



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

February 28, 2022

The Honorable Christopher T. Hanson  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT:** REPORT ON THE SAFETY ASPECTS OF THE SUBSEQUENT LICENSE  
RENEWAL APPLICATION REVIEW OF THE NORTH ANNA POWER STATION,  
UNITS 1 AND 2

Dear Chairman Hanson:

During the 692<sup>nd</sup> meeting of the Advisory Committee on Reactor Safeguards (ACRS), February 2-4, 2022, we completed our review of the subsequent license renewal (SLR) application for the North Anna Power Station, Units 1 and 2 (North Anna), and the associated final safety evaluation report prepared by the staff. Our review considered actions by Virginia Electric and Power Company (Dominion Energy) to extend the license of each unit by 20 years beyond the currently approved 60 years of licensed operation. Our Plant License Renewal Subcommittee also considered these topics on December 15, 2021.

During this review, we had the benefit of discussions with representatives of the staff and Dominion Energy. We also had the benefit of the referenced documents. This report fulfills the requirement of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 54.25 that the ACRS review and report on all license renewal applications.

## **CONCLUSION AND RECOMMENDATION**

1. The established programs and the commitments made by Dominion Energy to manage age-related degradation provide reasonable assurance that North Anna can be operated in accordance with its current licensing basis for the subsequent period of extended operation (SPEO) without undue risk to the health and safety of the public.
2. The Dominion Energy application for the subsequent license renewal of the operating license for North Anna should be approved.

## **BACKGROUND**

North Anna Power Station, Units 1 and 2, are located on the southern shore of Lake Anna in Louisa County, Virginia. Each unit includes a three-loop, pressurized light water reactor nuclear steam supply system and a turbine generator supplied by Westinghouse Electric Corporation. Each unit has a licensed thermal power output of 2,940 megawatts thermal (MWt). The Nuclear

Regulatory Commission (NRC) issued the initial operating licenses on April 1, 1978, for Unit 1, and August 21, 1980, for Unit 2. The NRC issued the first 20 year renewed operating licenses on March 20, 2003, establishing the periods of operation until April 1, 2038, for Unit 1 and August 21, 2040, for Unit 2.

In this application, Dominion Energy requests renewal of the operating licenses for an additional 20 years beyond the expiration of their current renewed licenses. The licenses would be extended to April 1, 2058, for Unit 1, and to August 21, 2060, for Unit 2.

## **DISCUSSION**

The staff reviewed the Dominion Energy application for SLR in accordance with the Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) and the Standard Review Plan for Review of Subsequent License Renewal Applications (SRP-SLR) guidance documents. Conformance with this guidance provides the bases for a conclusion that an applicant for a license renewal of 20 additional years beyond its current approved license for 60 years will assure adequate protection of the public through the SPEO.

Significant generic issues challenging the industry for plant operation beyond 60 years are: reactor pressure vessel embrittlement; irradiation-assisted stress corrosion cracking of reactor internals; concrete structures and containment degradation; and electrical cable environmental qualification, condition monitoring, and assessment. The staff also considered site-specific performance issues related to buried grey cast iron piping. Each of these items has been addressed by Dominion Energy and evaluated by the staff through the review process. We agree with the staff's safety evaluation report regarding these issues.

Dominion Energy implemented several process improvements based on lessons learned from the Surry SLR and industry operating and licensing experience, and joined in Nuclear Energy Institute, Electric Power Research Institute, and Pressurized-Water Reactor Owners Group programs related to SLR program development. These approaches resulted in fewer Aging Management Programs (AMPs) with enhancements and half the number of requests for additional information (RAIs). Dominion Energy also participated in an initiative with NRC to improve consistency with GALL-SLR guidance resulting in fewer AMPs with exceptions. Likewise, the NRC staff implemented review process improvements that minimized multiple rounds of RAIs and enhanced synergy between the Operating Experience and Safety audits.

Prior to requesting SLR, Dominion Energy has been making improvements in the North Anna facility based on equipment performance monitoring of each unit. Significant primary system modifications for both units included reactor vessel head replacement and reactor vessel up-flow conversion. Secondary system modifications for each unit were implemented to replace service water spray array piping, service water instrument air compressor dryers, and emergency diesel generator transfer pumps buried fuel lines. Major electrical system modifications to the units involved replacement of the main generators, main transformers, station service transformers, and reserved station service transformers. Modifications specific to Unit 1 included replacement of: the flux thimble tubes, service water charging piping with AL-6XN, and the underground security diesel generator fuel supply tank. Dominion Energy has also replaced the fire detection system and underground fire protection piping. These improvements demonstrate investments by Dominion Energy to maintain the units in good material condition to assure safe operation.

