VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

December 6, 2021

10 CFR 50
10 CFR 51
10 CFR 54

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Serial No.: 21-393
NRA/DEA: R0
Docket Nos.: 50-338/339
License Nos.: NPF-4/7

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION (NAPS) UNITS 1 AND 2
SUBSEQUENT LICENSE RENEWAL APPLICATION
RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION
SAFETY REVIEW - SET 5

By letter dated August 24, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20246G697), Virginia Electric and Power Company (Dominion) submitted an application for the subsequent license renewal of Renewed Facility Operating License Nos. NPF-4 and NPF-7 for North Anna Power Station (NAPS) Units 1 and 2, respectively. The US Nuclear Regulatory Commission (NRC) has been reviewing the subsequent license renewal application (SLRA) for NAPS.

The NRC staff has identified an area where additional information is needed to complete their review. In an email from Lois M. James (NRC) to Daniel G. Stoddard (Dominion), dated November 18, 2021 (ADAMS Package No. ML21322A095), the NRC staff transmitted a request for additional information (RAI) to support completion of the Safety Review.

Enclosure 1 provides Dominion's response to the RAI. Enclosure 2 provides the mark-ups of the Updated Final Safety Analysis Report (UFSAR) Supplement contained in SLRA Appendix A, in support of the RAI response.

If there are any questions regarding this submittal or if additional information is needed, please contact Mr. Paul Aitken at (804) 273-2818.

Sincerely,

Mark D. Sartain
Vice President - Nuclear Engineering and Fleet Support

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Mark D. Sartain, who is Vice President - Nuclear Engineering and Fleet Support 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 6th day of December, 2021.

My Commission Expires: 12/31/24

Notary Public

CRAIG D SLY
Notary Public
Commonwealth of Virginia
Reg. # 7518653
My Commission Expires December 31, 2024

Commitments made in this letter: None

Enclosures:

1. Response to NAPS SLRA Requests for Additional Information, Safety Review – Set 5
2. UFSAR Supplement Mark-ups for SLRA Appendix A

cc: U.S. Nuclear Regulatory Commission, Region II
Marquis One Tower
245 Peachtree Center Avenue, NE
Suite 1200
Atlanta, Georgia 30303-1257

Ms. Lois James
NRC Project Manager
U. S. Nuclear Regulatory Commission
One White Flint North
Mail Stop O 11F1
11555 Rockville Pike
Rockville, Maryland 20852-2738

Mr. Tam Tran
NRC Project Manager
U. S. Nuclear Regulatory Commission
One White Flint North
Mail Stop O 11F1
11555 Rockville Pike
Rockville, Maryland 20852-2738

Mr. L. John Klos
NRC Project Manager
U. S. Nuclear Regulatory Commission
One White Flint North
Mail Stop O9 E-3
11555 Rockville Pike
Rockville, Maryland 20852-2738

Mr. G. Edward Miller
NRC Senior Project Manager
U. S. Nuclear Regulatory Commission
One White Flint North
Mail Stop O9 E-3
11555 Rockville Pike
Rockville, Maryland 20852-2738

NRC Senior Resident Inspector
North Anna Power Station

Mr. Marcus Harris
Old Dominion Electric Cooperative
Innsbrook Corporate Center, Suite 300
4201 Dominion Boulevard
Glen Allen, Virginia 23060

State Health Commissioner
Virginia Department of Health
James Madison Building – 7th Floor
109 Governor Street
Room 730
Richmond, Virginia 23219

Mr. David K. Paylor, Director
Virginia Department of Environmental Quality
P.O. Box 1105
Richmond, VA 23218

Ms. Melanie D. Davenport, Director
Water Permitting Division
Virginia Department of Environmental Quality
P.O. Box 1105
Richmond, VA 23218

Ms. Bettina Rayfield, Manager
Office of Environmental Impact Review
Virginia Department of Environmental Quality
P.O. Box 1105
Richmond, VA 23218

