VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

October 18, 2016

10CFR50.90

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

Serial No.: 16-181A
SPS/LIC-CGL: R0
Docket Nos.: 50-280/281
License Nos.: DPR-32/37

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
PROPOSED LICENSE AMENDMENT REQUEST
EXPANSION OF PRIMARY GRADE WATER
LOCKOUT REQUIREMENTS IN TS 3.2.E
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

By letter dated May 10, 2016 (Serial No. 16-181), Virginia Electric and Power Company (Dominion) submitted a license amendment request (LAR) to extend the Surry Technical Specification (TS) 3.2.E requirements for primary grade water (PG) lockout from being applicable in Refueling Shutdown and Cold Shutdown to being applicable in Refueling Shutdown, Cold Shutdown, Intermediate Shutdown and Hot Shutdown, except during the approach to critical and within one hour following reactor shutdown from Reactor Critical or Power Operation.

On September 22, 2016, the NRC Project Manager for Surry provided a request for additional information (RAI) to facilitate NRC review of the LAR. Dominion's response to the RAI is provided in the attachment. The information provided in this letter does not affect the conclusions of the significant hazards consideration or the environmental assessment included in the May 10, 2016 LAR.

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

Respectfully,

Mark D. Sartain
Vice President - Nuclear Engineering

Vicki L. Hull
NOTARY PUBLIC
Commonwealth of Virginia
Reg. # 140542
My Commission Expires May 31, 2018

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Mr. Mark D. Sartain, 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.

Acknowledged before me this 18TH day of October, 2016.

My Commission Expires: 5-31-18.

Vicki L. Hull
Notary Public

ADD1
NRR

Commitments contained in this letter: None

Attachment: Response to NRC Request for Additional Information – Proposed License Amendment Request - Expansion of Primary Grade Water Lockout Requirements in TS 3.2.E

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Surry Power Station

State Health Commissioner
Virginia Department of Health
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Attachment

Response to NRC Request for Additional Information

Proposed License Amendment Request
Expansion of Primary Grade Water Lockout Requirements in TS 3.2.E

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

Response to NRC Request for Additional Information
Proposed License Amendment Request
Expansion of Primary Grade Water Lockout Requirements in TS 3.2.E
Surry Power Station Units 1 and 2

By letter dated May 10, 2016 (Serial No. 16-181), Virginia Electric and Power Company (Dominion) submitted a license amendment request (LAR) to extend the Surry Technical Specification (TS) 3.2.E requirements for primary grade water (PG) lockout from being applicable in Refueling Shutdown and Cold Shutdown to being applicable in Refueling Shutdown, Cold Shutdown, Intermediate Shutdown and Hot Shutdown, except during the approach to critical and within one hour following reactor shutdown from Reactor Critical or Power Operation. On September 22, 2016, the NRC Project Manager for Surry provided the following request for additional information (RAI) to facilitate NRC review of the LAR. The RAI and Dominion's response are provided below.

***NRC Comment**: In the May 10, 2016, LAR requesting changes to TS 3.2.E and TS 3.2.F for Surry Power Station (SPS) TS changes, the licensee indicated that:*

1. *A revision to the boron dilution analysis for intermediate shutdown and hot shutdown was prepared with credits of the proposed TS 3.2.E and TS 3.2.F.*

2. *Secondary neutron sources was [were] re-introduced into SPS reload core designs to restore the dynamics response characteristics of the Source Range Nuclear Instrumentation (SRNI).*

Based on the above, the NRC staff requests the following information:

1. *Discuss the revision to the boron dilution analysis referred [to] in item 1 listed above, identify the differences between the revision and the applicable analysis of record documented in UFSAR Section 14.2.5.2.2, and address the acceptance of the revision for the use in support of the TS changes.*

Dominion Response:

