Indiana Michigan
Power Company
Cook Nuclear Plant
One Cook Plant
Bridgman, MI 49106
616 465 5901

INDIANA MICHIGAN POWER

November 3, 1999

C1199-13
10 CFR 50.90

Docket Nos.: 50-315
50-316

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop O-P1-17
Washington, DC 20555-0001

Donald C. Cook Nuclear Plant Units 1 and 2
TECHNICAL SPECIFICATION CHANGE REQUEST
FUEL ROD ZIRLO CLADDING AND INTEGRAL FUEL BURNABLE ABSORBER (IFBA) REQUIREMENTS

Pursuant to 10 CFR 50.90, Indiana Michigan Power Company (I&M), the Licensee for Donald C. Cook Nuclear Plant (CNP) Units 1 and 2, proposes to amend Appendix A, Technical Specifications (T/S), of Facility Operating Licenses DPR-58 and DPR-74. The proposed changes to T/S Section 5.0, "Design Features," are related to requirements for the storage and use of new and spent fuel assemblies in the reactor, spent fuel storage racks, and new fuel storage racks.

T/S changes are proposed to allow use of fuel rods with ZIRLO cladding. I&M seeks approval to use fuel rods with ZIRLO cladding in order to take advantage of improvements in fuel clad corrosion and fuel integrity.

T/S changes are also proposed to specify an alternate NRC-approved methodology to determine the IFBA requirements for Westinghouse fuel assemblies stored in the new fuel storage racks. The existing methodology has been found to be nonconservative in predicting reactivity of stored fuel assemblies when determining compliance with the T/S reactivity limits for the new fuel storage racks. Both the existing and proposed methodologies are described in CDB-95-175, "Criticality Analysis of the Donald C. Cook Nuclear Plant New Fuel Storage Vault with Credit for Integral Fuel Burnable Absorbers." CDB-95-175 was previously reviewed and approved by the NRC as described in

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the Safety Evaluation Report dated February 27, 1997, for Amendment Nos. 213 and 198 for CNP Units 1 and 2, respectively.

T/S changes are also proposed to delete the designation of the fuel assembly types allowed in the spent fuel storage racks and new fuel storage racks. Requirements already exist in T/S Section 5.0 that specify maximum enrichment, reactivity, and spacing requirements for stored fuel assemblies. Therefore, it is unnecessary to list the specific fuel assembly types.

Attachment 1 provides a detailed description and safety analysis to support the proposed changes. Attachments 2A and 2B provide marked up T/S pages for Unit 1 and Unit 2, respectively. Attachments 3A and 3B provide the proposed T/S pages with the changes incorporated for Unit 1 and Unit 2, respectively. Attachment 4 describes the evaluation performed in accordance with 10 CFR 50.92(c), which concludes that no significant hazard is involved. Attachment 5 provides the environmental assessment. Attachment 6 provides commitments included in this submittal.

I&M requests approval of this request by February 15, 2000, to support storage and use of new fuel assemblies, including fuel assemblies containing fuel rods with ZIRLO cladding, for the next Unit 1 fuel cycle.

Copies of this letter and its attachments 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.

Should you have any questions, please contact Mr. Robert C. Godley, Director of Regulatory Affairs, at (616) 466-2698.

Sincerely,

R. P. Powers
Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 3rd DAY OF November, 1999

Notary Public

My Commission Expires

PATRICIA A. EDDIE
NOTARY PUBLIC - BERRIEN CO. MICH
MY COMMISSION EXPIRES
NOVEMBER - 8 - 2003

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Attachments

c: J. E. Dyer
MDEQ - DW & RPD
NRC Resident Inspector
R. Whale

ATTACHMENT 1 TO C1199-13

DESCRIPTION AND SAFETY ANALYSIS FOR THE PROPOSED CHANGES

A. Summary of Proposed Changes

Indiana Michigan Power Company (I&M), the Licensee for Donald C. Cook Nuclear Plant (CNP) Units 1 and 2, proposes to amend Appendix A, Technical Specifications (T/S), of Facility Operating Licenses DPR-58 and DPR-74. The proposed changes to T/S Section 5.0, "Design Features," are related to requirements for the storage and use of new and spent fuel assemblies in the reactor, spent fuel storage racks, and new fuel storage racks.

