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SOUTHERN NUCLEAR
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MAR 16 2016

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50-424
50-425

NL-16-0034

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

Joseph M. Farley Nuclear Plant – Units 1 and 2
Vogtle Electric Generating Plant – Units 1 and 2
License Amendment Request and 10 CFR 50.12 Exemption Request
Optimized ZIRLO™ Fuel Rod Cladding

Ladies and Gentlemen:

Pursuant to 10 CFR 50.90, Southern Nuclear Operating Company (SNC) hereby requests an amendment to Facility Operating License Nos. NPF-2 and NPF-8 for Joseph M. Farley Nuclear Plant (FNP), Units 1 and 2, respectively and requests an amendment to Facility Operating License Nos. NPF-68 and NPF-81 for Vogtle Electric Generating Plant (VEGP) Units 1 and 2, respectively. This amendment proposes to revise Technical Specifications (TS) to allow the use of Optimized ZIRLO™ as an approved fuel rod cladding. This change is consistent with the U.S. Nuclear Regulatory Commission (NRC) allowed use of Optimized ZIRLO™ fuel cladding material as documented in the Safety Evaluation included in Addendum 1-A to Westinghouse topical report WCAP-12610-P-A & CENPD-404-P-A, "Optimized ZIRLO™."

To support this change to allow the use of Optimized ZIRLO™, in accordance with 10 CFR 50.12, SNC 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 Appendix K to 10 CFR 50, "ECCS Evaluation Models." This 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 use of either Zircaloy or ZIRLO® fuel rod cladding. The exemption is required since Optimized ZIRLO™ has slightly different composition than Zircaloy or ZIRLO®.

The Enclosure 1 to this letter provides SNC's evaluation of the proposed license amendment request (LAR) changes, and Enclosure 2 provides the exemption request. SNC evaluated the proposed changes in accordance with the criteria provided in 10 CFR 50.12(a) and determined that the request satisfies the requirements for an exemption from certain requirements of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 for both Joseph M. Farley Nuclear Plant – Units 1 and 2 and Vogtle Electric Generating Plant – Units 1 and 2. Enclosure 3 and 4 provide the Markups of the Proposed Technical Specifications and Clean Typed Technical Specifications in support of the amendment requests. As discussed in the evaluation, the proposed changes do not involve a significant hazards consideration pursuant to 10 CFR 50.92, and pursuant to 10 CFR 51.22(b), there are no significant environmental impacts associated with the change.

SNC requests approval of the proposed license amendment by December 30, 2016. The proposed changes would be implemented within 90 days of issuance of the amendment.

This letter contains no NRC commitments. If you have any questions, please contact Ken McElroy at (205) 992-7369.

Mr. C. R. Pierce states he is the Regulatory Affairs Director for Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and, to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

C. R. Pierce

C. R. Pierce
Regulatory Affairs Director

CRP/GLS/lac

Sworn to and subscribed before me this 16th *day of* March, *2016.*

Laura L. Chugg
Notary Public

My commission expires: 10-8-2017

Enclosures:
1. Basis for Proposed LAR Change
2. Exemption Request for Optimized ZIRLO™ Fuel Cladding Material
3. Markup of Proposed Technical Specification
4. Clean Typed Pages for Technical Specification

cc: Southern Nuclear Operating Company
Mr. S. E. Kuczynski, Chairman, President & CEO
Mr. D. G. Bost, Executive Vice President & Chief Nuclear Officer
Ms. C. A. Gayheart, Vice President – Farley
Mr. B. K. Taber, Vice President – Vogtle 1 & 2
Mr. M. D. Meier, Vice President – Regulatory Affairs
Mr. D. R. Madison, Vice President – Fleet Operations
Mr. B. J. Adams, Vice President – Engineering
Ms. B. L. Taylor, Regulatory Affairs Manager – Farley
Mr. G. W. Gunn, Regulatory Affairs Manager – Vogtle 1 & 2
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U. S. Nuclear Regulatory Commission
Ms. C. Haney, Regional Administrator
Mr. S. A. Williams, NRR Project Manager – Farley
Mr. P. K. Niebaum, Senior Resident Inspector – Farley
Mr. R. E. Martin, NRR Senior Project Manager – Vogtle 1& 2
Mr. A. M. Alen Resident Inspector – Vogtle 1 & 2

Alabama Department of Public Health
Dr. T. M. Miller, MD, State Health Officer

State of Georgia
Mr. J. H. Turner, Director – Environmental Protection Division

Joseph M. Farley Nuclear Plant – Units 1 and 2
Vogtle Electric Generating Plant – Units 1 and 2
License Amendment for Optimized ZIRLO™ Fuel Rod Cladding

Enclosure 1

Basis for Proposed LAR Change

Enclosure 1

Basis for Proposed LAR Change for Farley Nuclear Plant – Units 1 and 2 and Vogtle Electric Generating Plant – Units 1 and 2

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1. Summary Description

Pursuant to 10 CFR 50.90, Southern Nuclear Operating Company (SNC), the licensee for Joseph M. Farley Nuclear Plant - Units 1 and 2 (FNP) and Vogtle Electric Generating Plant Units 1 and 2 (VEGP), hereby requests an amendment to Technical Specification (TS) 4.2.1 which currently does not include Optimized ZIRLO™ as an approved fuel rod cladding material. SNC proposes the following changes: 1) replacing ZIRLO with ZIRLO®; 2) adding Optimized ZIRLO™ to the approved fuel rod cladding materials identified in TS 4.2.1. SNC 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 NRC'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 & CENPD-404-P-A, "Optimized ZIRLO™."

