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June 9, 2009
RC-09-0068

SCE&G®
A SCANA COMPANY

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

Dear Sir / Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
LICENSE AMENDMENT REQUEST - LAR 09-00562
License Amendment Request For Use Of Optimized Zirlo™ Fuel Rod Cladding

Pursuant to 10 CFR 50.90, South Carolina Electric and Gas Company (SCE&G), acting for itself and as an agent for South Carolina Public Service Authority (Santee Cooper), hereby requests the following amendment for Virgil C. Summer Nuclear Station (VCSNS), Technical Specifications (TS). TS 5.3.1 addresses the reactor core assemblies that specify, "Each fuel assembly shall consist of 264 Zircaloy-4 or ZIRLO™ clad fuel rods..." the Enclosure proposes the following changes; 1) adding Optimized ZIRLO™ to the approved fuel rod cladding materials and 2) adding a Westinghouse topical report to the analytical methods used to determine the core operating limits previously reviewed and approved by the NRC identified in TS 6.9.1.11. This change is consistent with the US 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, "Optimized ZIRLO™."

To support the change and pursuant to 10 CFR 50.12, SCE&G 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 Part 50, "ECCS Evaluation Models" for VCSNS. The exemption request relates solely to the specific types of cladding material specified in these regulations for use in light water reactors. As written, the regulations presume the use of either Zircaloy or ZIRLO™ fuel rod cladding. The exemption request is required since Optimized ZIRLO™ has a slightly different composition than Zircaloy or ZIRLO™. The exemption request is included as Attachment 1. The NRC has granted prior approval for use of Optimized ZIRLO™ fuel rod cladding to Entergy Operations Inc. Arkansas Nuclear One, Unit 2 (ML080370014) and Waterford Steam Electric Station, Unit 3 (ML080380004).

SCE&G requests approval of the proposed amendment by February 10, 2010 to support the next core design for the Spring 2011 core reload. Once approved, the amendment shall be implemented within 60 days.

This proposed change has been reviewed and approved by both the VCSNS Plant Safety Review Committee (PSRC) and the VCSNS Nuclear Safety Review Committee (NSRC).

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In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the designated South Carolina Official.

If you should have any questions regarding this submittal, please contact Mr. Bruce L. Thompson at (803) 931-5042.

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

6/9/09
Executed on

Jeffrey B. Archie

JMG/GAR/JBA/jhw/dr
Enclosures:
Evaluation of the Proposed Change(s)
Attachments: 4

1. Request for Exemption from the Provisions of 10 CFR 50.46 and 10 CFR Part 50 Appendix K to Allow Use of Optimized ZIRLO™ in Core Reload Applications
2. Proposed Technical Specification Changes (mark-up)
3. Proposed Technical Specification pages (Retyped)
4. List of Regulatory Commitments

cc: K. B. Marsh
S. A. Byrne
N. S. Carns
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RTS (CR-09-00562)
File (813.20)
PRSF (RC-09-0068)

Subject: **LICENSE AMENDMENT REQUEST - LAR 09-00562
EVALUATION OF THE PROPOSED TECHNICAL SPECIFICATION
CHANGE(S) TO SECTIONS 5.3.1 AND 6.9.1.11.**

1.0 DESCRIPTION

This license amendment request (LAR) is a request to amend the Technical Specifications (TS) for Virgil C. Summer Nuclear Station (VCSNS).

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 VCSNS TS 5.3.1, Reactor Core Assemblies. The proposed change would revise TS 5.3.1 and TS 6.9.1.11 to add Westinghouse topical report WCAP-12610-P-A to the analytical methods used to determine the core operating limits previously reviewed and approved by the NRC.

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 required to support this change. The exemption request is included as Attachment 1.

2.0 PROPOSED CHANGE

The proposed change will revise VCSNS TS 5.3.1 by adding Optimized ZIRLO™ as an acceptable fuel rod cladding material. Additionally TS 6.9.1.11 is being revised to add WCAP-12610-P-A to the list of documents previously reviewed and approved by the NRC.

3.0 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.

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 "Optimized ZIRLO™," July 2006 (Reference 1). The staff's safety evaluation for Optimized ZIRLO™ dated 6/10/2005 (ML051670395) requires licensees referencing Addendum 1-A to implement Optimized ZIRLO™ must comply with the ten (10) conditions and limitations listed within the safety evaluation. These conditions and limitations are addressed in Section 4.0. The NRC has allowed use of Optimized ZIRLO™ fuel cladding material in Westinghouse reactors as issued for Entergy Operations Inc. Arkansas Nuclear One, Unit 2 (ML080370014) and Waterford Steam Electric Station, Unit 3 (ML080380004).