T/S changes are proposed to allow use of fuel rods with ZIRLO cladding. I&M seeks approval to use fuel rods with ZIRLO cladding in order to take advantage of improvements in fuel clad corrosion and fuel integrity.

T/S changes are also proposed to specify an alternate NRC-approved methodology to determine the integral fuel burnable absorber (IFBA) requirements for Westinghouse fuel assemblies stored in the new fuel storage racks. The existing methodology has been found to be nonconservative in predicting reactivity of stored fuel assemblies when determining compliance with the T/S reactivity limits for the new fuel storage racks. Both the existing and proposed methodologies are described in CDB-95-175, "Criticality Analysis of the Donald C. Cook Nuclear Plant New Fuel Storage Vault with Credit for Integral Fuel Burnable Absorbers." CDB-95-175 was previously reviewed and approved by the NRC as described in the Safety Evaluation Report (SER) dated February 27, 1997, for Amendment Nos. 213 and 198 for CNP Units 1 and 2, respectively.

T/S changes are also proposed to delete the designation of the fuel assembly types allowed in the spent fuel storage racks and new fuel storage racks. Requirements already exist in T/S Section 5.0 that specify maximum enrichment, reactivity, and spacing requirements for stored fuel assemblies. Therefore, it is unnecessary to list the specific fuel assembly types.

The proposed T/S changes to allow use of fuel rods with ZIRLO cladding are described in detail in Section B of this attachment. Section C of this attachment describes the proposed T/S changes to specify an alternate NRC-approved methodology to determine the IFBA requirements for Westinghouse fuel assemblies stored in the new fuel storage racks. The proposed T/S changes to delete designation of the fuel assembly types allowed in the spent fuel storage racks and new fuel storage racks are described in detail in Section D of this attachment. T/S pages that are marked to show the proposed changes are provided in Attachments 2A and 2B for Unit 1 and Unit 2, respectively. The proposed T/S pages, with the changes incorporated, are provided in Attachments 3A and 3B for Unit 1 and Unit 2, respectively.

B. Proposed T/S Change for Use of ZIRLO Fuel Cladding

Description of the Current Requirements

T/S 5.3.1, "Fuel Assemblies," requires the fuel rods to be clad with Zircaloy-4.

Bases for the Current Requirements

The fuel assemblies are designed to perform satisfactorily throughout their lifetime as described in the CNP Updated Final Safety Analysis Report (UFSAR). The loads, stresses, and strains resulting from the combined effects of flow induced vibrations, earthquakes, reactor pressure, fission gas pressure, fuel growth, thermal strain, and differential expansion during both steady state and transient reactor operating conditions have been considered in the design of the fuel rods and fuel assembly. The fuel rod cladding is designed to withstand operating pressure loads without rupture and to maintain encapsulation of the fuel throughout the design life. The current T/S requirement for fuel rod cladding is based on the assumption that only fuel rods clad in Zircaloy-4 have been evaluated and found acceptable for meeting these criteria.

Need for Revision of the Requirements

I&M is transitioning to a more advanced Westinghouse fuel assembly design consisting of the VANTAGE 5 fuel assembly design currently used at CNP with the addition of ZIRLO cladding. This new fuel assembly design has become a standard fuel design. It is used at many other Westinghouse plants and provides improved corrosion resistance, enhanced fuel reliability, and the capability to support future increased discharge burnups.

Description of the Proposed Changes

I&M proposes to revise T/S 5.3.1 to allow fuel rods to be clad with either Zircaloy-4 as currently allowed or with ZIRLO.