To support the change, SNC 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 FNP and VEGP. 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 NRC has granted prior approval for use of Optimized ZIRLO™ fuel rod cladding for Seabrook Station, Unit No. 1 (ML13213A143) which was similar in content to this amendment. NRC approval has also been granted for other Westinghouse fueled reactors with similar content.

The Enclosure 1 to this letter provides SNC's evaluation of the proposed license amendment request (LAR) changes, and Enclosure 2 provides the exemption request. Enclosure 3 and 4 provide the Markups of the Proposed Technical Specifications and Clean Typed Technical Specifications in support of the amendment requests.

SNC requests review and approval in accordance with the normal NRC review schedule. Once approved, the amendment will be implemented within 90 days.

2. Detailed Description

Joseph M. Farley Nuclear Plant – Units 1 and 2

This license amendment request (LAR) is a request to amend the Technical Specifications (TS) for Joseph M. Farley Nuclear Plant - Units 1 and 2.

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 FNP TS 4.2.1, Reactor Core Fuel Assemblies. The proposed change would revise TS 5.6.5.b 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 U. S. Nuclear Regulatory Commission (NRC). The proposed change will also replace ZIRLO with ZIRLO® and add Optimized ZIRLO™ in TS 4.2.1 which describes the matrix of fuel rods.

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 2.

Vogtle Electric Generating Plant – Units 1 and 2

This license amendment request (LAR) is a request to amend the Technical Specifications (TS) for Vogtle Electric Generating Plant – Units 1 and 2.

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 VEGP TS 4.2.1, Reactor Core Fuel Assemblies. The proposed change would revise TS 5.6.5.b to add Westinghouse Electric Company LLC (Westinghouse) topical report WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™" and WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report" to the analytical methods used to determine the core operating limits previously reviewed and approved by the U. S. Nuclear Regulatory Commission (NRC). The proposed change will also replace ZIRLO™ with ZIRLO® and add Optimized ZIRLO™ in TS 4.2.1 which describes the matrix of fuel rods.

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 2.

2.1 Proposed Changes

Joseph M. Farley Nuclear Plant – Units 1 and 2

The proposed change will revise FNP 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 W CAP-12610-P-A and CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™," to the list of documents previously reviewed and approved by the NRC. The proposed changes are shown in mark-up TS pages as Enclosure 3 to this letter.

For FNP:

1. TS 4.2.1, Reactor Core, Fuel Assemblies

Replace:

The reactor shall contain 157 fuel assemblies. Each assembly shall consist of a matrix of zirconium alloy, zircaloy-4, or ZIRLO fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material.

With:

The reactor shall contain 157 fuel assemblies. Each assembly shall consist of a matrix of zirconium alloy, zircaloy-4, ZIRLO®, or Optimized ZIRLO™ fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material.

Basis for the change: The proposed change adds Optimized ZIRLO™ to the Fuel Assembly

Design Features in TS 4.2.1 as an approved fuel rod cladding material for future core reload applications. The ZIRLO trademark (ZIRLO™) is changed consistent with the Westinghouse ZIRLO trademark registered as ZIRLO®.

2. TS 5.6.5.b, Core Operating Limits Report (COLR)

Added "3c. WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006 (Westinghouse Proprietary)". Renumbered reference contained in Reference 3 and changed "Vantage+" to "VANTAGE+" in Reference 3b.

Basis for the change: The proposed change adds the previously approved Westinghouse topical report (WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A) to the COLR list of approved analytical methods for use in future application of Optimized ZIRLO™.

Vogtle Electric Generating Plant – Units 1 and 2

The proposed change will revise VEGP 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 and CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™," to the list of documents previously reviewed and approved by the NRC. The proposed changes are shown in mark-up TS pages as Enclosure 3 to this letter.

For VEGP:

1. TS 4.2.1, Reactor Core, Fuel Assemblies

Replace:

The reactor shall contain 193 fuel assemblies. Each assembly shall consist of a matrix of Zircaloy or ZIRLO™ clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material.

With:

The reactor shall contain 193 fuel assemblies. Each assembly shall consist of a matrix of Zircaloy, ZIRLO®, or Optimized ZIRLO™ clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material.

2. TS 5.6.5.b, Core Operating Limits

Report (COLR) Replace:

WCAP-10266-P-A, Revision 2, "The 1981 Version of the Westinghouse ECCS Evaluation Model Using the BASH Code," March 1987.

With:

WCAP-10266-P-A, Revision 2, "The 1981 Version of the Westinghouse ECCS Evaluation Model Using the BASH Code," March 1987 (W Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

Added:

WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," April 1995. (Westinghouse Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006 (Westinghouse Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W (Z) surveillance requirements for F_Q Methodology).)

Basis for the change: The proposed change adds the previously approved Westinghouse topical reports (WCAP-12610-P-A and WCAP-12610-P-A & CENPD-404-P-A Addendum 1-A) to the COLR list of approved analytical methods for use in future application of Optimized ZIRLO™.

