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Energy to Serve Your World™

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NL-08-1875

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

**Vogtle Electric Generating Plant
License Renewal – Responses to 11/18/2008 RAIs**

Ladies and Gentlemen:

By letter dated June 27, 2007, Southern Nuclear Operating Company (SNC) submitted a License Renewal Application (LRA) for Vogtle Electric Generating Plant (VEGP) Units 1 and 2, seeking to extend the terms of the operating licenses an additional 20 years beyond the current expiration dates.

By letter dated November 18, 2008 the Nuclear regulatory Commission (NRC) submitted seven Requests for Additional Information (RAIs) to SNC resulting from the NRC staff review of the LRA. The SNC responses to these RAIs are provided in the enclosure to this letter, including RAI 3.3-03 which was re-formatted for clarity following telephone discussion with the staff on December 15, 2008.

Mr. T. E. Tynan states he is a Vice President of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

T. E. Tynan
Vice President – Vogtle

Sworn to and subscribed before me this 16th day of December, 2008.

Notary Public

My commission expires: _____
Notary Public, Burke County, Georgia
My Commission Expires January 13, 2012

TET/JEH/daj

Enclosure: VEGP License Renewal RAI Responses

cc: Southern Nuclear Operating Company
Mr. J. T. Gasser, Executive Vice President w/o Enclosure
Mr. T. E. Tynan, Vice President – Vogtle w/o Enclosure
Mr. D. H. Jones, Vice President – Engineering w/o Enclosure
Mr. M. J. Ajluni, Manager, Nuclear Licensing w/ Enclosure
Mr. N. J. Stringfellow, Licensing Supervisor, Vogtle w/ Enclosure
RType: CVC7000

U. S. Nuclear Regulatory Commission
Mr. L. A. Reyes, Regional Administrator w/ Enclosure
Mr. R. A. Jervy, NRR Project Manager – Vogtle w/ Enclosure
Mr. G. J. McCoy, Senior Resident Inspector – Vogtle w/ Enclosure
Mr. D. J. Ashley, License Renewal Project Manager, Vogtle w/ Enclosure

State of Georgia
Mr. N. Holcomb, Commissioner – Department of Natural Resources w/o Enclosure

Vogtle Electric Generating Plant

Enclosure

VEGP License Renewal RAI Responses – November 18, 2008

Vogtle License Renewal RAI Responses - 11/18/2008 RAIs

SNC RESPONSE - RAI-3.3-01

SNC's position is that the current licensing basis for the VEGP Unit 1 BORAL™ spent fuel rack assemblies is adequate. Further, there are no data indicating that this licensing basis will not be adequate for the period extended operation. Continued implementation of chemistry controls, monitoring of industry operating experience, and participation in industry supported investigations of BORAL™ performance are adequate to provide reasonable assurance that the BORAL™ panels will perform their intended function through the period of extended operation.

- a. Industry operating experience to date indicates that statistically significant reductions in ¹⁰B areal density have not occurred, even in conjunction with surveillance coupons exhibiting some corrosion. Manufacturer testing of BORAL™ indicates that no degradation occurs in the capability to absorb thermal neutrons over longer service periods.
- b. As noted previously in NL-08-0107 (ML080430373) (SNC response to RAI B.3.28-4), studies of BORAL™ corrosion issues are presented in EPRI 1013721, "Handbook of Neutron Absorber Materials for Spent Nuclear Fuel Transportation and Storage Applications." Corrosion coupon weight loss studies and operating experience reviews indicate that while some corrosion will occur, corrosion significant enough to impact the ¹⁰B areal density of the boron carbide - aluminum matrix core is unlikely to occur. Continued SNC evaluation of operating experience and participation in the Neutron Absorber Users Group provide reasonable assurance that SNC will become aware of significant BORAL™ degradation issues before the loss of the BORAL™ intended function.
- c. At present, there is no basis to indicate that a one-time inspection of the VEGP Unit 1 BORAL™ spent fuel panels is necessary to manage loss of material due to corrosion and reduction in neutron attenuating capacity. See the SNC response to items "a" and "b" above. Also see the SNC response to RAI 3.3-02, which describes SNC's participation in the EPRI Neutron Absorber Users Group.

