in the TSs. Thus, the granting of this exemption request will not pose an undue risk to public health and safety.

3. This exemption is consistent with the common defense and security

   As noted above, the exemption request is only to allow the application of 10 CFR 50.46 regulations to an improved fuel rod cladding material. All the requirements and 10 CFR 50.46 acceptance criteria will be maintained. The special nuclear material in these

assemblies is required to be handled, controlled, and protected in accordance with approved procedures. Use of Optimized ZIRLO™ fuel rod cladding in the CNP Unit 1 core will not affect plant operations and is consistent with the common defense and security.

Special circumstances support the issuance of an exemption

10 CFR 50.12(a)(2) states that the NRC will not consider granting an exemption to the regulations unless special circumstances are present. The requested exemption meets the special circumstances of 10 CFR 50. 12(a)(2)(ii) which states that, "Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule." In this particular circumstance, application of the subject regulations is not necessary to achieve the underlying purpose of the rule.

10 CFR 50.46 identifies acceptance criteria for ECCS performance at nuclear power plants. Due to the similarities in the material properties of Optimized ZIRLO™ and standard ZIRLO™, the current ECCS analysis approach remains applicable. Westinghouse will continue to perform a reload safety evaluation of the CNP Unit 1 core using Loss of Coolant Accident (LOCA) methods approved for the unit to ensure that assemblies with Optimized ZIRLO™ fuel rod cladding material meet all LOCA safety criteria.

Requirements for cladding performance during a design basis LOCA are specified in 10 CFR Part 50, Appendix K, Paragraph I.A.5. The intent of this paragraph is to apply an equation for rates of energy release, hydrogen generation, and cladding oxidation from a metal-water reaction that conservatively bounds all post-LOCA scenarios (i.e., the Baker-Just equation). Application of the Baker-Just equation has been demonstrated to be appropriate for the Optimized ZIRLO™ alloy. Due to the similarities in the composition of the Optimized ZIRLO™ and standard ZIRLO™ fuel rod cladding materials, the application of the Baker-Just equation will continue to conservatively bound all post-LOCA scenarios

Conclusion

The acceptance criteria and requirements of 10 CFR 50.46 and 10 CFR Part 50, Appendix K currently are limited in applicability to the use of fuel rods cladding with Zircaloy or ZIRLO™. 10 CFR 50.46 and 10 CFR Part 50, Appendix K do not apply as written to the proposed use of Optimized ZIRLO™ fuel rod cladding material since Optimized ZIRLO™ is not one of the alloys specifically listed. With the approval of this exemption request, these regulations will be applied to Optimized ZIRLO™.

In order to support the use of Optimized ZIRLO™ fuel rod cladding material, an exemption from the requirements of 10 CFR 50.46 and 10 CFR Part 50, Appendix K is requested. As required by 10 CFR 50.12, the requested exemption is authorized by law, does not present undue risk to public health and safety, and is consistent with the common defense and security. Approval of this exemption request is consistent with the underlying purpose of the rule. In addition, special circumstances do exist to justify the approval of an exemption from the subject requirements.

References

1. Westinghouse Topical Report, "WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, 'Optimized ZIRLO™,'" July 2006.

2. Letter from H. N. Berkow (USNRC) to J. A. Gresham (Westinghouse), "Final Safety Evaluation for Addendum 1 to Topical Report WCAP-12610-P-A & CENPD-404-P-A, 'Optimized ZIRLO™,'" June 10, 2005.

3. Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, 'Optimized ZIRLO™,'" LTR-NRC-07-1, January 4, 2007.

4. Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, 'Optimized ZIRLO™,'" LTR-NRC-07-58, November 6, 2007.

5. Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), "SER Compliance with WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, 'Optimized ZIRLO™,'" LTR-NRC-07-58, Rev. 1, February 5, 2008.

6. Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), "SER Compliance of WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A, 'Optimized ZIRLO™,'" LTR-NRC-08-60, December 30, 2008.

Enclosure 4 to AEP-NRC-2010-51

REGULATORY COMMITMENTS

The following table identifies those actions committed to by Indiana Michigan Power Company (I&M) in this document. Any other actions discussed in this submittal represent intended or planned actions by I&M. They are described to the Nuclear Regulatory Commission (NRC) for the NRC's information and are not regulatory commitments.

Commitment	Date
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 higher burnup/fluence 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. This commitment relates to conditions and limitations 6 of the NRC Safety Evaluation for Optimized ZIRLO™.	Continuous for each cycle specific core reload safety evaluation until the LTA data up through the fuel burnup limit applicable for Donald C. Cook Nuclear Plant (CNP) Unit 1 has been provided to the NRC.
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. This commitment relates to conditions and limitations 7 and 8 of the NRC SE for Optimized ZIRLO™.	Continuous for each cycle specific core reload safety evaluation until the contingency requirements of the conditions and limitations have been satisfied.

Attachment to AEP-NRC-2010-51

DONALD C. COOK NUCLEAR PLANT UNIT 1 PROPOSED TECHNICAL SPECIFICATION MARKUPS FOR OPTIMIZED ZIRLO™

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 ~~Zircalloy~~Zircaloy ~~or ZIRLO~~, ZIRLO™, or Optimized ZIRLO™ fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) 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 ($F^N_{\Delta H}$)";

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); ~~and~~

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™," (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 H 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.