VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

February 10, 2010

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Serial No. 10-074
SPS-LIC/CGL R0
Docket Nos. 50-280
50-281
License Nos. DPR-32
DPR-37

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
LICENSE AMENDMENT REQUEST
FOR USE OF OPTIMIZED ZIRLO FUEL ROD CLADDING

Pursuant to 10 CFR 50.90, Virginia Electric and Power Company (Dominion) hereby requests the following amendment for Surry Power Station Units 1 and 2 Technical Specifications (TS). TS 5.2.1 describes the reactor core fuel assemblies, and identifies, in part, Zircaloy or ZIRLO as the allowable fuel rod cladding materials. The proposed change will add Optimized ZIRLO as an acceptable fuel rod cladding material. In addition, we propose adding the Westinghouse topical report for Optimized ZIRLO to the analytical methods used to determine the core operating limits listed in TS 6.2.C. These changes are 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 Topical Report WCAP-12610-P-A and CENPD-404-P-A, "Optimized ZIRLO."

To support this change and pursuant to 10 CFR 50.12, Dominion 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 Surry Units 1 and 2. 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 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 standard ZIRLO. The exemption request is included as Attachment 4. 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).

Dominion requests approval of the proposed amendment by November 15, 2010 to support the core designs for the Surry 2 Cycle 24 core reload in the Spring of 2011 and

for the Surry 1 Cycle 25 core reload in the Spring of 2012. Once approved, the amendment shall be implemented within 60 days.

If you have any questions or require additional information, please contact Mr. Gary D. Miller at (804) 273-2771.

Sincerely,

J. Alan Price
Vice President - Nuclear Engineering

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by J. Alan Price, who is Vice President – Nuclear Engineering, of Virginia Electric and Power Company. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of his knowledge and belief.

MARGARET ANN REYES
Notary Public
Commonwealth of Virginia
244109
My Commission Expires Mar 31, 2012

Acknowledged before me this 10th day of February, 2010.

My Commission Expires: 3-31-12.

Margaret Ann Reyes
Notary Public

Commitments made in this letter:
1. The core reload process for Surry Power Station will ensure the Conditions and Limitations of the NRC Safety Evaluation for Optimized ZIRLO, as addressed in Attachment 1, are met when a batch of Optimized ZIRLO is implemented.
2. Dominion will confirm that Westinghouse will provide additional confirmatory data associated with lead test assembly programs at other facilities prior to subsequent cycles of operation with Optimized ZIRLO fuel rod cladding.

Attachments:
1. Discussion of Change
2. Marked-up Technical Specifications Pages
3. Proposed Technical Specification Pages
4. Exemption Request

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Attachment 1

Discussion of Change

Virginia Electric and Power Company
(Dominion)
Surry Power Station Units 1 and 2

Attachment 1

Discussion of Technical Specifications Changes

Table of Contents

1.0 Summary Description 2

2.0 Detailed Description of Proposed Technical Specifications Changes 2

3.0 Background 3

4.0 Technical Evaluation 4

5.0 Regulatory Evaluation 8

5.1 Applicable Regulatory Requirements / Criteria 8

5.2 No Significant Hazards Consideration 8

5.3 Precedents 10

5.4 Conclusion 11

6.0 Environmental Considerations 11

7.0 References 11

DISCUSSION OF TECHNICAL SPECIFICATIONS CHANGES

1.0 Summary Description

Virginia Electric and Power Company (Dominion) proposes to change Surry Power Station Units 1 and 2 Technical Specifications (TS) to allow the use of an additional fuel rod cladding material, Optimized ZIRLO. The current acceptable fuel rod cladding materials (Zircaloy and ZIRLO) are identified in TS 5.2.1, "Fuel Assemblies." A change to the References of Technical Specification 6.2.C, "Core Operating Limits Report," is also proposed to add the topical report for Optimized ZIRLO to the list of NRC-approved analytical models and methods used to determine the core operating limits.

In addition to the proposed Technical Specifications changes, 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," is required to support the use of this additional fuel rod cladding material. The exemption request is provided as a separate attachment to this submittal.