Vogtle License Renewal RAI Responses - 11/18/2008 RAIs

RAI-3.3-02

Please describe how the neutron-absorbing capacity will be monitored. Please include a description of the parameters, calculations, and acceptance criteria. If degradation of Boral is identified, what mitigation strategies will be employed?

SNC RESPONSE - RAI-3.3-02

As described in response to RAI 3.3-01 above, there is currently no data supporting a conclusion that BORAL™ neutron absorbing capability will degrade during the period of extended operation. The continued performance of BORAL™ as a neutron absorber for the VEGP Unit 1 spent fuel storage racks is monitored by SNC's ongoing commitment to identify applicable operating experience and to implement appropriate corrective actions.

In addition to monitoring industry events, SNC continues to be an active participant in the Electric Power Research Institute (EPRI) Neutron Absorber User Group. The purposes of the Neutron Absorber User Group (NAUG) are to share information and experience about managing widely used neutron absorber materials. This project monitors the field performance of all neutron absorber materials used in spent-fuel storage and transportation. The project also provides an annual forum for utilities to exchange operational experience and lessons learned relative to neutron absorber materials. The EPRI Handbook of Neutron Absorber Materials for Spent Fuel Transportation and Storage Applications (currently EPRI 1013721) is periodically updated by this project. This users group developed out of the Boraflex Users Group. Originally, this group focused on addressing the significant degradation issues associated with Boraflex sheets. However, as issues with Boraflex become less important due to sunset of the material, the group focus has broadened to address other neutron absorber materials, including BORAL™. At present, this group is supporting a test program for BORAL™.

It is notable that the EPRI Boraflex User's Group (now the Neutron Absorber Users Group) was accurate in warning that the long-term stability of Boraflex was uncertain and recommended specific research and accelerated surveillance to provide a basis for predicting service life. In many cases, it is known that predictions based solely on test coupons can be unreliable in assessing degradation. This operating experience associated with the Boraflex Users Group & Neutron Absorber Users Group highlights the ability of proactive monitoring and information sharing to address significant issues.

SNC does not have any specific plans to address a hypothetical degradation of BORAL™ neutron absorbing capability. If data were to accumulate to suggest a degradation phenomenon, SNC would work within applicable industry organizations such as EPRI and WOG to seek viable mitigation or management strategies. Any mitigation or management strategy would necessarily be developed in response to a specific degradation mode.

As stated in the VEGP Future Action Commitment List (NL-08-1230, Enclosure 2) (ML082240518), SNC commits to continue to monitor issues related to BORAL™ spent fuel storage racks through its Operating Experience and Corrective Actions Programs. Any issues regarding BORAL™ material performance (including indications of blistering, bulging, or corrosion) will be evaluated and, if appropriate, included in the site Corrective Actions Program.

Vogtle License Renewal RAI Responses - 11/18/2008 RAIs

RAI-3.3-03

Please provide the following specifications of the Boral panels in the spent fuel pool racks:

