November 24, 2009

L-PI-09-125
10 CFR 50.90
10 CFR 50.12

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

Prairie Island Nuclear Generating Plant Units 1 and 2
Dockets 50-282 and 50-306
License Nos. DPR-42 and DPR-60

License Amendment Request and Exemption Request to Support the Use of Optimized ZIRLO™ Fuel Rod Cladding

Pursuant to 10 CFR 50.90, Northern States Power Company, a Minnesota corporation (NSPM), doing business as Xcel Energy, hereby requests the following amendment for the Prairie Island Nuclear Generating Plant (PINGP) Technical Specifications (TS). The Enclosure 1 proposes changes to TS 4.2.1 and TS 5.6.5. These changes are consistent with the Nuclear Regulatory Commission (NRC) 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, entitled "Optimized ZIRLO™".

To support the change and pursuant to 10 CFR 50.12, NSPM is also requesting an exemption from certain requirements of 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" for the PINGP. The exemption request relates solely to the specific types of cladding material described in these regulations for use in light water reactors. The exemption request is included as Enclosure 2.

NSPM requests approval of the proposed amendment and exemption within one calendar year of the submittal date to support the first Optimized ZIRLO™ fuel loading tentatively scheduled for the spring 2011, Unit 1 refueling outage. Upon NRC approval, NSPM requests 60 days to implement the associated changes.

In accordance with 10 CFR 50.91, a copy of this application, with enclosures, is being provided to the designated Minnesota State Official.

Summary of Commitments
This letter contains new commitments listed below:

Commitment	Due Date
1. In the course of the core reload process approved for use at PINGP, and prior to first loading of Optimized ZIRLO™, Westinghouse will be programmatically required to evaluate the effects of Optimized ZIRLO™ on PINGP core performance and accident analysis. To satisfy NRC Safety Evaluation (SE) for Optimized ZIRLO™, NSPM will confirm that core reload safety evaluations satisfy conditions and limitations 3, 4, 5, 8, and 10 of the NRC SE for Optimized ZIRLO™.	Continuous, until the contingency requirements of the conditions and limitations have been satisfied.
2. To satisfy NRC SE for Optimized ZIRLO™, NSPM will confirm that Westinghouse provides additional confirmatory data associated with Lead Test Assembly (LTA) programs at other facilities prior to operation with Optimized ZIRLO™ fuel rod cladding. This commitment relates to conditions and limitations 6 and 7 of the NRC SE for Optimized ZIRLO™.	Continuous, until the LTA data up through the fuel burnup limit applicable for PINGP has been provided to the NRC.

If you should have any questions regarding this submittal, please contact Glenn Adams at (612) 330-6777.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on November 24, 2009

Mark A. Schimmel
Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota

Enclosures:
1. Evaluation of the Proposed Change
2. Request for Exemption from the Provisions of 10 CFR 50.46 and 10 CFR 50 Appendix K to Allow Use of Optimized ZIRLO™ in Core Reload Applications

cc: Administrator, Region III, USNRC
Project Manager, Prairie Island, USNRC
Resident Inspector, Prairie Island, USNRC
State of Minnesota

ENCLOSURE 1

Evaluation of the Proposed Change

Subject: License Amendment Request to Revise TS 4.2.1, "Fuel Assemblies" and TS 5.6.5, "Core Operating Limits Report (COLR)" to Support the Use of Optimized ZIRLO™ Fuel Rod Cladding

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1. Technical Specification Pages (Markup)
2. Technical Specification Pages (Retyped)

1.0 SUMMARY DESCRIPTION

This license amendment request (LAR) would amend Operating Licenses DPR-42 and DPR-60 for Prairie Island Nuclear Generating Plant (PINGP) Units 1 and 2.

Northern States Power Company, a Minnesota corporation (NSPM) requests Nuclear Regulatory Commission (NRC) review and approval of proposed revisions to Technical Specification (TS) Section 4.2.1, Fuel Assemblies, and TS Section 5.6.5, Core Operating Limits Report (COLR). The proposed change will revise the TS to allow the use of Optimized ZIRLO™ fuel rod cladding material.