The revised safety analysis of the boron dilution event mentioned in the LAR does not support the proposed change to the Surry TS. Rather, the proposed change to TS 3.2.E and TS 3.2.F establishes a plant configuration that will be credited to revise the safety analysis. That is, the boron dilution analysis for Intermediate Shutdown (ISD) and Hot Shutdown (HSD) (in UFSAR Section 14.2.5.2.2) will be revised to reflect the operating restrictions imposed by the revised TS. When the proposed TS change is implemented, valves in the highest capacity dilution flow path will be locked closed in HSD and ISD, except during strictly controlled makeup and dilution activities, thus precluding a high flow rate boron dilution event from occurring. This valve configuration will be identical to the current TS for Cold Shutdown (CSD) and Refueling

Shutdown (RSD). The safety analysis bases for boron dilution in CSD and HSD in UFSAR Section 14.2.5.1 do not include an explicit calculation for the safety analysis of a boron dilution event.

The current boron dilution safety analysis for ISD and HSD, described in UFSAR Section 14.2.5.2.2, assumes:

- Maximum reactor coolant system (RCS) dilution flow rate of 245 gpm.
- Source Range Nuclear Instrumentation (SRNI) response characteristics implied in the analysis.
- Administrative boron concentration controls to ensure adequate excess boron so that there is at least 15 minutes between initiation of dilution and loss of shutdown margin.

The revised safety analysis for ISD and HSD will:

- Reflect the new TS requirement for PG valve lockout that precludes high dilution flow rates, such that an explicit safety analysis to establish operator action times is not required. (This is consistent with the current basis for RSD and CSD documented in UFSAR Section 14.2.5.2.1.)
- Acknowledge that low flow rate dilution events are relatively slow reactivity addition events occurring over an extended time period, and multiple diverse methods are available to identify a dilution with adequate time for mitigation (as demonstrated by the Surry Unit 2 event in 2011). SRNI is one of the diverse indications available. However, there will no longer be a safety analysis assumption for SRNI dynamic response. (This is consistent with the current basis for RSD and CSD documented in UFSAR Section 14.2.5.2.1.)
- The revised UFSAR analysis basis will consolidate the licensing basis for all shutdown conditions.

The change to the safety analysis calculation for HSD and ISD will be implemented following approval of the proposed TS change.

2. *Discuss the adequacy of the re-introduction of the secondary neutron sources into the SPS core design in addressing the concern of the SRNI dynamics response characteristics referred to in item 2, listed above.*

Dominion Response:

As discussed in Section 2.0, Background, in the LAR Discussion of Change, the SRNI readings did not increase as much as expected during the boron dilution event at Surry Unit 2 in May 2011. An apparent cause evaluation concluded that the unexpected SRNI dynamic response was due principally to two factors: 1) transition to low leakage loading patterns, and 2) removal of secondary neutron sources from the reactor cores.

Secondary neutron sources are fuel assembly insert components mechanically similar to discrete burnable poison. When exposed to the neutron field in the reactor core, the secondary source material (antimony-beryllium) is activated and emits neutrons after the neutron field stemming from the fuel has diminished. Secondary sources are useful for producing an adequate neutron source for demonstrating SRNI operability during core on-load. This was historically the main use of secondary sources. Removal of secondary sources was done to simplify fuel handling activities and to eliminate the possibility of leaking source material into the RCS resulting in contamination issues. The primary focus with regard to the SRNI during this reload design transition was whether the inherent source strength of the burned fuel on the core periphery would be sufficient to provide indication of detector operability during fuel on-load. There was no documented design basis for SRNI efficiency (i.e., the degree to which the detectors respond to changes in reactivity in a subcritical core).

In response to the Surry Unit 2 dilution event, secondary sources have been re-introduced into the Surry Units 1 and 2 cores in an effort to improve SRNI dynamic response. Dominion has performed extensive analytical work to determine optimal secondary source placement to ensure SRNI response to reactivity changes in subcritical cores. While the textbook 1/M response is not achievable even with secondary sources installed, analyses and plant start-up data indicate that SRNI response has improved significantly. When secondary neutron sources are properly located in the core, the SRNIs provide an effective indication of changing core reactivity conditions (e.g., indicative of a boron dilution during shutdown conditions).