- a. Geometry of the Boral panels
- b. Acceptance criterion for the areal density of boron.
- c. In previous letters to the Nuclear Regulatory Commission (NRC) dated May 3, 2005 (ML051260207) and July 7, 2005 (ML051940421), the licensee has stated that it did not have a Boral Surveillance program and that "Southern Nuclear Company (SNC) continues to monitor the internal operating experience at one of its other plants that has a Boral Surveillance program." Please identify the plant whose Boral Surveillance program is being monitored by SNC for VEGP, Unit 1, and if this plant's Boral Surveillance program will be monitored into VEGP Unit 1's period of extended operation, please address the following:
 1. Indicate the installation date of the Boral panels/racks in the monitored plant.
 2. Describe the comparability of the monitored plant's and VEGP, Unit 1's, spent fuel pool and Boral panels/racks.
 3. Please confirm that the monitored plant has sufficient Boral coupon samples to maintain the sampling frequency through VEGP Unit 1's period of extended operation.
 4. Please provide a detailed description of the Boral coupons and the tests performed on them during their examination:
 - I. What was the location of coupons relative to the spent fuel racks?
 - II. How were the coupons mounted and are they fully exposed to the spent fuel pool water?
 - III. What specific testing procedures are used for determining B-10 areal density, verifying surface corrosion (if any) and examining for blister formation?
 - IV. After removal from the pool for inspection were the coupons inserted back at the same locations in the pool?
 5. Please discuss the correlation between measurements of the physical properties of Boral coupons and the integrity of the Boral panels in the storage racks.
 6. What was the subcritical margin used in the criticality analysis? How does this acceptance criteria account for potential degradation between surveillance periods?
 7. Please describe the corrective actions that would be implemented if coupon test results are not acceptable.
 8. Discuss the schedule for coupon removal and testing during VEGP, Unit 1's, period of extended operation to demonstrate continued Boral performance.

Vogtle License Renewal RAI Responses - 11/18/2008 RAIs

SNC RESPONSE - RAI-3.3-03

- a. The VEGP BORAL™ spent fuel racks are PWR Region 1 flux trap type designs and are described in:
- NL-04-0973, "VEGP Request to Revise Technical Specifications to Reflect Updated Spent Fuel Rack Criticality Analyses for Units 1 and 2," August 13, 2004. (ML042320393)
 - NL-05-0803, "VEGP Request to Revise Technical Specifications to Reflect Updated Spent Fuel Rack Criticality Analyses for Units 1 and 2, Response to Request for Additional Information," May 3, 2005. (ML051260207)
 - NL-05-1152, "Vogtle Electric Generating Plant: Request to Revise Technical Specifications to Reflect Updated Spent Fuel Rack Criticality Analyses for Units 1 and 2, Response to Supplemental Request for Additional Information," July 7, 2005. (ML051940421)

Within NL-04-0973, SNC directs the staff to Enclosure 5, "Unit 1 Spent Fuel Pool Criticality Analysis Report", specifically Section 1.3 and Figure 2-2.

Within NL-05-0803, SNC directs the staff to Enclosure 2, specifically the SNC response to Question 2 which provides some additional details of the BORAL™ plates in use at VEGP.

- b. VEGP does not have a BORAL™ coupon surveillance monitoring program. Therefore, there is not an acceptance criterion associated with coupon analysis. Criticality analyses use a lower bound ¹⁰B areal density value of 0.0238 g/cc. See also NL-04-0973 (Enclosure 5, Section 1.5) and NL-05-1152 (response to question 1).
- c. The other SNC plant whose BORAL™ surveillance program was referred to in previous correspondence (not related to license renewal) is Hatch Nuclear Plant (HNP). However SNC does not credit monitoring of the HNP BORAL™ surveillance program as an aging management program commitment for VEGP license renewal. This commitment is not included in either the SNC response to RAI B.3.28-4 or SNC Future Action Commitment List Item No. 37. The reference to the sister plant in NL-05-0803 and NL-05-1152 was intended to convey that operating experience from that plant would be considered in the same manner that OE is considered from other industry plants.
1. The installation date of the HNP BORAL™ spent fuel racks to is not relevant to aging management of the VEGP BORAL™ spent fuel racks. See the response to RAI 3.3-04.
 2. A comparison of the HNP BORAL™ spent fuel racks to the VEGP BORAL™ spent fuel racks is not relevant to aging management of the VEGP BORAL™ spent fuel racks. The HNP BORAL™ surveillance program is not credited for aging management of the VEGP BORAL™ spent fuel racks.
 3. The number of available BORAL™ surveillance coupons in the spent fuel racks at HNP is not relevant to aging management of the VEGP BORAL™ spent fuel racks because the HNP BORAL™ surveillance program is not credited for aging management of the VEGP BORAL™ spent fuel racks.
 4. Detailed descriptions of the HNP BORAL™ surveillance coupon testing program are not relevant to aging management of the VEGP BORAL™ spent fuel racks because the HNP BORAL™ surveillance program is not credited for aging management of the VEGP BORAL™ spent fuel racks.