Dominion currently plans to use fuel assemblies containing Optimized ZIRLO fuel rod cladding starting with the fresh fuel for Surry 2 Cycle 24 and Surry 1 Cycle 25 (Spring 2011 and Spring 2012, respectively).

2.0 Detailed Description of Proposed Technical Specifications Changes

Design Features Technical Specification 5.2.1, Fuel Assemblies:

This section is being revised to add the Westinghouse Electric Company, LLC (Westinghouse) Optimized ZIRLO alloy to the list of materials that may be used as the fuel rod cladding in Surry fuel assemblies. The proposed revised specification (with changes in bold) reads as follows:

> The reactor shall contain 157 fuel assemblies. Each assembly shall consist of a matrix of Zircaloy, **ZIRLO,** or **Optimized** ZIRLO fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in non-limiting core locations.

Technical Specification 6.2.C, CORE OPERATING LIMITS REPORT:

This section currently includes seven documents that define the methods used to determine the core operating limits for Surry Units 1 and 2. The proposed revision to this list of references would add the topical report for Optimized ZIRLO as Reference 2e (in bold), as follows:

1. VEP-FRD-42-A, "Reload Nuclear Design Methodology."
2a. WCAP-16009-P-A, "Realistic Large Break LOCA Evaluation Methodology Using the Automated Statistical Treatment of Uncertainty Method (ASTRUM)," (Westinghouse Proprietary).
2b. WCAP-10054-P-A, "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," (W Proprietary).
2c. WCAP-10079-P-A, "NOTRUMP, A Nodal Transient Small Break and General Network Code," (W Proprietary).
2d. WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Report," (Westinghouse Proprietary).
2e. WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO," (Westinghouse Proprietary).
3a. VEP-NE-2-A, "Statistical DNBR Evaluation Methodology."
3b. VEP-NE-3-A, "Qualification of the WRB-1 CHF Correlation in the Virginia Power COBRA Code."

3.0 Background

As the nuclear industry has pursued longer operating cycles with increased fuel discharge burnup and fuel duty, the corrosion performance requirements for the nuclear fuel cladding become more demanding. Westinghouse developed the Optimized ZIRLO cladding material to meet these needs and provide 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 in turn minimizes temperature feedback effects, thus providing additional margin to the fuel rod design criterion on rod internal pressure.

Optimized ZIRLO is described in Westinghouse topical report WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO" (Reference 1). As noted in Reference 2, Optimized ZIRLO differs 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.

The NRC has approved Optimized ZIRLO fuel cladding based upon: 1) similarities to standard ZIRLO; 2) demonstrated material performance as documented in Reference 1 and in Westinghouse responses to NRC requests for additional information; and 3) a commitment to provide irradiated data and validate fuel performance models ahead of burnups achieved in batch applications. The NRC safety evaluation for Reference 1 identified ten Conditions and Limitations that are applicable to the use of Optimized ZIRLO. Compliance with these Conditions and Limitations is discussed in Section 4.0 below.

The NRC has approved use of Optimized ZIRLO fuel rod cladding material in reload quantities for Arkansas Nuclear One, Unit 2 and Waterford Unit 3. Dominion currently plans to use Optimized ZIRLO as the fuel rod cladding material for Surry Units 1 and 2 reloads starting with the new fuel introduced in the second quarter of 2011.

4.0 Technical Evaluation

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) contains ten Conditions and Limitations with which licensees must comply when referencing the Optimized ZIRLO topical report:

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.*

   A request for the required exemption from 10 CFR 50.46 and 10 CFR Part 50 Appendix K is provided as a separate attachment to this submittal.

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.*

   Consistent with References 7 and 8, the lead fuel rod burnup of Surry Units 1 and 2 fuel assemblies incorporating Optimized ZIRLO fuel rod cladding will continue to be limited to 62 GWd/MTU until such time that a new fuel rod burnup limit may be approved by the NRC.

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

   The maximum fuel rod waterside corrosion for fuel using Optimized ZIRLO fuel rod cladding will be confirmed to be less than the specified proprietary limits for all locations of the fuel rod. Evaluations to confirm that the appropriate corrosion limits are satisfied are performed as part of the normal reload design process under 10 CFR 50.59.