Mr. Michael Dowd, Director
Air Division
Virginia Department of Environmental Quality
P.O. Box 1105
Richmond, VA 23218

Ms. Kathryn Perszyk
Land Division Director
Virginia Department of Environmental Quality
1111 East Main Street
Suite 1400
Richmond, VA 23219

Mr. James Golden, Regional Director
Virginia Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060

Ms. Jewel Bronaugh, Commissioner
Virginia Department of Agriculture & Consumer Services
102 Governor Street
Richmond, Virginia 23219

Mr. Jason Bulluck, Director
Virginia Department of Conservation & Recreation
Virginia Natural Heritage Program
600 East Main Street, 24th Floor
Richmond, VA 23219

Mr. Ryan Brown, Executive Director
Director's Office
Virginia Department of Wildlife Resources
P.O. Box 90778
Henrico, VA 23228

Ms. Julie Henderson, Director
Virginia Department of Health
Office of Environmental Health Services
109 Governor St, 5th Floor
Richmond, VA 23129

Ms. Julie Langan, Director
Virginia Department of Historic Resources
State Historic Preservation Office
2801 Kensington Avenue
Richmond, VA 23221

Mr. Steven G. Bowman, Commissioner
Virginia Marine Resources Commission
380 Fenwick Road
Building 9
Ft. Monroe, VA 23651

Ms. Angel Deem, Director
Virginia Department of Transportation
Environmental Division
1401 East Broad Street
Richmond, VA 23219

Mr. Stephen Moret, President
Virginia Economic Development Partnership
901 East Byrd Street
Richmond, VA 23219

Mr. William F. Stephens, Director
Virginia State Corporation Commission
Division of Public Utility Regulation
1300 East Main St, 4th Fl, Tyler Bldg
Richmond, VA 23219

Ms. Lauren Opett, Director
Virginia Department of Emergency Management
9711 Farrar Ct
North Chesterfield, VA 23226

Mr. Mark Stone, Chief Regional Coordinator
Virginia Department of Emergency Management
13206 Lovers Lane
Culpeper, VA 22701

Enclosure 1

RESPONSE TO NAPS SLRA REQUESTS FOR ADDITIONAL INFORMATION SAFETY REVIEW – SET 5

Virginia Electric and Power Company
(Dominion Energy Virginia)
North Anna Power Station Units 1 and 2

Response to NAPS SLRA Requests for Additional Information
Safety Review – Set 5

North Anna Power Station, Units 1 and 2
Subsequent License Renewal Application

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The NRC staff has identified an area where additional information is needed to complete their review. In an email from Lois M. James (NRC) to Daniel G. Stoddard (Dominion), dated November 18, 2021 (ADAMS Package No. ML21322A095), the NRC staff transmitted a request for additional information (RAI) to support completion of the Safety Review.

This enclosure provides Dominion's response to the RAI.

1. Buried and Underground Piping and Tanks, AMP XI.M41

Regulatory Basis: Title 10 of the *Code of Federal Regulations* (10 CFR) Section 54.21(a)(3) requires an applicant to demonstrate that, for components within the scope of license renewal, the effects of aging will be adequately managed to maintain the component's intended function(s) consistent with the current licensing basis for the period of extended operation. One of the findings that the Nuclear Regulatory Commission (NRC) staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to managing the effects of aging during the period of extended operation on the functionality of components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. To complete its review and enable formulation of a finding under 10 CFR 54.29(a), the staff is requesting additional information regarding the matters described below.