3. Background

Joseph M. Farley Nuclear Plant – Units 1 and 2

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 FNP 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 & CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™," dated July 2006 (Reference 1). The staff's Safety Evaluation (SE) for Optimized ZIRLO™ dated June 10, 2005 (Reference 2) (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.

Vogtle Electric Generating Plant – Units 1 and 2

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 VEGP 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 & CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™," dated July 2006 (Reference 1). The staff's Safety Evaluation (SE) for Optimized ZIRLO™ dated June 10, 2005 (Reference 2) (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. Technical Evaluation

Joseph M. Farley Nuclear Plant – Units 1 and 2

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 staff's Safety Evaluation (SE) for Optimized ZIRLO™ dated June 10, 2005 requires that licensees comply with the ten conditions and limitations listed within the SE (Reference 2).

The ten conditions and limitations laid out in the NRC's Safety Evaluation for WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A are listed below. FNP complies 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 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 is 62 GW d/MTU until such time that a new fuel rod burnup limit is approved for use. FNP uses a Westinghouse fuel design therefore the burnup limit for CE fuel designs is not applicable. Confirmation that the FNP licensing basis burnup limit is not exceeded is part of the normal reload design process.

3. *The maximum fuel rod waterside corrosion, as predicted by the best-estimate model, will [satisfy 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 using Optimized ZIRLO™ fuel cladding will be confirmed to be less than the specified proprietary limits for all locations of the fuel rod. Confirmation that the appropriate corrosion limits are satisfied is part of the normal reload design 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. Confirmation that these conditions are satisfied is part of the normal reload design 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 & CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™," July 2006. Confirmation that this condition is satisfied is part of the normal reload design 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 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.
- Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "SER Compliance with W CAP-12610-P-A & CENPD-404-P-A Addendum 1-A'Optimized ZIRLO™'," LTR-NRC-07-58, November 6, 2007.
- 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.
- 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.
- 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-10-43, July 26, 2010.
- Letter from James 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-13-6, February 25, 2013.
- Letter from James A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "Submittal of Responses to Draft RAIs and Revisions to Select Figures in LTR-NRC-13-6 to Fulfill Conditions 6 and 7 of the Safety Evaluation for WCAP-12610-P-A & CENPD-404-P-A Addendum 1- A (Proprietary/Non-Proprietary)," LTR-NRC-15-7, February 9, 2015.

LTA measured data and favorable results from visual examinations of once, twice, and thrice- burned LTAs confirm, up to the fuel rod burnup limit, that the current fuel performance models are applicable for Optimized ZIRLO™ fuel rods. Through transmittal of the information contained in the above mentioned letters, Westinghouse has fulfilled its obligation to provide additional data from the Optimized ZIRLO™ LTA programs to the NRC. Southern Nuclear has confirmed that the requirements of this condition have been met.

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 U.S. Nuclear Regulatory Commission, "SER Compliance with W CAP-12610-P-A & CENPD-404-P-A Addendum 1-A 'Optimized ZIRLO™'," LTR-NRC-07-1, January 4, 2007.
- 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.
- 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.
- 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.
- 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-10-43, July 26, 2010.
- Letter from James 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-13-6, February 25, 2013.
- Letter from James A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "Submittal of Responses to Draft RAIs and Revisions to Select Figures in LTR-NRC-13-6 to Fulfill Conditions 6 and 7 of the Safety Evaluation for WCAP-12610-P-A & CENPD-404-P-A Addendum 1- A (Proprietary/Non-Proprietary)," LTR-NRC-15-7, February 9, 2015.

The data from three cycles of operation have 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. Through transmittal of the information contained in the above mentioned letters, Westinghouse has fulfilled its obligation to provide additional data regarding test data and performance models to the NRC. Southern Nuclear has confirmed that the requirements of this condition have been met.

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 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: FNP uses a Westinghouse fuel design, and therefore, condition and limitation 8.b does not apply.

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. Confirmation that this condition is satisfied is part of the normal reload design process.

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: FNP is not licensed with LOCBART or STRIKIN-II. Therefore this condition does not apply to FNP.

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: For implementation of Optimized ZIRLO™ fuel cladding, the PCT calculated for the locked rotor event has been assessed relative to the Westinghouse Optimized ZIRLO™ PCT limit. Confirmation that this limit is satisfied is part of the normal reload design process.

Vogtle Electric Generating Plant – Units 1 and 2

Addendum 1-A to Westinghouse topical report WCAP-12610-P-A & 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 staff's Safety Evaluation (SE) for Optimized ZIRLO™ dated June 10, 2005 requires that licensees comply with the ten conditions and limitations listed within the SE (Reference 2).

The ten conditions and limitations laid out in the NRC's Safety Evaluation for WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A are listed below. VEGP 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 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 is 62 GWd/MTU until such time that a new fuel rod burnup limit is approved for use. VEGP uses a Westinghouse fuel design therefore the burnup limit for CE fuel designs is not applicable. Confirmation that the VEGP licensing basis burnup limit is not exceeded is part of the normal reload design process.

3. *The maximum fuel rod waterside corrosion, as predicted by the best-estimate model, will [satisfy 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 using Optimized ZIRLO™ fuel cladding will be confirmed to be less than the specified

proprietary limits for all locations of the fuel rod. Confirmation that the appropriate corrosion limits are satisfied is part of the normal reload design 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. Confirmation that these conditions are satisfied is part of the normal reload design 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. Confirmation that this condition is satisfied is part of the normal reload design 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 followng letters:

   - 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.