4.0 TECHNICAL

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 contains ten conditions and limitations. SCE&G 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 Part 50, Appendix K is included as Attachment 1 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 [proprietary limits

included in topical report and proprietary version of safety evaluation] of hydrides for all locations of the fuel rod. Confirmation of these modified limits for Optimized ZIRLO™ fuel cladding are 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 all conditions associated with approved methods. For VCSNS 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 VCSNS 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 U.S. Nuclear Regulatory Commission, "SER Compliance With WCAP-12610-P-A and CENDP-404-P-A, Addendum 1-A, "Optimized ZIRLO™," LTR-NRC-07-01, January 4, 2007.
- Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "SER Compliance With WCAP-12610-P-A and CENDP-404-P-A, Addendum 1-A, "Optimized ZIRLO™," LTR-NRC-07-58, November 6, 2007. (ML073130556)
- Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "SER Compliance With WCAP-12610-P-A and CENDP-404-P-A, Addendum 1-A, "Optimized ZIRLO™," LTR-NRC-07-58 Rev. 1, February 5, 2008. (ML080390451)
- 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.

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. SCE&G will confirm that as higher burnups/fluences are achieved for Optimized ZIRLO™ clad fuel rods that the requirements of this condition will be met as it applies to VCSNS.

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 and CENDP-404-P-A, Addendum 1-A, "Optimized ZIRLO™," LTR-NRC-07-01, January 4, 2007.
- Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "SER Compliance With WCAP-12610-P-A and CENDP-404-P-A, Addendum 1-A, "Optimized ZIRLO™," LTR-NRC-07-58, November 6, 2007. (ML073130556)
- Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "SER Compliance With WCAP-12610-P-A and CENDP-404-P-A, Addendum 1-A, "Optimized ZIRLO™," LTR-NRC-07-58 Rev. 1, February 5, 2008. (ML080390451)
- 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. SCE&G will confirm that as higher burnups/fluences are achieved for Optimized ZIRLO™ clad fuel rods that the requirements of this condition will be met as it applies to VCSNS.

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 pseudoirradiated 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: VCSNS 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. SCE&G will confirm that as higher burnups/fluences are achieved for Optimized ZIRLO™ clad fuel rods that the requirements of this condition will be met as it applies to VCSNS.

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: VCSNS is not licensed with LOCBART or STRIKIN-II therefore, this condition and limitation does 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: The Westinghouse limit on PCT during the locked rotor event will be assessed relative to the [proprietary limits included in topical report and proprietary version of safety evaluation] PCT limit as part of the core reload design process.

5.0 REGULATORY SAFETY ANALYSIS

5.1 No Significant Hazards Consideration

SCE&G 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 Technical Specification change is to add Optimized ZIRLO™ to the allowable or approved cladding materials to be used at Virgil C. Summer Nuclear Station (VCSNS). The proposed change of adding a cladding material does not result in an increase to the probability or consequences of an accident previously evaluated. Technical Specifications (TS 5.3.1) address the reactor core assemblies that specify, "Each fuel assembly shall consist of 264 Zicaloy-4 or ZIRLO™ clad fuel rods..." The proposed change will add Optimized ZIRLO™ to the approved fuel rod cladding materials. Additionally, reference to WCAP-12610-P-A, "VANTAGE + Fuel Assembly Reference Core Report," April 1995 (W Proprietary) and WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006 (W Proprietary) will be included to the listing of documents previously reviewed and approved by the NRC within TS 6.9.1.11.

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™. 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. Therefore, adding Optimized ZIRLO™ to the approved fuel rod cladding materials does not result in an increase to the probability or consequences of an accident previously evaluated.

The US 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 within NRC Safety Evaluation (SE) for the topical report. The conditions and limitations are the current requirements and confirmation of these conditions is required as part of the core reload process.

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

Response: No.

The proposed Technical Specification change is to add Optimized ZIRLO™ to the allowable or approved cladding materials to be used at VCSNS. Optimized ZIRLO™ was developed to provide a reduced corrosion rate while maintaining the benefits of mechanical strength and resistance to accelerated corrosion from abnormal chemistry conditions. The fuel rod design bases are established to satisfy the general and specific safety criteria addressed within FSAR Chapter 15, Accident Analyses and TSs. The fuel rods are designed to prevent excessive fuel temperatures, excessive internal rod gas pressures due to fission gas releases, and excessive cladding stresses and strains. 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 original design basis requirements have been maintained. Therefore, the change in material does not create the possibility of a new or different kind of accident or malfunction previously evaluated within the FSAR.