Bases for the Proposed Changes

Westinghouse proprietary topical report WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," serves as a reference core report for the fuel assembly design referred to as the VANTAGE+ fuel assembly. This new fuel assembly design incorporates the use of ZIRLO fuel clad. NRC evaluation and approval of this topical report was provided in an NRC letter to Westinghouse, dated July 1, 1991, "Acceptance for Referencing of Topical Report WCAP-12610, 'VANTAGE+ Fuel Assembly Reference Core Report' (TAC No. 77258)." WCAP-12610-P-A and the associated NRC SER support the following conclusions:

1. The mechanical design bases and limits for the new fuel assembly design using ZIRLO clad are the same as those for the previously licensed fuel assembly design using Zircaloy-4 clad (VANTAGE 5), except those for clad corrosion which are improved.

2. The neutronic evaluations have shown that the new fuel assembly nuclear design bases are satisfied and that the key safety parameter limits are applicable to the new fuel assembly design. Standard approved nuclear design analytical models and methods accurately describe the behavior of the new fuel assembly design.

3. The thermal and hydraulic design bases for the new fuel assembly design are the same as those of the previously licensed fuel assembly design using Zircaloy-4 clad (VANTAGE 5). The use of the ZIRLO clad and the new fuel assembly modifications do not adversely affect the existing performance.

4. The methods and computer codes used in the analysis of the non-LOCA licensing basis events are valid for the new fuel assembly design and the licensing basis criteria continue to be met.

5. The large break LOCA evaluation model was modified to reflect the behavior of the ZIRLO clad material during a LOCA. The revised evaluation model satisfies the intent of 10 CFR 50.46 and Appendix K of 10 CFR 50. There is no significant impact on typical large break LOCA analysis results for the ZIRLO model revisions.

6. Sensitivity analyses have been performed to determine the effect of ZIRLO clad material on peak clad temperature and metal-to-water reaction rates for determining hydrogen generation following a LOCA. Conservative analyses have determined that the use of ZIRLO clad material results in less than a 5°F increase in peak clad temperature when compared to Zircaloy-4, and there is no consequential change in the metal-water reaction rates.

7. Sensitivity analyses of the hot full power and hot zero power rod ejection events were performed accounting for the specific heat versus temperature relationship of the ZIRLO clad material. These analyses demonstrate that the ZIRLO clad material produces a minor decrease in both the fraction of fuel melted at the hot spots as well as the peak fuel stored energy when compared to the results for Zircaloy-4. Use of ZIRLO clad material has no effect on the peak reactor coolant system pressure during a rod ejection event.

Compliance with the other existing requirements in T/S 5.3.1 further ensures the acceptability of the new fuel assembly design. Only fuel configurations, sizes, enrichments, and cladding materials that have been analyzed with applicable NRC-approved codes and methods, and shown by tests or analysis to comply with fuel safety design bases, shall be used. The use of ZIRLO fuel cladding is required by T/S 5.3.1 to be justified by cycle-specific reload analyses in accordance with NRC-approved applications of fuel rod configurations.

A similar T/S change has already been approved for other Westinghouse plants that have transitioned to fuel assembly designs using ZIRLO fuel rod cladding. These include Turkey Point Plant Units 3 and 4 (63 FR 33116), South Texas Project Units 1 and 2 (62 FR 47704), Byron Station Units 1 and 2 and Braidwood Station Units 1 and 2 (61 FR 188), and Surry Power Station Units 1 and 2 (60 FR 42620). In addition, NUREG-1431, "Standard Technical Specifications for Westinghouse Plants," specifically includes ZIRLO as an acceptable cladding material.

In Federal Register Volume 57, Number 169, dated August 31, 1992, the NRC published amended regulations to reduce regulatory burden on nuclear licensees. The NRC revised the acceptance criteria in 10 CFR 50.44 and 10 CFR 50.46 applicable to Zircaloy clad fuel to include ZIRLO clad fuel. ZIRLO is a preferred cladding material because it provides an improvement in corrosion margin and fuel integrity. The NRC noted that the revision to include ZIRLO as an acceptable zirconium-based cladding material along with Zircaloy reduces the licensee burden without reducing the protection of the public health or safety.