- 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.
- 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.
- 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.
- 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-10-43, July 26, 2010.
- Letter from James 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-13-6, February 25, 2013.
- Letter from James A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "Submittal of Responses to Draft RAIs and Revisions to Select Figures in LTR-NRC-13-6 to Fulfill Conditions 6 and 7 of the Safety Evaluation for WCAP-12610-P-A & CENPD-404-P-A Addendum 1- A (Proprietary/Non-Proprietary)," LTR-NRC-15-7, February 9, 2015.

LTA measured data and favorable results from visual examinations of once, twice, and thrice- burned LTAs confirm, up to the fuel rod burnup limit, that the current fuel performance models are applicable for Optimized ZIRLO™ fuel rods. Through transmittal of the information contained in the above mentioned letters, Westinghouse has fulfilled its obligation to provide additional data from the Optimized ZIRLO™ LTA programs to the NRC. Southern Nuclear has confirmed that the requirements of this condition have been met.

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 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.
- 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.
- 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.
- 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.
- 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-10-43, July 26, 2010.
- Letter from James 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-13-6, February 25, 2013.
- Letter from James A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "Submittal of Responses to Draft RAIs and Revisions to Select Figures in LTR-NRC-13-6 to Fulfill Conditions 6 and 7 of the Safety Evaluation for WCAP-12610-P-A & CENPD-404-P-A Addendum 1- A (Proprietary/Non-Proprietary)," LTR-NRC-15-7, February 9, 2015.

The data from three cycles of operation have 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. Through transmittal of the information contained in the above mentioned letters, Westinghouse has fulfilled its obligation to provide additional data regarding test data and performance models to the NRC. Southern Nuclear has confirmed that the requirements of this condition have been met.

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 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 10^2 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: VEGP uses a Westinghouse fuel design, and therefore, condition and limitation 8.b does not apply.

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. Confirmation that this condition is satisfied is part of the normal reload design process.

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: A review of the VEGP Large Break LOCA calculations reveals that in all pertinent cases, the peak cladding temperature (PCT) does not occur during the blowdown or early reflood portion of the transient; therefore, a LOCBART calculation using the Optimized ZIRLO™ specific heat model is not required for VEGP. VEGP is not licensed with STRIKIN-II. Therefore this condition does not apply to VEGP.

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: For implementation of Optimized ZIRLO™ fuel cladding, the PCT calculated for the locked rotor event has been assessed relative to the Westinghouse Optimized ZIRLO™ PCT limit. Confirmation that this limit is satisfied is part of the normal reload design process.

5. Regulatory Evaluation

5.1 Significant Hazards Consideration

Joseph M. Farley Nuclear Plant – Units 1 and 2

Southern Nuclear Operating Company (SNC) proposes to revise the FNP Technical Specifications (TS) to allow the use of Optimized ZIRLO™ fuel rod cladding material. The proposed changes would revise TS 4.2.1 to add Optimized ZIRLO™ to the approved fuel rod cladding materials and TS 5.6.5 to add Westinghouse Electric Company LLC (Westinghouse) topical report WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™," to the NRC approved analytical methods used to determine the core operating limits.

SNC 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 & 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 ZIRLO®. Therefore, Optimized ZIRLO™ fuel rod cladding will perform similarly to those fabricated from 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 ZIRLO®. Optimized ZIRLO™ is expected to perform similarly to ZIRLO® for all normal operating and accident scenarios, including both loss of coolant accident (LOCA) and non-LOCA scenarios. For LOCA scenarios, plant-specific evaluations have been performed which allow the use of fuel assemblies with fuel rods containing Optimized ZIRLO™. These LOCA evaluations address the NRC SER conditions and limitations for Optimized ZIRLO™ fuel rod cladding and provide continued compliance with the acceptance criteria of 10 CFR 50.46.

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

Based on the above, SNC 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.

Vogtle Electric Generating Plant – Units 1 and 2

Southern Nuclear Operating Company (SNC) proposes to revise the VEGP Technical Specifications (TS) to allow the use of Optimized ZIRLO™ fuel rod cladding material. The proposed changes would revise TS 4.2.1 to add Optimized ZIRLO™ to the approved fuel rod cladding materials and TS 5.6.5 to add Westinghouse Electric Company LLC (Westinghouse) topical report WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A "Optimized ZIRLO™," to the NRC approved analytical methods used to determine the core operating limits.

SNC 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 & 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 & CENPD-404-P-A demonstrated that the material properties of Optimized ZIRLO™ are similar to those of ZIRLO®. Therefore, Optimized ZIRLO™ fuel rod cladding will perform similarly to those fabricated from 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 ZIRLO®. Optimized ZIRLO™ is expected to perform similarly to ZIRLO® for all normal operating and accident scenarios, including both loss of coolant accident (LOCA) and non-LOCA scenarios. For LOCA scenarios, plant- specific evaluations have been performed which allow the use of fuel assemblies with fuel rods containing Optimized ZIRLO™. These LOCA evaluations address the NRC SER conditions and limitations for Optimized ZIRLO™ fuel rod cladding and provide continued compliance with the acceptance criteria of 10 CFR 50.46.