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.*

The analyses of fuel using Optimized ZIRLO fuel rod cladding will continue to meet all approved design limits. All conditions associated with approved methodologies will continue to be applied as part of the analyses. Confirmation that the approved design limits are met using current approved methodologies (including any additional conditions that may have been identified as part of the approval of those methodologies) is performed under 10 CFR 50.59 as part of the normal reload design process for Surry Units 1 and 2.

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.*

   All approved methodologies used for normal reload core design will be used to support operation only within the ranges for which the ZIRLO and Optimized ZIRLO data were acceptable and for which verifications were discussed in the Optimized ZIRLO topical report and RAIs. This is a required part of the normal reload core design process for Surry Units 1 and 2.

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 [Reference 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 cycles. 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.

   Westinghouse has submitted several letters to the NRC to provide information related to test data and models (References 3 through 6). Lead Test Assembly (LTA) measured data and favorable results from visual examinations of once and twice-burned LTAs confirm that the

current fuel performance models are applicable for Optimized ZIRLO fuel rods through two cycles of operation. As new data become available, Westinghouse will continue to provide additional data from the Optimized ZIRLO LTA programs, such as results of recent examinations on Millstone 3 LTAs that operated for three cycles and achieved burnups in excess of 62 GWd/MTU. Because reload batches of fuel with Optimized ZIRLO cladding have already been introduced at Arkansas Nuclear One Unit 2 and Waterford 3, and implementation of Optimized ZIRLO fuel rod cladding at Surry Units 1 and 2 is not planned before 2011, sufficient data should be available to satisfy this Condition for Surry fuel. Nevertheless, Dominion will confirm that the requirements of this Condition are met as it applies to use of Optimized ZIRLO for Surry Units 1 and 2.

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 [Reference 3]):*

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

   b. *Using the standard 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 cycles. 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.

   Westinghouse has submitted several letters to the NRC to provide information related to test data and models (References 3 through 6). Currently, the data from two 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 Vogtle samples. This information was provided to the NRC in Reference 6. Because reload batches of fuel with Optimized ZIRLO cladding have already been introduced at Arkansas Nuclear One Unit 2 and Waterford 3, and implementation of Optimized ZIRLO fuel rod cladding at Surry Units 1 and 2 is not planned before 2011, sufficient data should be available that this Condition will not be an issue for Surry fuel. Nevertheless, Dominion will confirm that the requirements of this Condition are met as it applies to Surry Units 1 and 2 fuel.

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 the BOL analyses.*
   ii. *Between BOL up to a radiation fluence of $3.0x10^{21}$ 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 $3.0x10^{21}$ n/cm^2 (E>1MeV), irradiated strength of standard ZIRLO at the fluence of $3.0x10^{21}$ n/cm^2 (E>1MeV) minus 3 ksi.*
   iii. *During subsequent irradiation from $3.0x10^{21}$ n/cm^2 up to $12x10^{21}$ n/cm^2 , the differences in strength (the difference at a fluence of $3x10^{21}$ 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 $12x10^{21}$ 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).*

Surry Units 1 and 2 use a Westinghouse fuel design, so Condition 8b does not apply. Design analyses of Surry fuel rods using Optimized ZIRLO cladding will use the yield strength and ultimate tensile strength as modified per Condition 8a until such time that the NRC agrees that Westinghouse has provided sufficient basis to remove or otherwise modify this Condition. Dominion will confirm that the requirements of this Condition are incorporated into analyses for Surry fuel incorporating Optimized ZIRLO fuel rod cladding performed under 10 CFR 50.59 to support normal core reload activities.

9. *As discussed in response to RAI #21 (Reference 3), 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.*

Surry Units 1 and 2 are not licensed with LOCBART or STRIKIN-II. Therefore, this Condition 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 limit included in topical report and proprietary version of safety evaluation].*

For Surry Units 1 and 2, non-LOCA safety analyses such as the locked rotor evaluation are performed by Dominion. The locked rotor event is one of the accidents that are evaluated for each reload cycle (Reference 9). For cycles using fuel with Optimized ZIRLO cladding, if fuel is predicted to enter DNB during the locked rotor event, Dominion will assess the fuel against the specified coolability limit on PCT until such time that the NRC agrees that Westinghouse has provided sufficient basis to remove or otherwise modify this Condition.