Vogtle License Renewal RAI Responses - 11/18/2008 RAIs

SNC RESPONSE - RAI-3.3-03 continued

5. Discussion of the physical properties of the HNP BORAL™ surveillance coupons versus the HNP storage racks are not relevant to aging management of the VEGP BORAL™ spent fuel racks because the HNP BORAL™ surveillance program is not credited for aging management of the VEGP BORAL™ spent fuel racks.
6. Details of the criticality analysis of the HNP BORAL™ spent fuel racks are not relevant to aging management of the VEGP BORAL™ spent fuel racks because the HNP BORAL™ surveillance program is not credited for aging management of the BORAL™ spent fuel racks at VEGP.
7. Corrective actions for the VEGP BORAL™ spent fuel racks will not be issued as a direct result of HNP BORAL™ surveillance coupons failing to meet an acceptance criterion. As stated previously, HNP operating experience would be considered in the same manner that OE is considered from other industry plants. Operating experience determined to be applicable to VEGP would be entered into the corrective action program in accordance with existing procedures. Any corrective actions would be dependent on evaluation of the specific OE.
8. The schedule for removal and testing of surveillance coupons under the HNP BORAL™ surveillance program is not relevant to aging management of the VEGP BORAL™ spent fuel racks because the HNP BORAL™ surveillance program is not credited for aging management of the VEGP BORAL™ spent fuel racks.

Vogtle License Renewal RAI Responses - 11/18/2008 RAIs

RAI-3.3-04

The age of the oldest Boral material in VEGP Unit 1's spent fuel pool is potentially already over 30 years old. Please explain which industry and plant specific operating experience would be applicable to Boral of this age.

SNC RESPONSE - RAI-3.3-04

Regardless of age, as fabricated ^{10}B density, or cell design / configuration, any identification of degraded conditions potentially having a significant impact on the ^{10}B areal density of the BORAL™ panels would be considered applicable. Presently, there are insufficient data to establish a clear association between time in service and the appearance of anomalies in BORAL™ surveillance coupons, such as those identified at Seabrook.

Also see the SNC response to staff question 4, documented in SNC letter NL-05-1152 (ML051940421).

Vogtle License Renewal RAI Responses - 11/18/2008 RAIs

RAI-3.3-05

In September 2003, inspection of Boral test coupons at Seabrook Nuclear Station revealed bulging and blistering of the aluminum cladding. Please discuss the impact, if any, that this event is considered to have on the surveillance of Boral at VEGP, Unit 1. Industry experience has indicated that during longer exposure such blisters may form. Since formation of blisters may affect the efficiency of the Boral panels to attenuate neutrons (through flux trap formation) and may cause deformation of the fuel cells, the applicant should explain why blistering of the Boral panels will not be a safety concern in its plant.

SNC RESPONSE - RAI-3.3-05

Seabrook surveillance capsule coupons exhibiting blisters were tested for reductions in ^{10}B areal density. These tests concluded that no significant reductions in the neutron absorbing capacity of the B_4C -Aluminum matrix core resulted. As a result, there is no evidence that the VEGP Unit 1 BORAL™ spent fuel storage racks are subject to a loss of neutron absorbing capacity. The major concern associated with blistering is a possible reduction in flux trap size and an associated impact on criticality analyses. The VEGP Unit 1 BORAL™ spent fuel storage racks are PWR Region 1 flux trap design racks which incorporate the neutron attenuating properties of water (flux trap) into the design. Formation of blisters are assumed to create an air gap in the BORAL™ that will reduce the effect of the water gap flux trap, resulting in an increase in the reactivity in the racks.