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

Based on the above, SNC 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

Applicable Regulatory Requirements / Criteria

- 10 CFR 50.46 provides acceptance criteria for emergency core cooling systems for light-water nuclear power reactors.
- Appendix K to Part 50 establishes the required and acceptable features of the ECCS evaluation models.
- By letter dated June 10, 2005, the NRC staff issued a safety evaluation approving Addendum 1 to Westinghouse Topical Report WCAP-12610-P-A & CENPD-404-P-A, "Optimized ZIRLO™," wherein the NRC staff approved the use of Optimized ZIRLO™ as an acceptable fuel cladding material for Westinghouse and Combustion Engineering (CE) fuel designs.

Joseph M. Farley Nuclear Plant – Units 1 and 2

SNC evaluated the proposed changes to determine whether applicable regulations and requirements continue to be met. This determination found that the proposed change to allow the use of Optimized ZIRLO™ fuel rod cladding material requires an exemption 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 2 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 FNP Plant Specific Design Criterion differently than described in the Updated Final Safety Analysis Report.

Vogtle Electric Generating Plant – Units 1 and 2

SNC evaluated the proposed changes to determine whether applicable regulations and requirements continue to be met. This determination found that the proposed change to allow the use of Optimized ZIRLO™ fuel rod cladding material requires an exemption 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 2 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 VEGP Plant Specific Design Criterion differently than described in the Updated Final Safety Analysis Report.

5.3 Precedent

As part of the industry focus to minimize the potential for fuel failure, several licensees have received staff approval to use Optimized ZIRLO™. Dominion has received approval at North Anna Power Station, Units 1 and 2, Surry Power Station, Units 1 and 2, (References 3 - 5) and most recently, Millstone Power Station, Unit 3 (Reference 6). Indiana Michigan Power Company has also received approval at D.C. Cook Nuclear Plant, Unit 1 and 2 (References 7-8).

5.4 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.

6. Environmental Considerations

Joseph M. Farley Nuclear Plant – Units 1 and 2

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR Part 20. However, 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 effluents 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.

Vogtle Electric Generating Plant – Units 1 and 2

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR Part 20. However, 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 effluents 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. References

Joseph M. Farley Nuclear Plant – Units 1 and 2

1. 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 W CAP-12610-P-A & CENPD-404-P-A, 'Optimized ZIRLO™'," June 10, 2005.

3. J. S. Wiebe to D. A. Heacock, "North Anna Power Station, Unit Nos. 1 and 2, Issuance of Amendment Regarding the Use of Optimized ZIRLO™ Fuel Rod Cladding (TAC Nos. ME3885 and ME3886)," Accession No. ML110601196, April 14, 2011.

4. K. Cotton to D. A. Heacock, "Surry Power Station, Unit Nos. 1 and 2, Issuance of Amendments Regarding the Use of Optimized ZIRLO™ Fuel Rod Cladding (TAC Nos. ME3343 and ME 3344)," Accession No. ML103360256, December 22, 2010.

5. K. Cotton to D. A. Heacock, "Surry Power Station, Unit Nos. 1 and 2, Corrections to Amendments Regarding the Use of Optimized ZIRLO™ Fuel Rod Cladding (TAC Nos. ME3343 and ME 3344)," Accession No. ML103570192, December 23, 2010.

6. J. Kim to D. A. Heacock, "Millstone Power Station Unit No. 3 - Issuance of Amendment Re: The Use of Optimized ZIRLO™ Fuel Rod Cladding (TAC No. ME7663)," Accession No. ML12236A396, September 24, 2012.

7. P .S. Tam to L. J. Weber, "Donald C. Cook Nuclear Plant, Unit 1- Issuance of Amendment Re: Use of Optimized ZIRLO™ Fuel Rod Cladding Material (TAC No. ME5183)," Accession No. ML111610020, August 25, 2011.

8. P .S. Tam to L. J. Weber, "Donald C. Cook Nuclear Plant, Unit 2 - Issuance of Amendment Re: Use of Optimized ZIRLO™ Fuel Rod Cladding Material (TAC No. ME7323)," Accession No. ML12138A398, August 23, 2012.

Vogtle Electric Generating Plant – Units 1 and 2

1. 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 W CAP-12610-P-A & CENPD-404-P-A, 'Optimized ZIRLO™'," June 10, 2005.

3. J. S. Wiebe to D. A. Heacock, "North Anna Power Station, Unit Nos. 1 and 2, Issuance of Amendment Regarding the Use of Optimized ZIRLO™ Fuel Rod Cladding (TAC Nos. ME3885 and ME3886)," Accession No. ML110601196, April 14, 2011.

4. K. Cotton to D. A. Heacock, "Surry Power Station, Unit Nos. 1 and 2, Issuance of Amendments Regarding the Use of Optimized ZIRLO™ Fuel Rod Cladding (TAC Nos. ME3343 and ME 3344)," Accession No. ML103360256, December 22, 2010.

5. K. Cotton to D. A. Heacock, "Surry Power Station, Unit Nos. 1 and 2, Corrections to Amendments Regarding the Use of Optimized ZIRLO™ Fuel Rod Cladding (TAC Nos. ME3343 and ME 3344)," Accession No. ML103570192, December 23, 2010.