5.0 Regulatory Evaluation

5.1 Applicable Regulatory Requirements / Criteria

The NRC has allowed use of Optimized ZIRLO fuel cladding material in Westinghouse Original Equipment Manufacturer (OEM) reactors provided that the Licensees ensure compliance with the Conditions and Limitations set forth in the 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 (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. Each of the Conditions and Limitations were specifically addressed for their applicability to Surry Units 1 and 2 in the Technical Evaluation section of this LAR. In summary:

- the exemption request required by Condition and Limitation 1 has been prepared and is provided as a separate attachment to this LAR;
- Westinghouse has provided the NRC with information related to test data and models to address Condition and Limitations 6 and 7;
- Condition and Limitation 9 does not apply because Surry Units 1 and 2 are not licensed with the applicable codes; and
- the remaining Conditions and Limitations for the insertion of fuel rods clad with Optimized ZIRLO will be addressed in evaluations performed under 10 CFR 50.59 to support normal core reload activities.

5.2 No Significant Hazards Consideration

Dominion 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 Specifications changes are to add Optimized ZIRLO to the allowable or approved cladding materials to be used at Surry Units 1 and 2. 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 Specification 5.2.1 addresses the fuel assembly design, and currently specifies that "Each assembly shall consist of a matrix of Zircaloy or ZIRLO fuel rods...". The proposed change will add Optimized ZIRLO to the approved fuel rod cladding materials listed in this Technical Specification. In addition, a reference to the topical report for Optimized ZIRLO, WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, will be included in the listing of approved methods used to

determine the core operating limits for Surry Units 1 and 2 given in Technical Specification 6.2.C.

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. 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 industry needs by providing a reduced corrosion rate while maintaining the composition and physical properties, such as mechanical strength, similar to standard ZIRLO. In addition, margin to the fuel rod design criterion on fuel rod internal pressure has been impacted by increased fuel duty, use of integral fuel burnable absorbers, and corrosion/temperature feedback effects. Reducing the associated corrosion buildup reduces temperature feedback effects, providing additional margin to the fuel rod internal pressure design criterion. The fuel will continue to satisfy the pertinent design basis operating limits, so cladding integrity is maintained. There are no changes that will adversely affect the ability of existing components and systems to mitigate the consequences of any accident. Addition of Optimized ZIRLO to the allowable cladding materials for Surry Units 1 and 2 therefore does not result in an increase to the probability or consequences of an accident previously evaluated.

The NRC has allowed use of Optimized ZIRLO fuel cladding material in Westinghouse fueled reactors provided that licensees ensure compliance with the Conditions and Limitations set forth in the NRC Safety Evaluation for the topical report. Confirmation that these Conditions are satisfied is performed under 10 CFR 50.59 as part of the normal 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 Specifications change adds Optimized ZIRLO to the approved fuel rod cladding materials that may be used at Surry Units 1 and 2. Optimized ZIRLO was developed to provide a reduced cladding corrosion rate while maintaining the benefits of mechanical strength and resistance to accelerated corrosion from potential abnormal chemistry conditions. The fuel rod design bases are established to satisfy the general and specific safety criteria addressed in the Surry Units 1 and 2 UFSAR, Chapter 14 (Safety Analysis). The fuel rods are designed to prevent excessive fuel temperatures, excessive fuel rod internal 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," 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 fuel design basis requirements have been maintained. No new single failure mechanisms will be created, and there are no alterations to plant equipment or procedures that would introduce any new or unique operational modes or accident precursors.

Addition of Optimized ZIRLO as another approved cladding material of similar composition and properties as the current approved cladding materials to the Surry Units 1 and 2 Technical Specifications therefore does not create the possibility of a new or different kind of accident or malfunction from those previously evaluated within the UFSAR.

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

   Response: No.