2.0 DETAILED DESCRIPTION

2.1 PROPOSED CHANGES

Brief descriptions of the associated proposed TS changes are provided below along with discussions of the justification for each change. The specific wording changes to the TS are provided in Attachments 1 and 2 to this enclosure.

TS 4.2.1, "Fuel Assemblies"

This LAR proposes to revise TS 4.2.1 by adding Optimized ZIRLO™ as an acceptable fuel rod cladding material.

TS 5.6.5, "Core Operating Limits Report (COLR)"

This LAR proposes to revise TS 5.6.5 to add WCAP-12610-P-A and Addendum 1-A to Topical Report WCAP-12610-P-A and CENPD-404-P-A, entitled "Optimized ZIRLO™" to the list of documents previously reviewed and approved by the NRC.

There are no TS Bases changes associated with this LAR.

In summary, these changes are acceptable because they meet the regulatory criteria for appropriate content of the Technical Specifications. Also, these changes meet the conditions and limitations of NRC Safety Evaluation for Optimized ZIRLO™ (Reference 2) as described in the Technical Evaluation.

2.2 BACKGROUND

As the nuclear industry pursues longer operating cycles with increased fuel discharge burnup and fuel duty, the corrosion performance requirements for the nuclear fuel cladding become more demanding. Optimized ZIRLO™ was developed to meet these needs and 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.

As prescribed by TS 4.2.1, fuel cladding materials approved for use at the PINGP are Zircaloy or ZIRLO™. 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 the industry has committed to provide irradiated data and validate 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 entitled "Optimized ZIRLO™", July 2006 (Reference 1). The staff's safety evaluation for Optimized ZIRLO™ dated June 10, 2005 (Reference 2) requires licensees invoking Addendum 1-A (for the purpose of implementing Optimized ZIRLO™) to comply with the ten conditions and limitations listed within the safety evaluation. These conditions and limitations are addressed in Section 3.0 of this LAR.

3.0 TECHNICAL EVALUATION

PINGP is a two unit plant located on the right bank of the Mississippi River, approximately 6 miles northwest of the city of Red Wing, Minnesota. The facility is owned and operated by NSPM. Each unit at the PINGP employs a two-loop pressurized water reactor designed and supplied by Westinghouse Electric Corporation. The initial PINGP application for a Construction Permit and Operating License was submitted to the Atomic Energy Commission (AEC) in April 1967. The Final Safety Analysis Report (FSAR) was submitted for application of an Operating License in January 1971. Unit 1 began commercial operation in December 1973, and Unit 2 began commercial operation in December 1974.

The PINGP was designed and constructed to comply with NSPM's understanding of the intent of the AEC General Design Criteria (GDC) for Nuclear Power Plant Construction Permits, as proposed on July 10, 1967. PINGP was not licensed to NUREG-0800, "Standard Review Plan (SRP).

Westinghouse Electric Company, LLC (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 Safety Evaluation (SE) for the topical report (Reference 2) contains ten conditions and limitations. The non-proprietary version of those conditions and

limitations is listed below, copied verbatim from the SE without proprietary information. Following each condition and limitation is the NSPM response to explain compliance:

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 request for exemption from 10 CFR 50.46 and 10 CFR Part 50, Appendix K is included as Enclosure 2 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 [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 the proprietary limits included in the topical report and the proprietary version of safety evaluation of hydrides for all locations of the fuel rod. Confirmation of these modified limits for Optimized ZIRLO™ fuel cladding is 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 cladding will continue to meet the conditions associated with approved methods. For the PINGP, this is a current requirement and confirmation of these conditions is 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 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™", July 2006.

For the PINGP, this is a current requirement and confirmation of these conditions is 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 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 following letters:
   - Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), SER Compliance with WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", LTR-NRC-07-1, January 4, 2007 (ADAMS Accession No. ML070100389, Proprietary, Not Publicly Available)
   - Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), SER Compliance with WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", LTR-NRC-07-58, November 6, 2007 (ADAMS Accession No. ML073130562, Proprietary, Not Publicly Available)
   - Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), SER Compliance with WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", LTR-NRC-07-58 Rev. 1, February 5, 2008 (ADAMS Accession No. ML080390452)
   - 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

Lead Test Assembly (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 will continue to provide additional data from the Optimized ZIRLO™ LTA programs to the NRC after new data for higher burnup/fluence become available. NSPM will confirm that Westinghouse transmits the requisite data such 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 the PINGP.