6. J. Kim to D. A. Heacock, "Millstone Power Station Unit No. 3 - Issuance of Amendment Re: The Use of Optimized ZIRLO™ Fuel Rod Cladding (TAC No. ME7663)," Accession No. ML12236A396, September 24, 2012.

7. P .S. Tam to L. J. Weber, "Donald C. Cook Nuclear Plant, Unit 1- Issuance of Amendment Re: Use of Optimized ZIRLO™ Fuel Rod Cladding Material (TAC No. ME5183)," Accession No. ML111610020, August 25, 2011.

8. P .S. Tam to L. J. Weber, "Donald C. Cook Nuclear Plant, Unit 2 - Issuance of Amendment Re: Use of Optimized ZIRLOTM Fuel Rod Cladding Material (TAC No. ME7323)," Accession No. ML12138A398, August 23, 2012.

Joseph M. Farley Nuclear Plant – Units 1 and 2
Vogtle Electric Generating Plant – Units 1 and 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™
High Performance Fuel Cladding Material in Core Reload Applications

Enclosure 2

Basis for Proposed Exemption Request

Enclosure 2

Basis for Proposed Exemption from the Provisions of 10 CFR 50.46 and 10 CFR Part 50 Appendix K to Allow Use of Optimized ZIRLO™ High Performance Fuel Cladding Material in Core Reload Applications

Table of Contents

1. Purpose

Southern Nuclear Operating Company (SNC) 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 FNP and VEGP. 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.

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™ material 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.

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

3. Technical Justification of Acceptability

Joseph M. Farley Nuclear Plant – Units 1 and 2

Westinghouse Electric Company, LLC (Westinghouse) topical report W CAP-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 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. Westinghouse has provided the U. S. Nuclear Regulatory Commission (NRC) with information related to test data and models (References 3, 4, 5, 6, 7, 8, and 9) to address conditions and limitations 6 and 7.

Condition and limitation 9 does not apply because Farley Units 1 and 2 are not licensed with LOCBART or STRIKIN-II. The remaining conditions and limitations will be addressed by the FNP 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.

Vogtle Electric Generating Plant – Units 1 and 2

Westinghouse Electric Company, LLC (Westinghouse) topical report WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™" (Reference 1), provides the details and results of material testing of Optimized ZIRLO™ compared to ZIRLO® as well as the material properties to be used in various models and methodologies when analyzing 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. Westinghouse has provided the U. S. Nuclear Regulatory Commission (NRC) with information related to test data and models (References 3, 4, 5, 6, 7, 8, and 9) to address conditions and limitations 6 and 7.

Condition and limitation 9 requires a LOCBART or STRIKIN-II calculation if the limiting peak clad temperature (PCT) occurs during blowdown or early reflood. Vogtle Units 1 and 2 are not licensed with STRIKIN-II. A review of the Vogtle Units 1 and 2 Large Break LOCA calculations reveals that in all pertinent cases, the peak cladding temperature does not occur during the blowdown or early reflood portion of the transient; therefore, a LOCBART calculation using the Optimized ZIRLO™ specific heat model is not required for Vogtle Units 1 and 2. The remaining conditions and limitations will be addressed by the proposed VEGP 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.

4. 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 FNP and VEGP 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, SNC 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 FNP and VEGP are supported by the applicable site specific TS. Reload cores are required to be operated in accordance with the operating limits specified in the TS. 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 FNP and VEGP cores will not affect plant operations and is consistent with the common defense and security.

5. 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 ZIRLO®, the current ECCS analysis approach remains applicable. Westinghouse will continue to perform a reload safety evaluation of the FNP and VEGP cores using Loss of Coolant Accident (LOCA) methods approved for FNP and VEGP 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 ZIRLO® fuel rod cladding materials, the application of the Baker-Just equation will continue to conservatively bound all post-LOCA scenarios.

6. 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 clad 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 in the FNP and VEGP cores, 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.

7. References

Joseph M. Farley Nuclear Plant – Units 1 and 2

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.

7. Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "SER Compliance of W CAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, 'Optimized ZIRLO™'," LTR-NRC-10-43, July 26, 2010.

8. Letter from James A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "SER Compliance of W CAP-12610-P-A & CENPD-404-P-A Addendum 1- A, 'Optimized ZIRLO™'," LTR-NRC-13-6, February 25, 2013.

9. Letter from James A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "Submittal of Responses to Draft RAIs and Revisions to Select Figures in LTR-NRC-13-6 to Fulfill Conditions 6 and 7 of the Safety Evaluation for WCAP-12610-P-A & CENPD-404-P-A Addendum 1- A (Proprietary/Non-Proprietary)," LTR-NRC-15-7, February 9, 2015.

Vogtle Electric Generating Plant – Units 1 and 2

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.

7. Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "SER Compliance of W CAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, 'Optimized ZIRLO™'," LTR-NRC-10-43, July 26, 2010.

8. Letter from James A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "SER Compliance of W CAP-12610-P-A & CENPD-404-P-A Addendum 1- A, 'Optimized ZIRLO™'," LTR-NRC-13-6, February 25, 2013.

9. Letter from James A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "Submittal of Responses to Draft RAIs and Revisions to Select Figures in LTR-NRC-13-6 to Fulfill Conditions 6 and 7 of the Safety Evaluation for WCAP-12610-P-A & CENPD-404-P-A Addendum 1- A (Proprietary/Non-Proprietary)," LTR-NRC-15-7, February 9, 2015.