   The cladding materials used for fuel rods are designed and tested to prevent excessive fuel temperatures, excessive fuel rod internal gas pressures due to fission gas releases, and excessive cladding stresses and strains. Optimized ZIRLO was developed to meet these needs while providing a reduced cladding corrosion rate and maintaining the benefits of mechanical strength and resistance to accelerated corrosion from potential abnormal chemistry conditions. Reducing the associated corrosion buildup reduces temperature feedback effects, providing additional margin to the fuel rod internal pressure design criterion. 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 has allowed use of the Optimized ZIRLO fuel cladding material as detailed in their Safety Evaluation of this topical report. The original fuel design basis requirements have been maintained, and evaluations will be performed under 10 CFR 50.59 for each reload cycle that incorporates Optimized ZIRLO cladding to confirm that design and safety limits are satisfied. Therefore inclusion of Optimized ZIRLO as an additional fuel rod cladding material for Surry Units 1 and 2 does not result in a reduction in margin required to preclude or reduce the effects of an accident or malfunction previously evaluated in the UFSAR.

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

5.3 Precedents

The proposed changes to the Surry Units 1 and 2 Technical Specifications are similar to the following proposed changes that have been submitted to allow use of fuel with Optimized ZIRLO fuel cladding:

- Entergy letter 2CAN040703, dated April 24, 2007, Arkansas Nuclear One, Unit 2, "License Amendment Request To Allow the Use of Optimized ZIRLO Fuel Rod Cladding" (ML071220267)

- Entergy letter W3F1-2007-0020, dated April 24, 2007, Waterford Steam Electric Station, Unit 3, "License Amendment Request To Allow the Use of Optimized ZIRLO Fuel Rod Cladding" (ML071160348)

- SCE&G letter RF-09-0068, dated June 9, 2009, Virgil C. Summer Nuclear Station (VCSNS) License Amendment Request - LAR 09-00562, "License amendment Request For Use of Optimized Zirlo Fuel Rod Cladding" (ML091620072)

The requested license amendments for Arkansas Nuclear One, Unit 2 (ML080370014), and Waterford 3 (ML080308004) were issued by the NRC in March and April, 2008, respectively.

5.4 Conclusion

Based on the considerations discussed above, there is reasonable assurance that (1) the health and safety of the public will not be endangered by operation with Optimized ZIRLO fuel rod cladding, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the requested license amendments will not be inimical to the common defense and security or to the health and safety of the public.

6.0 Environmental Considerations

Dominion has reviewed the proposed license amendment for environmental considerations. The proposed license 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 from an environmental assessment as 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 & 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' (TAC No. MB8041)," 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 G. T. Bischof to USNRC (Document Control Desk), "Virginia Electric and Power Company, Surry Power Station Units 1 and 2, License Amendment Request, Proposed Increase in the Lead Rod Average Burnup Limit," Serial Number 07-0024, March 6, 2007.

8. Letter from S. P. Lingham (USRNC) to D. A. Christian, "Surry Power Station, Unit Nos. 1 and 2, Issuance of Amendments Regarding Increase in the Lead Rod Average Burnup Limit (TAC Nos. MD4716 and MD1717)," December 19, 2007.

9. Virginia Power Topical Report VEP-FRD-42, Rev. 2.1-A, "Reload Nuclear Design Methodology," August 2003.

Attachment 2

Marked-up Technical Specifications Pages

Virginia Electric and Power Company
(Dominion)
Surry Power Station Units 1 and 2

5.0 DESIGN FEATURES

5.1 SITE LOCATION

The Surry Power Station is located in Surry County, Virginia, on property owned by Virginia Electric and Power Company on a point of land called Gravel Neck which juts into the James River. It is approximately 46 miles SE of Richmond, Virginia, 17 miles NW of Newport News, Virginia, and 25 miles NW of Norfolk, Virginia.

5.2 REACTOR CORE

5.2.1 Fuel Assemblies

The reactor shall contain 157 fuel assemblies. Each assembly shall consist of a matrix of Zircaloy ~~or ZIRLO~~, ZIRLO, or Optimized ZIRLO fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in non-limiting core locations.

5.2.2 Control Rod Assemblies

The reactor core shall contain 48 control rod assemblies. The control material shall be silver indium cadmium, as approved by the NRC.