Background: As required by 10 CFR 54.21(d), each [subsequent] license renewal application (SLRA) must include a final safety analysis report (FSAR) supplement containing a summary description of the programs and activities determined by 10 CFR 54.21(a) for managing the effects of aging. In its discussions about FSAR supplements, NRC Standard Review Plan for Subsequent License Renewal (SRP-SLR), "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power

Plants," (NUREG-2192, Revision 0, July 2017) (ADAMS Accession No. ML17187A204) Section 3.3.2.5 notes that the FSAR supplement description should be sufficiently comprehensive such that later changes to the program can be controlled by 10 CFR 50.59 "Changes, Tests, and Experiments." The SRP-SLR also notes that the program description should include any future aging management activities including enhancements and commitments and contain the bases for determining that aging effects will be managed. The SRP-SLR further notes that the type of information to be included is provided in NUREG-2191, Revision 0, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," dated July 2017 (ADAMS Accession No. ML17187A031), Table XI-01, "FSAR Supplement Summaries for GALL-SLR Report Chapter XI Aging Management Programs [AMP]."

As amended by Supplement 4 to the SLRA (letter dated August 26, 2021, ADAMS Accession No. ML21238A297), Dominion Energy included extensive changes to the program description in SLRA Section B2.1.27, "Buried and Underground Piping and Tanks." Supplement 4 adds a new Enhancement (No. 6) to reflect the deletion of jockey pump monitoring as the basis for not performing excavated direct visual inspection of the buried gray cast iron fire main piping. The new enhancement describes the performance of nondestructive examinations (i.e., magnetic particle and radiographic testing) of the excavated piping, and destructive examinations of any identified bounding cracks, with engineering evaluations of crack growth, and flaw stability to address cracking due to cyclic loading. Supplement 4 also modifies Enhancement No. 5 to the Buried and Underground Piping and Tanks program to provide for destructive examinations of the excavated gray cast iron pipe as given in GALL-SLR AMP XI.M33, Selective Leaching.

Supplement 4 to the application also modified SLRA Section A1, "Summary Description of Aging Management Programs," and SLRA Section A1.27, "Buried and Underground Piping and Tanks," by adding the sentence: "The program will also manage cracking due to cyclic loading in buried gray cast iron fire protection piping that is lined with a cementitious coating." A previous supplement had deleted the discussion about monitoring jockey pump activity in lieu of performing visual inspections of buried fire protection system components. The staff notes that Supplement 4 also modified SLRA Table A4.0-1, "Subsequent License Renewal Commitments," Item 27 to describe the commitments to revise procedures for Enhancements No. 5 and No.6.

As documented in the NRC's Determination of Acceptability and Sufficiency for Docketing associated with the SLRA (letter dated October 13, 2020, ADAMS Accession No. ML20258A284), the GALL-SLR Report does not address cracking due to cyclic loading for buried gray cast iron piping. Dominion recognized this aspect when it eventually cited an aging management review item with generic note H (indicating the aging affect was not in the GALL-SLR Report) for cracking due to cyclic loading that will be managed by the Buried and Underground Piping and Tanks program.

NAPS SLRA

Because the aging effect for the given material and environment combination is not addressed in the GALL-SLR Report, the FSAR program description in GALL-SLR Table XI-01 for the Buried and Underground Piping and Tanks AMP would not be sufficient. The staff notes that the SLRA did not initially address cracking due to cyclic loading and after substantially enhancing the Buried and Underground Piping and Tank program only a single sentence (noted above) was added to the FSAR program description. The staff also notes that although the table with subsequent license renewal commitments includes a description of the program's enhancements, once commitments (e.g., to revise procedures) have been completed, they can, and have been deleted from the commitment table.

RAI 4.7.6-1

Issue: In order to ensure that changes to the program, which could decrease the overall effectiveness of the program to manage the effects of aging, will receive appropriate review by a licensee, the FSAR supplement should be sufficiently comprehensive. The FSAR supplement in SLRA Section A1.27, "Buried and Underground Piping and Tanks," appears to lack a sufficient description of the activities for managing cracking due to cyclic loading to provide appropriate administrative and regulatory controls for the program. The current program includes specific nondestructive and destructive inspections of excavated gray cast iron piping and relatively unique engineering evaluations of crack growth and flaw stability in a brittle material that are not described in the current FSAR supplement. In addition, specific activities for managing the loss of material due to selective leaching are being performed as part of the Buried and Underground Piping and Tanks program; however, these activities are not referenced or otherwise noted in SLRA Section A1.21, Selective Leaching. The staff cannot complete its review of the above FSAR supplements without additional information.