C. Proposed T/S Change for IFBA Requirements

Description of the Current Requirements

T/S 5.6.2, "Criticality - New Fuel," specifies design and operational requirements for the new fuel storage racks. T/S 5.6.2.a specifies that fuel assemblies having a maximum enrichment in accordance with Table 5.6-1 may be stored in the new fuel storage racks.

T/S Table 5.6-1, "Maximum Nominal Fuel Assembly Enrichment For New Fuel Storage Racks," lists the specific fuel assembly types that are allowed to be stored in the new fuel storage racks and the maximum nominal fuel assembly enrichment (up to 4.55 weight % U-235) for each of these specific fuel assembly types. In addition, the table includes a footnote stating that: "[a] maximum nominal enrichment of 4.95 weight percent U-235 for Westinghouse fuel types is acceptable provided that sufficient integral fuel burnable absorber is present in each fuel assembly stored in the new fuel storage racks such that the maximum reference fuel assembly k_∞ is less than or equal to 1.4857 at 68°F."

Bases for the Current Requirements

The T/S design requirements for the new fuel storage racks are intended to ensure that adequate reactivity margin is maintained to prevent an inadvertent criticality. Reactivity margin is maintained by controlling maximum enrichment and spacing of fuel assemblies in the new fuel storage racks. In addition, the use of IFBA is necessary for Westinghouse fuel assemblies with higher base reactivity (high enrichments) to maintain the required reactivity margin.

The current T/S requirement for determining the amount of IFBA present in each stored Westinghouse fuel assembly for reactivity control employs the K-infinity (or k_∞) methodology. This methodology and an additional methodology based on use of a CNP site-specific IFBA-enrichment curve for Westinghouse fuel assemblies are both described in the previously submitted CDB-95-175.

Need for Revision of the Requirements

The k_∞ methodology uses the reactor core configuration rather than a site-specific new fuel storage rack configuration. A review of this methodology was recently performed by Westinghouse and documented in Nuclear Safety Advisory Letter (NSAL) 99-003, dated February 26, 1999. This review determined that the k_∞ methodology could lead to IFBA requirements that are nonconservative compared to those required by the methodology involving use of an IFBA-enrichment curve as described in CDB-95-175.

Description of the Proposed Changes

I&M proposes to revise T/S 5.6.2.a and add a new T/S Figure 5.6-4, "New Fuel Storage Rack Integral Fuel Burnable Absorber (IFBA) Requirements" to specify maximum enrichments and IFBA requirements for Westinghouse fuel in the new fuel storage racks. Specifically, T/S 5.6.2.a is proposed to state that the new fuel storage racks are designed and shall be maintained with "Westinghouse fuel assemblies having either a maximum enrichment of 4.55 weight % U-235, or an enrichment between 4.55 and 4.95 weight % U-235 with greater than or equal to the minimum number of integral fuel burnable absorber pins as shown on Figure 5.6-4 (interpolation of the Boron-10 loading between 1.0X and 1.5X and between 1.5X and 2.0X is acceptable)." The new T/S Figure 5.6-4 specifically covers IFBA requirements between 4.55 and 4.95 weight percentage U-235. I&M proposes to delete the footnote for T/S Table 5.6-1 since it is superseded by the proposed change to T/S 5.6.2.a.

Bases for the Proposed Changes

The CNP new fuel storage rack IFBA-enrichment curve for Westinghouse fuel (T/S Figure 5.6-4) is based on the additional calculational method described in CDB-95-175, which was previously reviewed by the NRC as described in the SER dated February 27, 1997, for Amendment Nos. 213 and 198 for CNP Units 1 and 2, respectively. Use of this new method ensures the required reactivity margin is maintained for storage of Westinghouse fuel assemblies in the new fuel storage racks.