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 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 following letters:
   - Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), SER Compliance with WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", LTR-NRC-07-1, January 4, 2007 (ADAMS Accession No. ML070100389, Proprietary, Not Publicly Available)
   - Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), SER Compliance with WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", LTR-NRC-07-58, November 6, 2007 (ADAMS Accession No. ML073130562, Proprietary, Not Publicly Available)
   - Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control 9999Desk), SER Compliance with WCAP-12610-P-A and CENPD-404-P-A,

Addendum 1-A, "Optimized ZIRLO™", LTR-NRC-07-58 Rev. 1, February 5, 2008 (ADAMS Accession No. ML080390452)

- 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

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 (LTR-NRC-08-60) at the end of calendar year 2008. NSPM will confirm that Westinghouse transmits the requisite data such 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 PINGP.

8. *The licensee shall account for the relative differences in unirradiated strength (YS and UTS) 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 3.0×10^{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 3.0×10^{21} n/cm^2 (E > 1 MeV), irradiated strength of standard ZIRLO™ at the fluence of 3.0×10^{21}, n/cm^2 (E > 1 MeV) minus 3 ksi.*
      iii. *During subsequent irradiation from 3.0×10^{21} n/cm^2 up to 12×10^{21} n/cm^2, the differences in strength (the difference at a fluence of 3×10^{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 12×10^{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).*

<u>Response</u>: PINGP is a Westinghouse fuel design; therefore, 8.b does not apply. The fuel analysis of Optimized ZIRLO™ clad fuel 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. NSPM will confirm that as higher burnups/fluences are achieved for Optimized ZIRLO™ clad fuel rods, the requirements of this condition will be met as they apply to PINGP.

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 update all computer models with Optimized ZIRLO™ specific material properties.*

   Response: PINGP is not licensed with LOCBART or STRIKIN-II; therefore, this condition and limitation do not apply.

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: As part of the core reload safety evaluation process, the Westinghouse limit on Peak Cladding Temperature (PCT) during the locked rotor event will be assessed relative to the proprietary limits included in topical report and proprietary version of safety evaluation.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements / Criteria

Title 10 Code of Federal Regulations 50.36, "Technical Specifications":

> *(c) Technical specifications will include items in the following categories:*
>
> *(4) Design features. Design features to be included are those features of the facility such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety and are not covered in categories described in paragraphs (c) (1), (2), and (3) of this section.*

The proposed change to Technical Specifications (TS) 4.2.1 adds Optimized ZIRLO™ to the list of approved fuel rod materials described as design features. As an incremental addition to an existing list in TS 4.2.1, the proposed change is consistent with current content and satisfies the regulatory criteria established for 10 CFR 50.36 for content of the Technical Specifications. Also, the addition of trademark notation "TM" is an editorial change that protects the intellectual property rights of Westinghouse without affecting the Technical Specification content requirements of 10 CFR 50.36.

> *(5) Administrative controls. Administrative controls are the provisions relating to organization and management, procedures, recordkeeping, review and audit,*

and reporting necessary to assure operation of the facility in a safe manner. Each licensee shall submit any reports to the Commission pursuant to approved technical specifications as specified in § 50.4.

The proposed change to TS 5.6.5 adds two analyses to the existing list of analyses approved for use in developing the core operating limits. As an incremental addition to an existing list in TS 5.6.5, the proposed change is consistent with current content and satisfies the regulatory criteria established for 10 CFR 50.36 for content of the Technical Specifications.

Thus, with the changes proposed in this license amendment request, the requirements of 10 CFR 50.36 continue to be met.