EPRI 1013721 (Neutron Absorber Handbook) notes that blistering of BORAL™ has, to date, proved to be primarily an esthetic effect; however, the potential effects on fuel assembly clearance and the reactivity state of Region 1 racks have been noted. For racks manufactured in the 1970s (which applies to the Maine Yankee BORAL™ spent fuel storage racks installed at VEGP), typical blister formation includes the formation of a series of relatively small blisters within approximately one inch of a cut edge of BORAL™.

The SNC response to staff question 3 contained in Enclosure 2 of SNC letter NL-05-0803 (ML051260207), describes a sensitivity study performed by Westinghouse to evaluate the potential effect of blister formation on criticality analyses. This study assumed blister formation typical of the observations noted in EPRI 1013721. Specifically, the study assumes the loss of the water gap flux trap in a one-inch wide region along both sides of the BORAL™ plates for all storage cells. The results of this study found that the estimated effects of blistering were considered to be well within the conservatisms in the rack modeling and associated criticality analyses. The modeling and analysis conservatisms which offset the effects of blistering on neutron attenuating capability are also described in Enclosure 2 of NL-05-0803 as part of the SNC response to staff question 2. Two primary conservatisms are included. First, lower bound ^{10}B areal densities are assumed. Second, the analyses use the thickest BORAL™ plate dimensions, which minimize the flux trap benefits.

Also see SNC letter NL-05-1152 (ML051940421), SNC response to question 3.

Vogtle License Renewal RAI Responses - 11/18/2008 RAIs

RAI-3.3-06

Please discuss any other operating experience that may be applicable to VEGP and describe why it would not be a safety concern.

SNC RESPONSE - RAI-3.3-06

Specific to VEGP, it is important to note that the VEGP BORAL™ storage rack cells are vented so that gas cannot accumulate. The use of venting has been successful throughout the industry in minimizing bulge formation. Additionally, the SNC response to staff RAI 1, part "b" documented in Enclosure 2 of SNC letter NL-05-0803 (ML051260207) describes that, for the racks supplied to VEGP, Maine Yankee had routinely performed drag testing and visual inspection. Prior to shipping the racks to VEGP, the last two surveillances showed no signs of swelling or bulging.

The experiences of other PWR units having BORAL™ surveillance coupons are available to SNC through the EPRI Neutron Absorber Users Group and by the 10 CFR 50.21 reporting process. As listed in EPRI 1013721, BORAL™ is in use as a wetted system neutron absorber in numerous domestic and international units. At present, SNC is unaware of any BORAL™ degradation event having safety significance.

RAI-3.3-07

VEGP, Unit 2, has Boraflex that they no longer credit for criticality in their spent fuel pools. There is no indication whether or not they still monitor the Boraflex for degradation. Past operating experience indicates that there can be blistering and bulging of the Boraflex material and the cladding surrounding the material. This can cause potential safety issues with fuel handling.

Although Boraflex is not credited for criticality in the VEGP, Unit 2, spent fuel pools, degradation of the material may impede safe handling of the spent fuel if blistering and/or bulging of the rack occurs. How will potential degradation of Boraflex material be identified and monitored during the proposed period of extended operation?

SNC RESPONSE - RAI-3.3-07

Blistering of Boraflex material and bulging of racks constructed with Boraflex have not been concerns for VEGP. Further, SNC is not aware of any industry operating experience related to Boraflex blistering or rack bulging. The primary concern related to Boraflex materials in use at VEGP is continued silica leaching into the spent fuel pool water from the degraded Boraflex material. This effect is primarily an operating concern.

SNC is also not aware of any significant fuel handling concerns resulting from degraded Boraflex sheets. Review of NUREG-1801 Revision 1, Vol. 2 does not provide any indication of staff concerns regarding deformation of Boraflex lined rack cells and associated fuel handling concerns.