Joseph M. Farley Nuclear Plant – Units 1 and 2
Vogtle Electric Generating Plant – Units 1 and 2
License Amendment for Optimized ZIRLO™ Fuel Rod Cladding

Enclosure 3

Markup of Proposed Technical Specification

4.0 DESIGN FEATURES

4.1 Site Location

The site is located in southeast Alabama on the west side of the Chattahoochee River about 6 miles north of the intersection of U.S. Highway No. 84 and State Highway No. 95. It is in the northeastern section of Houston County, Alabama, and about 180 miles south-southwest of Atlanta, Georgia.

4.2 Reactor Core

ZIRLO®, or Optimized ZIRLO™

4.2.1 Fuel Assemblies

The reactor shall contain 157 fuel assemblies. Each assembly shall consist of a matrix of zirconium alloy, zircaloy-4, ~~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, zircaloy-4, ZIRLO, or stainless steel filler rods for fuel rods, in accordance with NRC-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 48 control rod assemblies. The control material shall be silver, indium, and 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 5.0 weight percent;

(continued)

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

3a. WCAP-12945-P-A, Volume 1, Revision 2, and Volumes 2 through 5, Revision 1, "Code Qualification Document for Best Estimate LOCA Analysis," March 1998 (W Proprietary). VANTAGE+

3b. WCAP-12610-P-A, "~~Vantage+~~ Fuel Assembly Reference Core Report," April 1995 (W Proprietary).

(Methodology for LCO 3.2.1 - Heat Flux Hot Channel Factor and LCO 3.4.1-RCS Pressure, Temperature and Flow Departure from Nucleate Boiling Limits.)

~~3c.~~ 3d. WCAP-16009-P-A, "Realistic Large Break LOCA Evaluation Methodology Using Automated Statistical Treatment of Uncertainty Method (ASTRUM)" M.E. Nissley, et al., January 2005 (Proprietary).

4. WCAP-8745-P-A, "Design Bases for the Thermal Overpower ΔT and Thermal Overtemperature ΔT Trip Functions," September 1986 (Westinghouse Proprietary)

(Methodology for Overpower ΔT and Thermal Overtemperature ΔT Trip Functions)

5. WCAP-14750-P-A Revision 1, "RCS Flow Verification Using Elbow Taps at Westinghouse 3-Loop PWRs. (Westinghouse Proprietary)

(Methodology for minimum RCS flow determination using the elbow tap measurement.)

6a. WCAP-11596-P-A, "Qualification of the Phoenix-P/ANC Nuclear Design System for Pressurized Water Reactor Cores," June 1988

----------NOTE----------
Commencing Unit 1 Cycle 27 and Unit 2 Cycle 24, methods 6b and 6c shall be used in lieu of method 6a.

6b. WCAP-16045-P-A, "Qualification of the Two-Dimensional Transport Code PARAGON," August 2004

6c. WCAP-16045-P-A, Addendum 1-A, "Qualification of the NEXUS Nuclear Data Methodology," August 2007

(Methodology for LCO 3.9.1 - Boron Concentration and LCO 3.1.3 – Moderator Temperature Coefficient.)

3c. WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006. (Westinghouse Proprietary)

(continued)

4.0 DESIGN FEATURES

4.1 Site

4.1.1 Site and Exclusion Area Boundaries (EAB)

The VEGP site and EAB consist of approximately 3,169 acres in eastern Georgia on the west side of the Savannah River about 26 miles southeast of Augusta, Georgia, and 15 miles east-northeast of Waynesboro, Georgia, in Burke County, Georgia. The nearest point to the EAB from the VEGP Reactors is the near bank of the Savannah River. Reactor 1 is approximately 3600 feet from the EAB and Reactor 2 is approximately 3900 feet from the EAB.

4.1.2 Low Population Zone (LPZ)

The LPZ is that area falling within a 2-mile radius from the midpoint between the containment buildings.

4.2 Reactor Core

, ZIRLO®, or Optimized ZIRLO™

4.2.1 Fuel Assemblies

The reactor shall contain 193 fuel assemblies. Each assembly shall consist of a matrix of Zircaloy ~~or ZIRLO™~~ clad 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 control rod assemblies. The control material shall be silver-indium-cadmium, or hafnium metal as approved by the NRC.

(continued)

5.6 Reporting Requirements (continued)

5.6.5 Core Operating Limits Report (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

LCO 3.1.1 "SHUTDOWN MARGIN"
LCO 3.1.3 "Moderator Temperature Coefficient"
LCO 3.1.5 "Shutdown Bank Insertion Limits"
LCO 3.1.6 "Control Bank Insertion Limits"
LCO 3.2.1 "Heat Flux Hot Channel Factor"
LCO 3.2.2 "Nuclear Enthalpy Rise Hot Channel Factor"
LCO 3.2.3 "Axial Flux Difference"
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:

WCAP-9272-P-A, "WESTINGHOUSE RELOAD SAFETY EVALUATION METHODOLOGY," July 1985 (W Proprietary). (Methodology for Moderator Temperature Coefficient, Shutdown Bank.Insertion Limit, Control Bank Insertion Limits, and Nuclear Enthalpy Rise Hot Channel Factor.)