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

Response: No.

The cladding material used in the fuel rods are 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 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 Safety Evaluation (SE). The original design basis requirements have been maintained. Therefore, the change in material does not result in a reduction in margin required to preclude or reduce the effects of an accident or malfunction previously evaluated in the FSAR.

Based on the above, SCE&G concludes that the proposed amendment 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.

5.2 Applicable Regulatory Requirements/Criteria

The NRC has allowed use of Optimized ZIRLO™ fuel cladding material in Westinghouse Original Equipment Manufacturer (OEM) reactors provided that Licensees ensure compliance with the conditions and limitations set forth within NRC Safety Evaluation (SE) for the topical report. 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™. Each of the limits and conditions were specifically addressed for their applicability to VCSNS within the technical section of this LAR. In summary, core reload evaluations ensure the acceptance criteria are met for all the limitations and conditions for the 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™. Additionally, SCE&G will confirm that prior to initial batch loading and/or prior to the startup of subsequent cycles for Optimized ZIRLO™ clad fuel rods, the requirement conditions of NRC staff's SER items 6, 7 and 8 will be met as it applies to VCSNS.

The proposed change has been evaluated to validate those regulations and requirements continue to be met. SCE&G concurs with the NRC SER that 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" is required. The request for exemption has been provided as Attachment 1 and provides the basis and justification for relief from these regulations.

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.

6.0 ENVIRONMENTAL CONSIDERATION

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

7.0 REFERENCES

1. WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006 (ML062080576).

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. (ML051670395)

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.

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. (ML073130556)

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. (ML080390451)

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.

VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12

ATTACHMENT 1

REQUEST FOR EXEMPTION FROM THE PROVISIONS OF 10 CFR 50.46 AND 10 CFR PART 50 APPENDIX K TO ALLOW USE OF OPTIMIZED ZIRLO™ IN CORE RELOAD APPLICATIONS

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

1.0 PURPOSE

South Carolina Electric and Gas Company (SCE&G) 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 Virgil C. Summer Nuclear Station (VCSNS). 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 cladding.

2.0 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 feed back effects) have become more limiting with respect to fuel rod design criteria. Reducing the associated corrosion buildup and thus minimizing temperature feedback effects provides additional margin to the fuel rod internal pressure design criterion.

Technical Specification (TS) changes for VCSNS are required to allow the use of Optimized ZIRLO™ fuel rod cladding for core reload applications. The request for these changes is included within the Enclosure.

3.0 TECHNICAL JUSTIFICATION OF ACCEPTABILITY

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 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 and limitation requires an exemption from 10 CFR 50.46 and 10 CFR Part 50, Appendix K. 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 VCSNS is not licensed with LOCBART or STRIKIN-II. The remaining conditions and limitations will be addressed in the VCSNS TS changes and evaluations required to support core reload activities. Since plant specific TS changes are required prior to utilizing Optimized ZIRLO™, no new commitments are necessary to support NRC approval of this exemption request.

The core reload evaluations will ensure that acceptance criteria are met for all the other limitations and conditions for the 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™.

4.0 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 in addition to Zircaloy or ZIRLO™ for core reload applications at VCSNS 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 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. Furthermore, by submitting this exemption request, VCSNS 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 core reload 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 VCSNS 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 only to allow the application of the aforementioned regulations to an improved fuel rod cladding material. All the requirements and acceptance criteria will be maintained. 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 VCSNS core will not affect plant operations and is consistent with common defense and security.

5.0 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. Westinghouse will perform an evaluation of the VCSNS core using 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.

6.0 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 does 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 request, these regulations will be applied to Optimized ZIRLO™.

In order to support the use of Optimized ZIRLO™ fuel rod cladding material, an exemption from the requirements of 10 CFR 50.46 and 10 CFR Part 50, Appendix K is requested. As required by 10 CFR 50.12, the requested exemption is authorized by law, does not present undue risk to public health and safety, and is consistent with 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.

7.0 REFERENCES

1. WCAP-12610-P-A and 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 to Topical Report WCAP-12610-P-A and CENPD-404-P-A, 'Optimized ZIRLO™'," June 10, 2005. (ML051670395)

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.

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. (ML073130556)

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. (ML080390451)

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.