General Design Criteria:

The construction of the PINGP was significantly complete prior to issuance of 10 CFR 50, Appendix A, General Design Criteria (GDC). The PINGP was designed and constructed to comply with the AEC GDC as proposed on July 10, 1967 as described in the plant Updated Safety Analysis Report (USAR). Furthermore, the PINGP is committed to selected Appendix A GDC. The PINGP GDC applicable to fuel cladding integrity is the following:

Criterion 6 – Reactor Core Design. The reactor core shall be designed to function throughout its design lifetime, without exceeding acceptable fuel damage limits which have been stipulated and justified. The core design, together with reliable process and decay heat removal systems, shall provide for this capability under all expected conditions of normal operation with appropriate margins for uncertainties and for transient situations which can be anticipated, including the effects of the loss of power to recirculation pumps, tripping out of a turbine generator set, isolation of the reactor from its primary heat sink, and loss of all offsite power.

PINGP implementation of the approved reload safety evaluation process provides ongoing assurance that reactor core design meets PINGP GDC 6, including any fuel design changes. With particular respect to the fuel changes proposed herein, NSPM will confirm that the core design involving Optimized ZIRLO™ will address the effects of that fuel including the conditions and limitations prescribed by the NRC Safety Evaluation SE for Optimized ZIRLO™. Thus, the proposed change does not affect conformance with any General Design Criterion differently than described in the PINGP USAR.

10 CFR 50.46, "Acceptance Criteria For Emergency Core Cooling Systems For Light Water Nuclear Power Reactors":

The proposed change has been evaluated to validate that the subject regulation and requirements continue to be met. NSPM concurs with the NRC SE that an exemption from 10 CFR 50.46, and 10 CFR 50, Appendix K, "ECCS Evaluation Models" is

required. The request for exemption has been provided as Enclosure 2 and provides the basis and justification for relief from these regulations.

4.2 Precedent

The NRC has previously approved the use of Optimized ZIRLO™ fuel cladding material in Combustion Engineering reactors. In a license amendment request dated April 24, 2007 (ADAMS Accession No. ML071220267), Entergy Operations, Inc. proposed to use the Optimized ZIRLO™ fuel cladding material for Arkansas Nuclear One, Unit 2. The license amendment request herein is similar to the Entergy submittal in that it comparably addresses the conditions and limitations of the applicable NRC SE. The only notable differences relate to the differences in reactor design (Combustion Engineering vs. Westinghouse), which are addressed appropriately in the Technical Evaluation for the PINGP as they apply to the Westinghouse reactor design. The NRC reviewed and approved the license amendment request for Entergy in a Safety Evaluation dated March 26, 2008 (ADAMS Accession No. ML080370014).

Also, in a license amendment request dated April 24, 2007 (ADAMS Accession No. ML071160348), Entergy Operations, Inc. proposed to use the Optimized ZIRLO™ fuel cladding material for Waterford, Unit 3. The license amendment request herein is similar to the Entergy submittal in that it comparably addresses the conditions and limitations of the applicable NRC SE. The only notable differences relate to the differences in reactor design (Combustion Engineering vs. Westinghouse), which are addressed appropriately in the Technical Evaluation for the PINGP as they apply to the Westinghouse reactor design. The NRC reviewed and approved the license amendment request for Entergy in a Safety Evaluation dated April 16, 2008 (ADAMS Accession No. ML080380004).

4.3 No Significant Hazards Consideration

The proposed Technical Specification (TS) change adds Optimized ZIRLO™ to the list of cladding materials approved for use at Prairie Island Nuclear Generating Plant (PINGP). Technical Specifications describe fuel rod material specifically as "Zircaloy or ZIRLO". The proposed change will add Optimized ZIRLO™ to the approved fuel rod cladding materials and will add reference to the supporting NRC-approved analyses, which are WCAP-12610-P-A, VANTAGE+ Fuel Assembly Reference Core Report, April 1995 (Westinghouse Proprietary) and WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", July 2006 (Westinghouse Proprietary).

Northern States Power – Minnesota (NSPM) 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.

   Westinghouse Electric Company, LLC (Westinghouse) topical report WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™", July 2006, 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 Nuclear Regulatory Commission (NRC) has allowed use of Optimized ZIRLO™ fuel cladding material in Westinghouse fueled reactors provided that licensees ensure compliance with the conditions and limitations set forth in the NRC Safety Evaluation (SE) for the topical report. By satisfying the conditions and limitations of the NRC SE through completed actions and its approved reload safety evaluation process, the licensee ensures that the effects of Optimized ZIRLO™ on PINGP core performance are evaluated and that the probability or consequences of previously-evaluated accidents are not increased.