The analytical methods used to determine the core operating limits identified above shall be those previously reviewed and approved by the NRC, and identified below. The COLR will contain the complete identification for each of the TS referenced topical reports used to prepare the COLR (i.e., report number, title, revision, date, and any supplements). The core operating limits shall be determined so that applicable limits (e.g., fuel thermal-mechanical limits, core thermal-hydraulic limits, ECCS 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 thereto, shall be provided for information for each reload cycle to the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

REFERENCES

1. VEP-FRD-42-A, "Reload Nuclear Design Methodology"

2a. WCAP-16009-P-A, "Realistic Large Break LOCA Evaluation Methodology Using the Automated Statistical Treatment of Uncertainty Method (ASTRUM)," (Westinghouse Proprietary).

2b. WCAP-10054-P-A, "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," (W Proprietary)

2c. WCAP-10079-P-A, "NOTRUMP, A Nodal Transient Small Break and General Network Code," (W Proprietary)

2d. WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Report," (Westinghouse Proprietary)

3a. VEP-NE-2-A, "Statistical DNBR Evaluation Methodology"

3b. VEP-NE-3-A, "Qualification of the WRB-1 CHF Correlation in the Virginia Power COBRA Code"

2e. WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO," (Westinghouse Proprietary)

Attachment 3

Proposed Technical Specifications Pages

Virginia Electric and Power Company
(Dominion)
Surry Power Station Units 1 and 2

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REFERENCES

1. VEP-FRD-42-A, "Reload Nuclear Design Methodology"

2a. WCAP-16009-P-A, "Realistic Large Break LOCA Evaluation Methodology Using the Automated Statistical Treatment of Uncertainty Method (ASTRUM)," (Westinghouse Proprietary).

2b. WCAP-10054-P-A, "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," (W Proprietary)

2c. WCAP-10079-P-A, "NOTRUMP, A Nodal Transient Small Break and General Network Code," (W Proprietary)

2d. WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Report," (Westinghouse Proprietary)

2e. WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO," (Westinghouse Proprietary)

3a. VEP-NE-2-A, "Statistical DNBR Evaluation Methodology"

3b. VEP-NE-3-A, "Qualification of the WRB-1 CHF Correlation in the Virginia Power COBRA Code"

Attachment 4

Exemption Request

Virginia Electric and Power Company
(Dominion)
Surry Power Station Units 1 and 2

Attachment 4

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

Table of Contents

1.0 Purpose 2

2.0 Background 2

3.0 Technical Justification of Acceptability 2

4.0 Justification of Exemption 3

5.0 Special Circumstances Support the Issuance of an Exemption 4

6.0 Conclusion 4

7.0 References 5

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

Virginia Electric and Power Company (Dominion) 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 Surry Units 1 and 2. The regulation in 10 CFR 50.46 contains acceptance criteria for the emergency core cooling system (ECCS) for reactors that have fuel rods fabricated either with Zircaloy or ZIRLO. 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 provide 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 minimizes temperature feedback effects, and thus provides additional margin to the fuel rod internal pressure design criterion.

Starting in the second quarter of 2011, the reloads for Surry Units 1 and 2 will contain fuel rods clad with Optimized ZIRLO.

Technical Specifications (TS) changes for Surry Units 1 and 2 are required to allow the use of Optimized ZIRLO fuel rod cladding for core reload applications. The request for these changes is provided as a separate attachment to this submittal.

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 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 Surry Units 1 and 2 are not licensed with LOCBART or STRIKIN-II. The remaining Conditions and Limitations are addressed in the Surry Units 1 and 2 TS changes included in this submittal or will be addressed in 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 normal core reload evaluations will ensure that acceptance criteria are met 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 of the Code of Federal Regulations 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 Surry Units 1 and 2 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, Dominion 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 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 Surry Units 1 and 2 is supported by the applicable site specific TSs. Reload cores are required to be operated in accordance with the operating limits specified in the TSs. Thus, the granting of this exemption request will not pose an undue risk to public health and safety.

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

   As noted above, the exemption request is 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 Surry Units 1 and 2 cores 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 Surry Units 1 and 2 cores 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 do not apply to the proposed use of Optimized ZIRLO fuel rod cladding material since Optimized ZIRLO has a slightly different composition

than Zircaloy or ZIRLO. With the approval of this exemption 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 & 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' (TAC No. MB8041)," 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.