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DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12

ATTACHMENT 2

PROPOSED TECHNICAL SPECIFICATION CHANGES (MARK-UP)

Proposed Technical Specification Changes Summary

Replace the following pages of the Appendix A to Operating License Number NPF-12, Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove Pages	Insert Pages
5-6	5-6
6-16	6-16
6-16a	6-16a

SCE&G - EXPLANATION OF CHANGES

Page	Affected Section	Bar #	Description of Change	Reason for Change
5-6	5.3.1	1	Changed "Zircaloy-4 or ZIRLO™", To "Zircaloy-4, ZIRLO™, or Optimized ZIRLO™".	Add Optimized ZIRLO™ to the approved fuel rod cladding materials.
6-16	6.9.1.11.a. 6.9.1.11.b.	N/A	Moved 6.9.1.11.a and 6.9.1.11.b from page 6-16a to 6.16.	Repagination.
6-16a	6.9.1.11.f	1	Added new 6.9.1.11.f.	Add Westinghouse topical report WCAP-12610-P-A to the analytical methods used to determine the core operating limits previously reviewed and approved by the NRC

DESIGN FEATURES

Zircaloy-4, ZIRLO™, or Optimized ZIRLO™

5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The core shall contain 157 fuel assemblies. Each fuel assembly shall consist of 264 ~~Zircaloy-4 or ZIRLO™~~ clad fuel rods with an initial composition of uranium dioxide with a maximum nominal enrichment of 4.95 weight percent U-235 as fuel material. Limited substitutions of ~~Zircaloy-4, ZIRLO™~~ and/or stainless steel filler rods for fuel rods, if justified by a cycle specific reload analysis using an NRC-approved methodology, may be used. Fuel assembly configurations shall be limited to those designs that have been analyzed with applicable NRC staff-approved codes and methods, and shown by tests or cycle-specific reload analyses to comply with all fuel safety design bases. Reload fuel shall contain sufficient integral fuel burnable absorbers such that the requirements of Specifications 5.6.1.1a.2 and 5.6.1.2.b are met. A limited number of lead test assemblies that have not completed representative testing may be placed in non-limiting core locations.

Zircaloy-4, ZIRLO™, Optimized ZIRLO™

CONTROL ROD ASSEMBLIES

5.3.2 The reactor core shall contain 48 full length control rod assemblies. The full length control rod assemblies shall contain a nominal 142 inches of absorber material. The nominal values of absorber material shall be 80 percent silver, 15 percent indium and 5 percent cadmium. All control rods shall be clad with stainless steel tubing.

5.4 REACTOR COOLANT SYSTEM

DESIGN PRESSURE AND TEMPERATURE

5.4.1 The reactor coolant system is designed and shall be maintained:

a. In accordance with the code requirements specified in Section 5.2 of the FSAR, with allowance for normal degradation pursuant to the applicable Surveillance Requirements,

b. For a pressure of 2485 psig, and

c. For a temperature of 650°F, except for the pressurizer which is 680°F.

VOLUME

5.4.2 The total water and steam volume of the reactor coolant system is 9914 ± 100 cubic feet at an indicated T_{avg} of 587.4°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

ADMINISTRATIVE CONTROLS

6.9.1.9 Not used.

6.9.1.10 Not used.

CORE OPERATING LIMITS REPORT

6.9.1.11 Core operating limits shall be established and documented in the CORE OPERATING LIMITS REPORT prior to each reload cycle, or prior to any remaining portion of a reload cycle, for the following:

a. Moderator Temperature Coefficient BOL and EOL Limits and 300 ppm surveillance limit for Specification 3/4.1.1.3,

b. Shutdown Rod Insertion Limit for Specification 3/4.1.3.5,

c. Control Rod Insertion Limits for Specification 3/4.1.3.6,

d. Axial Flux Difference Limits, target band, and APL^{NO} for Specification 3/4.2.1,

e. Heat Flux Hot Channel Factor, F_Q^{RTP}, K(z), W(z), APL^{NO}, $W(z)_{BL}$, and $F_Q(z)$ manufacturing/measurement uncertainties for Specification 3/4.2.2,

f. Nuclear Enthalpy Rise Hot Channel Factor, $F_{\Delta H}^{RTP}$, Power Factor Multiplier, $PF_{\Delta H}$, and $F_{\Delta H}^{N}$ measurement uncertainties limits for Specification 3/4.2.3.