WCAP-10216-P-A, Revision 1A, "RELAXATION OF CONSTANT AXIAL OFFSET CONTROL FQ SURVEILLANCE TECHNICAL SPECIFICATION," February, 1994 (W Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

(W Proprietary) (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

WCAP-10266-P-A, Revision 2, "The 1981 Version of the Westinghouse ECCS Evaluation Model Using the BASH Code," March 1987.

WCAP-13749-P-A, "Safety Evaluation Supporting the Conditional Exemption of the Most Negative EOL Moderator Temperature Coefficient Measurement," March 1997.

WCAP-16045-P-A, "Qualification of the Two-Dimensional Transport Code PARAGON," August 2004 (Methodology for Moderator Temperature Coefficient.)

WCAP-16045-P-A, Addendum 1-A, "Qualification of the NEXUS Nuclear Data Methodology," August 2007 (Methodology for Moderator Temperature Coefficient.)

(continued)

WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," April 1995. (Westinghouse Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006. (Westinghouse Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

Joseph M. Farley Nuclear Plant – Units 1 and 2
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License Amendment for Optimized ZIRLO™ Fuel Rod Cladding

Enclosure 4

Clean Typed Pages for Technical Specification

4.0 DESIGN FEATURES

4.1 Site Location

The site is located in southeast Alabama on the west side of the Chattahoochee River about 6 miles north of the intersection of U.S. Highway No. 84 and State Highway No. 95. It is in the northeastern section of Houston County, Alabama, and about 180 miles south-southwest of Atlanta, Georgia.

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3b. WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," April 1995 (W Proprietary).

3c. WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006 (Westinghouse Proprietary).

3d. WCAP-16009-P-A, "Realistic Large Break LOCA Evaluation Methodology Using Automated Statistical Treatment of Uncertainty Method (ASTRUM)" M.E. Nissley, et al., January 2005 (Proprietary).

(Methodology for LCO 3.2.1 - Heat Flux Hot Channel Factor and LCO 3.4.1-RCS Pressure, Temperature and Flow Departure from Nucleate Boiling Limits.)

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6c. WCAP-16045-P-A, Addendum 1-A, "Qualification of the NEXUS Nuclear Data Methodology," August 2007

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(continued)

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(continued)

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LCO 3.2.2 "Nuclear Enthalpy Rise Hot Channel Factor"
LCO 3.2.3 "Axial Flux Difference"
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:

WCAP-9272-P-A, "WESTINGHOUSE RELOAD SAFETY EVALUATION METHODOLOGY," July 1985 (W Proprietary). (Methodology for Moderator Temperature Coefficient, Shutdown Bank Insertion Limit, Control Bank Insertion Limits, and Nuclear Enthalpy Rise Hot Channel Factor.)

WCAP-10216-P-A, Revision 1A, "RELAXATION OF CONSTANT AXIAL OFFSET CONTROL FQ SURVEILLANCE TECHNICAL SPECIFICATION," February, 1994 (W Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

WCAP-10266-P-A, Revision 2, "The 1981 Version of the Westinghouse ECCS Evaluation Model Using the BASH Code," March 1987. (W Proprietary) (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

WCAP-13749-P-A, "Safety Evaluation Supporting the Conditional Exemption of the Most Negative EOL Moderator Temperature Coefficient Measurement," March 1997.

WCAP-16045-P-A, "Qualification of the Two-Dimensional Transport Code PARAGON," August 2004 (Methodology for Moderator Temperature Coefficient.)

WCAP-16045-P-A, Addendum 1-A, "Qualification of the NEXUS Nuclear Data Methodology," August 2007 (Methodology for Moderator Temperature Coefficient.)

(continued)

5.6 Reporting Requirements (continued)

5.6.5 Core Operating Limits Report (COLR) (continued)

WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," April 1995 (Westinghouse Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006 (Westinghouse Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

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 heatup, cooldown, operation, criticality, and hydrostatic testing 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"

b. The power operated relief valve lift settings required to support the Cold Overpressure Protection Systems (COPS) and the COPS arming temperature shall be established and documented in the PTLR for the following:

LCO 3.4.12 "Cold Overpressure Protection Systems"

c. The analytical methods used to determine the RCS pressure and temperature limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. WCAP-14040-A, Rev. 4, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves."

(continued)

5.6 Reporting Requirements

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

2. WCAP-16142-P, Rev. 1, "Reactor Vessel Closure Head/Vessel Flange Requirements Evaluation for Vogtle Units 1 and 2."

3. The PTLR will contain the complete identification for each of the TS reference Topical Reports used to prepare the PTLR (i.e., report number, title, revision, date, and any supplements).

d. The PTLR shall be provided to the NRC upon issuance for each reactor vessel fluence period and for any revision or supplement thereto.

5.6.7 EDG Failure Report

If an individual emergency diesel generator (EDG) experiences four or more valid failures in the last 25 demands, these failures and any nonvalid failures experienced by that EDG in that time period shall be reported within 30 days. Reports on EDG failures shall include the information recommended in Regulatory Guide 1.9, Revision 3, Regulatory Position C.4, or existing Regulatory Guide 1.108 reporting requirement.

5.6.8 PAM Report

When a Report is required by Condition G or J 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.

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