NRC Request

Provide additional information that either: (a) explains how the current FSAR supplement descriptions in SLRA Section A1.27 for of the Buried and Underground Piping and Tanks program and SLRA Section A1.21 for the Selective Leaching program will provide appropriate administrative and regulatory controls to ensure that any future changes to the programs will not decrease their overall effectiveness to manage the effects of aging, or (b) modifies the associated FSAR supplements to include a more detailed description of the programs and aging management activities.

Dominion Response

Enclosure 2 provides mark-ups to the Updated Final Safety Analysis Report (UFSAR) Supplement provided in SLRA Appendix A. These mark-ups include a more detailed description of the Buried and Underground Piping and Tanks program, Selective Leaching program, and aging management activities.

Enclosure 2

UFSAR SUPPLEMENT MARK-UPS FOR SLRA APPENDIX A

Virginia Electric and Power Company
(Dominion Energy Virginia)
North Anna Power Station Units 1 and 2

A1.21 SELECTIVE LEACHING

The *Selective Leaching* program is a new condition monitoring program that will manage loss of material of the susceptible materials located in a potentially aggressive environment. The materials of construction for these components may include gray cast iron, ductile iron, and copper alloys (greater than 15% zinc).

One-time inspections for components exposed to closed-cycle cooling water or treated water environments will be conducted when plant-specific operating experience has not revealed selective leaching in these environments. Opportunistic and periodic inspections will be conducted for raw water, waste water, soil, and groundwater environments, and for closed-cycle cooling water or treated water environments when plant specific operating experience has revealed selective leaching in these environments. Visual inspections coupled with mechanical examination techniques such as chipping, or scraping will be conducted. Periodic destructive examinations of components for physical properties (i.e., degree of de-alloying, through-wall thickness, and chemical composition) will be conducted for components exposed to raw water, waste water, soil, and groundwater environments or for closed-cycle cooling water or treated water environments when plant specific operating experience has revealed selective leaching in these environments.

Periodic inspections of the buried gray cast iron fire protection piping that is lined with a cementitious coating will be conducted to detect selective leaching. The required excavations of buried gray cast iron fire protection piping will be performed in accordance with the *Buried and Underground Piping and Tanks* program.

Inspections and tests will be conducted to determine whether loss of material will affect the ability of the components to perform their intended function for the subsequent period of extended operation. Inspections are performed by personnel qualified in accordance with procedures and programs to perform the specified task. Inspections within the scope of the ASME Code will follow procedures consistent with the ASME Code. Non-ASME Code inspection procedures will include requirements for items such as lighting, distance, offset, and surface conditions. When the acceptance criteria are not met such that it is determined that the affected component be replaced prior to the end of the subsequent period of extended operation, additional inspections will be performed.

Industry and plant specific operating experience will be evaluated in the development and implementation of this program.

A1.27 BURIED AND UNDERGROUND PIPING AND TANKS

The *Buried and Underground Piping and Tanks* program is an existing condition monitoring program that manages blistering, cracking, hardening or loss of strength, and loss of material on external surfaces of components in soil, concrete, or underground environments within the scope of subsequent license renewal through preventive and mitigative actions. The program addresses piping and tanks composed of stainless steel, carbon steel, cast iron, ductile iron, copper alloy, and fiberglass.