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:

a. WCAP-9272-P-A, "WESTINGHOUSE RELOAD SAFETY EVALUATION METHODOLOGY," July 1985 (W Proprietary).

(Methodology for Specifications 3.1.1.3 - Moderator Temperature Coefficient, 3.1.3.5 - Shutdown Rod Insertion Limits, 3.1.3.6 - Control Rod Insertion Limits, 3.2.1 - Axial Flux Difference, 3.2.2 - Heat Flux Hot Channel Factor, and 3.2.3 – RCS Flow Rate and Nuclear Enthalpy Rise Hot Channel Factor.)

b. WCAP-10216-P-A, Rev. 1A, "RELAXATION OF CONSTANT AXIAL OFFSET CONTROL FQ SURVEILLANCE TECHNICAL SPECIFICATION," February 1994 (W Proprietary).

(Methodology for Specifications 3.2.1 - Axial Flux Difference (Relaxed Axial Offset Control) and 3.2.2 - Heat Flux Hot Channel Factor (FQ Methodology for W(z) surveillance requirements).)

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ADMINISTRATIVE CONTROLS

CORE OPERATING LIMITS REPORT (Continued)

~~(Methodology for Specifications 3.1.1.3 - Moderator Temperature Coefficient, 3.1.3.5 - Shutdown Rod Insertion Limits, 3.1.3.6 - Control Rod Insertion Limits, 3.2.1 - Axial Flux Difference, 3.2.2 - Heat Flux Hot Channel Factor, and 3.2.3 - RCS Flow Rate and Nuclear Enthalpy Rise Hot Channel Factor.)~~

~~b. WCAP-10216-P-A, Rev. 1A, "RELAXATION OF CONSTANT AXIAL OFFSET CONTROL F_Q SURVEILLANCE TECHNICAL SPECIFICATION," February 1994 (W Proprietary).~~

~~(Methodology for Specifications 3.2.1 - Axial Flux Difference (Relaxed Axial Offset Control) and 3.2.2 - Heat Flux Hot Channel Factor (F_Q Methodology for W(z) surveillance requirements).)~~

c. WCAP-12945-P-A, Volume 1 (Revision 2) through Volumes 2 through 5 (Revision 1) "Code Qualification Document for Best Estimate LOCA Analysis," March 1998 (Westinghouse Proprietary).

Liparulo, N. (W) to NRC Document Control Desk, NSD-NRC-96-4746, "Re-Analysis Work Plans Using Final Best Estimate Methodology" dated 6/13/1996.

(Methodology for Specification 3.2.2 - Heat Flux Hot Channel Factor.)

d. WCAP-12472-P-A, "BEACON CORE MONITORING AND OPERATIONS SUPPORT SYSTEM," August 1994, (W Proprietary).

(Methodology for Specifications 3.2.2 - Heat Flux Hot Channel Factor, 3.2.3 - RCS Flow Rate and Nuclear Enthalpy Rise Hot Channel Factor, and 3.2.4 - Quadrant Power Tilt Ratio.)

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

(Methodology for Specification 3.1.1.3 - Moderator Temperature Coefficient.)

The core operating limits shall be determined so that all applicable limits (e.g., fuel thermal-mechanical limits, core thermal-hydraulic limits, nuclear limits such as shutdown margin, and transient and accident analysis limits) of the safety analysis are met.

The CORE OPERATING LIMITS REPORT, including any mid-cycle revisions or supplements

f. WCAP-12610-P-A, "VANTAGE + Fuel Assembly Reference Core Report," April 1995 (W Proprietary). WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006 (W Proprietary).

(Methodology for Specification 3.2.2 – Heat Flux Hot Channel Factor.)

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ATTACHMENT 3

PROPOSED TECHNICAL SPECIFICATION PAGES (RETYPED)

5.3 REACTOR CORE

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5.4.1 The reactor coolant system is designed and shall be maintained:

a. In accordance with the code requirements specified in Section 5.2 of the FSAR, with allowance for normal degradation pursuant to the applicable Surveillance Requirements,

b. For a pressure of 2485 psig, and

c. For a temperature of 650°F, except for the pressurizer which is 680°F.

VOLUME

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5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

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6.9.1.10 Not used.