D. Proposed T/S Change to Delete Specification of Stored Fuel Assembly Types

Description of the Current Requirements

T/S 5.6.1.2 and T/S Table 5.6-1 list the specific fuel assembly types allowed in the spent fuel storage racks and the specific fuel assembly types allowed in the new fuel storage racks. These include specific Westinghouse and Exxon/ANF fuel designs.

Bases for the Current Requirements

The design and operational requirements for the spent fuel storage racks and new fuel storage racks are intended to ensure that adequate reactivity margin is maintained to prevent an inadvertent criticality. Reactivity margin is maintained by controlling maximum enrichment, overall reactivity of the stored fuel assemblies, and spacing of fuel assemblies in the spent fuel storage racks and new fuel storage racks. The listing of specific fuel assembly types and their maximum nominal enrichment illustrates the different specific fuel assembly designs that have been determined to meet the design requirements for storage to ensure the reactivity margin requirements of the T/S are maintained.

Need for Revision of the Requirements

I&M proposes to delete the specific fuel assembly types from the T/S to eliminate the need to revise the T/S in the future for changes in specific fuel assembly types that otherwise do not affect T/S requirements or require NRC review and approval under 10 CFR 50.59.

Description of the Proposed Changes

I&M proposes to delete T/S 5.6.1.2 and T/S Table 5.6-1 to allow storage of any present or future fuel assembly designs as long as the current criticality requirements specified in T/S 5.6.1.1 and T/S 5.6.2 for the spent fuel storage racks and new fuel storage racks continue to be met.

Bases for the Proposed Changes

Identifying specific fuel assembly types is not necessary in the T/S. The criteria in 10 CFR 50.36 do not require this level of detail for inclusion in the T/S. This is because the maximum enrichment and criticality requirements in T/S 5.6.1.1 and T/S 5.6.2 ensure the safety of stored fuel assemblies. In addition, changes in specific fuel assembly types must be justified by cycle-specific reload analyses in accordance with 10 CFR 50.59. This proposed change is consistent with both the standard T/S in NUREG-0452, "Westinghouse Standard Technical Specifications," and NUREG-1431, "Standard Technical Specifications - Westinghouse Plants," Revision 1.

E. Impact on Previous Submittals

Letter AEP:NRC:0433Q, "Technical Specifications Change Request – Administrative Changes," dated December 3, 1998, affect T/S pages that are submitted in this request. For this and any future submittals that affect the T/S pages provided in this submittal, I&M will coordinate changes to the pages with the NRC Project Manager to ensure proper T/S page control when the associated license amendment requests are approved.

Letter C0999-11, "License Amendment Request for Credit of Rod Cluster Control Assemblies for Cold Leg Large Break Loss-of-Coolant Accident Subcriticality," submitted on September 17, 1999, is potentially affected by this submittal. Letter C0999-11 included both WCAP-15245 (proprietary) and WCAP-15246 (non-proprietary), "Control Rod Insertion Following a Cold Leg LBLOCA, D.C. Cook, Units 1 and 2." Both of these documents were based on the existing fuel assembly types in use during the last fuel cycle in CNP Units 1 and 2. This includes Westinghouse 15X15 OFA fuel assemblies in Unit 1, and Westinghouse 17X17 VANTAGE 5 IFM fuel assemblies in Unit 2.

I&M is evaluating the impact of using advanced fuel assembly designs, including Westinghouse fuel designs with ZIRLO fuel cladding, on this previous submittal. The NRC issued a request for additional information related to this previous submittal by letter dated October 26, 1999, "Donald C. Cook Nuclear Plant, Units 1 and 2 - Request for Additional Information Related to License Amendment Requesting Credit of Rod Cluster Control Assemblies for Cold Leg Large Break Loss-of-Coolant Accident (LOCA) Subcriticality (TAC Nos. MA6473 and MA6474)." I&M will submit the results of this evaluation to the NRC with the response to that request for additional information.