The *Buried and Underground Piping and Tanks* program will also manage cracking due to cyclic loading in buried gray cast iron fire protection piping that is lined with a cementitious coating. The program requires periodic and opportunistic visual inspections of the buried fire protection system piping and components that will facilitate examinations performed in accordance with the *Selective Leaching* program to manage loss of material due to selective leaching for applicable materials in soil environments. A minimum of six excavations will be conducted at each unit in the 10-year period prior to the subsequent period of extended operation (SPEO) and periodically in each 10-year period during the SPEO. A ten-foot pipe length will be excavated for each buried gray cast iron fire protection piping sample to inspect for blistering, cracking, hardening or loss of strength, and loss of material on external surfaces of piping. Additionally, the *Selective Leaching* program will require destructive examinations on a one-foot length of fire protection system piping or a different component type from each discrete excavation location (six/unit) to inspect for loss of material due to selective leaching. To meet these *Selective Leaching* program requirements, five inspections will be conducted on one-foot lengths of fire protection piping, and the sixth inspection will be conducted on either a one-foot length of piping from the fire protection system or a different component type (e.g., hydrant) from the fire protection system, whichever is removed during the sixth excavation. The five pipe excavations will also include inspections for cracking due to cyclic loading, which will be conducted at each unit in the 10-year period prior to the SPEO and periodically in each 10-year period during the SPEO.

Visual (VT), magnetic particle (MT), and radiographic (RT) nondestructive examination (NDE) methods will be used on the excavated gray cast iron fire protection piping to inspect for cracking due to cyclic loading. The NDE examination results will be evaluated by a Level II or III examiner qualified in accordance with ASME Code, Section XI requirements, to identify the presence of cracking. If cracking is not identified using the NDE techniques, then a one-foot axial piece of the fire protection piping will still be destructively examined for loss of material due to selective leaching as required by the *Selective Leaching* program. If cracking is identified, then a one-foot axial piece of the fire protection piping sample will be selected for further examination for cracking due to cyclic loading and loss of material due to selective leaching using destructive examination methods. The one-foot axial piece of fire protection piping will be selected from a bounding location, based on the crack size and characterization as determined by a NDE Level II or III examiner. RT will be applied

to validate potential crack indications detected with MT. Areas identified by RT examination as containing potential surface cracking indications will be recorded, and the bounding crack location will be selected for further metallurgical analysis.

The one-foot axial piece of fire protection piping selected from the bounding location, based on the crack size and characterization as determined by a NDE Level II or III examiner, will be further inspected by destructive examination to establish cause. If a crack is determined to be the result of a manufacturing flaw, and not the result of aging, then the results will be documented in a metallurgical analysis report with no further actions required. If the cracking is determined to be due to cyclic loading through the destructive examination evaluation, then a crack growth evaluation and flaw stability evaluation will be performed based on the predicted crack lengths at the end of the SPEO. If results of the evaluations indicate the depth or extent of cracking of the base metal is projected to cause loss of intended function prior to the end of the SPEO, an evaluation will be performed to determine the extent of condition, extent of cause, and the need for further follow-on actions through the Corrective Action Program (e.g., additional inspections).

Sections of buried gray cast iron fire protection piping and piping components that are removed for destructive examination will be replaced with a material better suited for the service conditions and environments.

Depending on the material, preventive and mitigative techniques include external coatings, cathodic protection (CP), and the quality of backfill. Direct visual inspection quantities for buried components are planned using procedural categorization criteria. Transitioning to a higher number of inspections than originally planned is based on the effectiveness of the preventive and mitigative actions. Also, depending on the material, inspection activities include annual surveys of CP, nondestructive evaluation of pipe or tank wall thicknesses, and visual inspections of the pipe from the exterior. For steel components, where the acceptance criteria for the effectiveness of the cathodic protection is other than -850 mV instant off, loss of material rates are measured.

Soil sampling and testing is performed during each excavation and a station-wide soil survey based on initial baseline data is also performed once in each 10-year period to confirm the soil corrosivity level near components within the scope of subsequent license renewal for the installed material types.

Inspections are conducted by qualified individuals. Where the coatings, backfill or the condition of exposed piping does not meet acceptance criteria such that the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material rate is extrapolated to the end of the subsequent period of extended operation an increase in the sample size is conducted.