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6.9.1.11 Core operating limits shall be established and documented in the CORE OPERATING LIMITS REPORT prior to each reload cycle, or prior to any remaining portion of a reload cycle, for the following:

a. Moderator Temperature Coefficient BOL and EOL Limits and 300 ppm surveillance limit for Specification 3/4.1.1.3,

b. Shutdown Rod Insertion Limit for Specification 3/4.1.3.5,

c. Control Rod Insertion Limits for Specification 3/4.1.3.6,

d. Axial Flux Difference Limits, target band, and APL^{ND} for Specification 3/4.2.1,

e. Heat Flux Hot Channel Factor, F_Q^{RTP}, K(z), W(z), APL^{ND}, $W(z)_{BL}$, and $F_Q(z)$ manufacturing/measurement uncertainties for Specification 3/4.2.2,

f. Nuclear Enthalpy Rise Hot Channel Factor, $F_{\Delta H}^{RTP}$, Power Factor Multiplier, $PF_{\Delta H}$, and $F_{\Delta H}^{N}$ measurement uncertainties limits for Specification 3/4.2.3.

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:

a. WCAP-9272-P-A, "WESTINGHOUSE RELOAD SAFETY EVALUATION METHODOLOGY," July 1985 (W Proprietary).

(Methodology for Specifications 3.1.1.3 - Moderator Temperature Coefficient, 3.1.3.5 - Shutdown Rod Insertion Limits, 3.1.3.6 - Control Rod Insertion Limits, 3.2.1 - Axial Flux Difference, 3.2.2 - Heat Flux Hot Channel Factor, and 3.2.3 - RCS Flow Rate and Nuclear Enthalpy Rise Hot Channel Factor.)

b. WCAP-10216-P-A, Rev. 1A, "RELAXATION OF CONSTANT AXIAL OFFSET CONTROL F_Q SURVEILLANCE TECHNICAL SPECIFICATION," February 1994 (W Proprietary).

(Methodology for Specifications 3.2.1 - Axial Flux Difference (Relaxed Axial Offset Control) and 3.2.2 - Heat Flux Hot Channel Factor (F_Q Methodology for W(z) surveillance requirements).)

CORE OPERATING LIMITS REPORT (Continued)

c. WCAP-12945-P-A, Volume 1 (Revision 2) through Volumes 2 through 5 (Revision 1) "Code Qualification Document for Best Estimate LOCA Analysis," March 1998 (Westinghouse Proprietary).

Liparulo, N. (W) to NRC Document Control Desk, NSD-NRC-96-4746, "Re-Analysis Work Plans Using Final Best Estimate Methodology" dated 6/13/1996.

(Methodology for Specification 3.2.2 - Heat Flux Hot Channel Factor.)

d. WCAP-12472-P-A, "BEACON CORE MONITORING AND OPERATIONS SUPPORT SYSTEM," August 1994, (W Proprietary).

(Methodology for Specifications 3.2.2 - Heat Flux Hot Channel Factor, 3.2.3 - RCS Flow Rate and Nuclear Enthalpy Rise Hot Channel Factor, and 3.2.4 - Quadrant Power Tilt Ratio.)

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

(Methodology for Specification 3.1.1.3 - Moderator Temperature Coefficient.)

f. WCAP-12610-P-A, "VANTAGE + Fuel Assembly Reference Core Report," April 1995 (W Proprietary). WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006 (W Proprietary).

(Methodology for Specification 3.2.2 - Heat Flux Hot Channel Factor.)

The core operating limits shall be determined so that all applicable limits (e.g., fuel thermal-mechanical limits, core thermal-hydraulic limits, nuclear limits such as shutdown margin, and transient and accident analysis limits) of the safety analysis are met.

The CORE OPERATING LIMITS REPORT, including any mid-cycle revisions or supplements there to shall be provided upon issuance, for each reload cycle, to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

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OPERATING LICENSE NO. NPF-12

ATTACHMENT 4

LIST OF REGULATORY COMMITMENTS

The following table identifies those actions committed to by Virgil C. Summer Nuclear Station (VCSNS) in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments. Please direct questions regarding these commitments to Mr. Bruce L. Thompson at (803) 931-5042.

Commitment	Due Date
The core reload process for VCSNS will ensure the conditions and limitations of the NRC SER for Optimized ZIRLO™ as addressed in Enclosure are met when a batch of Optimized ZIRLO™ is implemented.	Continuous, until the contingency requirements of the conditions and limitations have been satisfied.
SCE&G will confirm that Westinghouse will provide additional confirmatory data associated with LTA programs at other facilities prior to subsequent cycles of operation with Optimized ZIRLO™ fuel rod cladding.	Continuous, until the LTA data up through the fuel burnup limit applicable for VCSNS has been provided to the NRC.