   Therefore, the proposed change of adding a cladding material does not result in an increase to 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.

   Material properties of this fuel design have been evaluated in Westinghouse topical report WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™", July 2006. That report 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™. Neither that topical report nor the associated NRC SE identifies the possibility of a new or different kind of accident resulting from this change for generic application in Westinghouse reactors. As demonstrated in that topical report and stated in the NRC SE, there is reasonable assurance that under both normal and accident conditions, the Optimized ZIRLO™ fuel cladding will be able to safely operate and comply with NRC regulations. By satisfying the conditions and limitations of the NRC SE by virtue of its completed actions and its approved reload safety evaluation process, the licensee ensures that the effects of Optimized ZIRLO™ are evaluated and will not create the possibility of a new or different kind of accident. Assurance that the possibility of new or different type of accidents will not be created on a site-specific basis is inherent to the reload safety evaluation process approved for use at the PINGP. Site specific evaluation of the

PINGP core designs with Optimized ZIRLO™ will be performed programmatically and necessarily by the approved reload safety evaluation process.

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

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

   Response: No.

   The cladding material used in the fuel rods is designed and tested to prevent excessive fuel temperatures, excessive internal rod gas pressure due to fission gas releases, and excessive cladding stresses and strains. Optimized ZIRLO™ was developed to meet these needs and provides a reduced corrosion rate while maintaining the benefits of mechanical strength and resistance to accelerated corrosion from abnormal chemistry conditions. Westinghouse topical report WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™", July 2006, 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 has allowed use of Optimized ZIRLO™ fuel cladding material detailed within this topical report as detailed within their SE. Therefore, the change in material does not result in a significant reduction in a margin of safety.

Based on the above, NSPM concludes that the proposed amendments present 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.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (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.

5.0 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.

6.0 REFERENCES

1. WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", July 2006 (ADAMS Accession No. ML062080576, Proprietary, Not Publicly Available)
2. Letter from H. N. Berkow (USNRC) to J. A. Gresham (Westinghouse), Final Safety Evaluation for Addendum to Topical Report WCAP-12610-P-A and CENPD-404-P-A, "Optimized ZIRLO™", June 10, 2005 (ADAMS Accession No. ML051670395, Proprietary, Not Publicly Available)
3. Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), SER Compliance with WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", LTR-NRC-07-1, January 4, 2007 (ADAMS Accession No. ML070100389, Proprietary, Not Publicly Available)
4. Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), SER Compliance with WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", LTR-NRC-07-58, November 6, 2007 (ADAMS Accession No. ML073130562, Proprietary, Not Publicly Available)
5. Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), SER Compliance with WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", LTR-NRC-07-58 Rev. 1, February 5, 2008 (ADAMS Accession No. ML080390452)
6. 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

ATTACHMENT 1 to ENCLOSURE 1

Technical Specification Pages (Markup)

4.0-1
5.0-36

2 pages follow

4.0 DESIGN FEATURES

4.1 Site Location

The site for the Prairie Island Nuclear Generating Plant is located on the west bank of the Mississippi River, approximately 6 miles northwest of the city of Red Wing, Minnesota. The site exclusion area boundary has a minimum radius of 715 meters from the center line of either reactor.

4.2 Reactor Core

4.2.1 Fuel Assemblies

The reactor shall contain 121 fuel assemblies. Each assembly shall consist of a matrix of Zircaloy, ZIRLO™, or Optimized ZIRLO™ ~~or 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 29 control rod assemblies. The control material shall be silver indium cadmium as approved by the NRC.

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

18. WCAP-7908-A, "FACTRAN – A FORTRAN IV Code for Thermal Transients in a UO_2 Fuel Rod";

19. WCAP-7907-P-A, "LOFTRAN Code Description";

20. WCAP-7979-P-A, "TWINKLE – A Multidimensional Neutron Kinetics Computer Code";

21. WCAP-10965-P-A, "ANC: A Westinghouse Advanced Nodal Computer Code";

22. WCAP-11394-P-A, "Methodology for the Analysis of the Dropped Rod Event";

23. WCAP-11596-P-A, "Qualification of the PHOENIX-P/ANC Nuclear Design System for Pressurized Water Reactor Cores";

24. WCAP-12910 Rev. 1-A, "Pressurizer Safety Valve Set Pressure Shift";

25. WCAP-14565-P-A, "VIPRE-01 Modeling and Qualification for pressurized Water Reactor Non-LOCA Thermal-Hydraulic Safety Analysis";

26. WCAP-14882-P-A, "RETRAN-02 Modeling and Qualification for Westinghouse Pressurized Water Reactor Non-LOCA Safety Analyses"; ~~and~~

27. WCAP-16009-P-A, "Realistic Large Break LOCA Evaluation Methodology Using Automated Statistical Treatment of Uncertainty Method (ASTRUM)" ~~.~~ ;

28. WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report"; and
29. WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™".

ATTACHMENT 2 to ENCLOSURE 1

Technical Specification Pages (Retyped)

TS 4.0-1
TS 5.0-36
TS 5.0-37

3 pages follow

4.0 DESIGN FEATURES

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The site for the Prairie Island Nuclear Generating Plant is located on the west bank of the Mississippi River, approximately 6 miles northwest of the city of Red Wing, Minnesota. The site exclusion area boundary has a minimum radius of 715 meters from the center line of either reactor.

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5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

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19. WCAP-7907-P-A, "LOFTRAN Code Description";

20. WCAP-7979-P-A, "TWINKLE – A Multidimensional Neutron Kinetics Computer Code";

21. WCAP-10965-P-A, "ANC: A Westinghouse Advanced Nodal Computer Code";

22. WCAP-11394-P-A, "Methodology for the Analysis of the Dropped Rod Event";

23. WCAP-11596-P-A, "Qualification of the PHOENIX-P/ANC Nuclear Design System for Pressurized Water Reactor Cores";

24. WCAP-12910 Rev. 1-A, "Pressurizer Safety Valve Set Pressure Shift";

25. WCAP-14565-P-A, "VIPRE-01 Modeling and Qualification for pressurized Water Reactor Non-LOCA Thermal-Hydraulic Safety Analysis";

26. WCAP-14882-P-A, "RETRAN-02 Modeling and Qualification for Westinghouse Pressurized Water Reactor Non-LOCA Safety Analyses";

27. WCAP-16009-P-A, "Realistic Large Break LOCA Evaluation Methodology Using Automated Statistical Treatment of Uncertainty Method (ASTRUM)";

28. WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report"; and

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

29. WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™".

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 Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)

a. RCS pressure and temperature limits for heat-up, cooldown, low temperature operation, criticality, and hydrostatic testing, OPPS arming, PORV lift settings and Safety Injection Pump Disable Temperature as well as heatup and cooldown rates shall be established and documented in the PTLR for the following:

LCO 3.4.3, "RCS Pressure and Temperature (P/T) Limits";
LCO 3.4.6, "RCS Loops - MODE 4";
LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled";
LCO 3.4.10, "Pressurizer Safety Valves";
LCO 3.4.12, "Low Temperature Overpressure Protection (LTOP) – Reactor Coolant System Cold Leg Temperature (RCSCLT) > Safety Injection (SI) Pump Disable Temperature";
LCO 3.4.13, "Low Temperature Overpressure Protection (LTOP) – Reactor Coolant System Cold Leg Temperature (RCSCLT) ≤ Safety Injection (SI) Pump Disable Temperature"; and
LCO 3.5.3, "ECCS - Shutdown".

ENCLOSURE 2

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

In accordance with 10 CFR 50.12, "Specific Exemptions," NSPM 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 10 CFR 50, Appendix K, "ECCS Evaluation Models" to allow the use of Optimized ZIRLO™ fuel rod cladding in future core reload applications for Prairie Island Nuclear Generating Plant (PINGP) Units 1 and 2. The regulation in 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™. 10 CFR Part 50, Appendix K 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 10 CFR 50, Appendix K to fuel assembly designs utilizing Optimized ZIRLO™ fuel cladding.

Background

As the nuclear industry pursues longer operating cycles with increased fuel discharge burnup and fuel duty, the corrosion performance requirements for the nuclear fuel cladding become more demanding. Optimized ZIRLO™ was developed to meet these needs and 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.

Starting in spring 2011, the reloads for Prairie Island Units 1 and 2 will contain fuel rods clad with Optimized ZIRLO™.

Technical Specification (TS) changes for Prairie Island Units 1 and 2 are required to allow the use of Optimized ZIRLO™ fuel rod cladding for core reload applications. The

request for these changes is provided in the License Amendment Request enclosed herein.

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 50, Appendix K (which is being requested herein). 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. Condition and limitation 9 does not apply because Prairie Island Units 1 and 2 are not licensed with LOCBART or STRIKIN-II. The remaining conditions and limitations are addressed in the PINGP Units 1 and 2 license amendment request and the evaluations required to support core reload activities.

The reload safety 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 of the reload safety evaluation process to address the use of Optimized ZIRLO™.

Justification of 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 the PINGP Units 1 and 2, satisfies these criteria as described below.

1. <u>This exemption is authorized by law</u>

   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 Commission consistent with its statutory authority. No statute required the NRC to adopt this specification. 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, NSPM 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 safety evaluations will ensure that 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 analysis for PINGP Units 1 and 2 is 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 common defense and security

   As noted above, the exemption request is to allow the application of the aforementioned regulations to an improved fuel rod cladding material. By satisfying the conditions and limitations of the NRC Safety Evaluation (SE) (Reference 2) for the topical report, NSPM demonstrates compliance with the applicable regulations as they relate to fuel cladding. Furthermore, NSPM has established commitments to ensure continued compliance once the Optimized ZIRLO™ fuel cladding is received at PINGP. The special nuclear material in these assemblies is required to be handled and controlled in accordance with approved procedures. Use of full regions of Optimized ZIRLO™ fuel rod cladding in the PINGP Units 1 and 2 cores will not affect plant operations and is consistent with 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 the Optimized ZIRLO™ and standard ZIRLO™, the current ECCS analysis approach remains applicable. In the course of the core reload process approved for use at the PINGP, Westinghouse will be programmatically required to evaluate the effects of Optimized ZIRLO™ using Loss of

Coolant Accident (LOCA) methods approved for the site to ensure that assemblies with Optimized ZIRLO™ fuel rod cladding material meet all LOCA safety criteria.

The intent of 10 CFR Part 50, Appendix K, paragraph I.A.5, 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 50, Appendix K, currently are limited in applicability to the use of fuel rods clad with Zircaloy or ZIRLO™. 10 CFR 50.46 and 10 CFR 50, Appendix K, do not apply to the proposed use of Optimized ZIRLO™ fuel rod cladding material since Optimized ZIRLO™ has a slightly different composition than Zircaloy or ZIRLO™. With the approval of this exemption, 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 common defense and security. Approval of this exemption request does not violate 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. WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", July 2006 (ADAMS Accession No. ML062080576, Proprietary, Not Publicly Available)
2. Letter from H. N. Berkow (USNRC) to J. A. Gresham (Westinghouse), Final Safety Evaluation for Addendum to Topical Report WCAP-12610-P-A and CENPD-404-P-A, "Optimized ZIRLO™", June 10, 2005 (ADAMS Accession No. ML051670395, Proprietary, Not Publicly Available)
3. Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), SER Compliance with WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", LTR-NRC-07-1, January 4, 2007 (ADAMS Accession No. ML070100389, Proprietary, Not Publicly Available)
4. Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), SER Compliance with WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", LTR-NRC-07-58, November 6, 2007 (ADAMS Accession No. ML073130562, Proprietary, Not Publicly Available)

5. Letter from J. A. Gresham (Westinghouse) to USNRC (Document Control Desk), SER Compliance with WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™", LTR-NRC-07-58 Rev. 1, February 5, 2008 (ADAMS Accession No. ML080390452)
6. 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