Dominion Energy will implement 48 GALL-AMPs for SLR, comprised of 41 existing programs and seven new programs. The seven new programs are consistent with the GALL-SLR Report. Of the 41 existing programs, 16 are consistent with the GALL-SLR Report, 18 are consistent with enhancements, three are consistent with allowed exceptions, and four are consistent with enhancements and allowed exceptions. No plant-specific enhancements are required to be evaluated against the SRP-SLR. The staff found the programs with exceptions and enhancements to be acceptable.

Dominion Energy has demonstrated the effectiveness of their programs to maintain material condition, to sustain system and equipment performance, and to identify and implement improvements to assure facility safety and reliability. Commitments in the SLR application and in Dominion Energy responses to the staff audits and inspections provide assurance that these programs will continue throughout the SPEO. These items are managed through the Dominion Energy commitment tracking program and documented in the Updated Final Safety Analysis Report (UFSAR) supplement.

In its final safety evaluation report, the staff documented its review of the SLR application and other information submitted by Dominion Energy and obtained through staff audits, related inspections, and RAIs. The staff conducted a regulatory audit on the technical details of the SLR application from October 13, 2020, through January 8, 2021. This audit was used to evaluate the completeness of the identified structures, systems, and components within the scope of the license renewal program, the suitability and adequacy of the aging management review, and the acceptability of the plant-specific time limited aging analyses. The staff audit report confirms that the North Anna AMPs are comprehensive and effective.

Three post-approval site inspections for the North Anna first license renewal were performed in 2016, 2017, and 2019 and verified that the current license renewal requirements are being implemented appropriately. No findings related to SLR were identified in these inspections. The staff also examined routine on-site inspections for issues related to AMP implementation and identified no issues of concern. The focused audits and inspections were designed to identify issues and promote their resolution. The corresponding inspection and audit reports were thorough.

The staff performed a detailed review and issued RAIs regarding the performance of buried grey cast iron piping in the fire protection system. Two differing staff views regarding this buried grey cast iron pipe were presented during our review. In response to additional RAIs related to this topic, Dominion Energy developed detailed monitoring and inspection activities for this piping and described the remediation approach to address inspection results. The UFSAR has been updated accordingly. In addition, staff indicated they were evaluating changes in GALL-SLR guidance to address broader industry experience with buried grey cast iron piping.

Based on the audits, inspections, and the staff reviews, the staff concluded that Dominion Energy will continue to adequately manage the effects of aging. Safety functions will be maintained consistent with the North Anna licensing basis for the SPEO, as required by 10 CFR 54.21(a)(3). The staff's extensive and detailed review of the SLR application, documented in the final safety evaluation report, identified no open or confirmatory items.

We agree with the staff's conclusion that there are no issues that preclude renewal of the operating license for North Anna, as described in 10 CFR 54.29(a)(1) and (a)(2).

## SUMMARY

The established programs and the commitments made by Dominion Energy to manage age-related degradation provide reasonable assurance that North Anna can be operated in accordance with its licensing basis for the SPEO without undue risk to the health and safety of the public. The Dominion Energy application for the SLR of the operating license for North Anna should be approved.

Member Sunseri did not deliberate in portions of the meeting related to metal and environmental fatigue and irradiation embrittlement of the reactor pressure vessel.

We are not requesting a formal response from the staff to this letter report.

Sincerely,



Signed by Rempe, Joy  
on 02/28/22

Joy L. Rempe  
Chairman

## REFERENCES

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3. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report Related to the Subsequent License Renewal of North Anna Power Station, Units 1 and 2," January 2022 (ML21354A196).
4. U.S. Nuclear Regulatory Commission, "North Anna Subsequent License Renewal Aging Management Audit Plan," October 9, 2020 (ML20276A192).
5. U.S. Nuclear Regulatory Commission, "North Anna Power Station, Units 1 and 2 - Report for the Aging Management Audit Regarding the Subsequent License Renewal Application Review (EPID No. L-2020-SLR-0000)," April 2021 (ML21036A060).
6. U.S. Nuclear Regulatory Commission, "North Anna Nuclear Plant, Unit 1 - U.S. Nuclear Regulatory Commission Post-Approval Site Inspection for License Renewal Inspection Report 05000338/2016009," October 2016 (ML16306A189).
7. U.S. Nuclear Regulatory Commission, "North Anna Power Station Units 1 and 2 - NRC Post-Approval Site Inspection for License Renewal, Inspection Report 05000338/2017008 and 05000339/2017008," January 2018 (ML18029A029).

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9. U.S. Nuclear Regulatory Commission, NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP-LR)," December 2010 (ML103490036).
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14. U.S. Nuclear Regulatory Commission, NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants," July 2017 (ML17188A158).
15. U.S. Nuclear Regulatory Commission, NUREG-2221, "Technical Bases for Changes in the Subsequent License Renewal Guidance Documents NUREG–2191 and NUREG–2192," December 2017 (ML17362A126).
16. U.S. Nuclear Regulatory Commission, NUREG-2222, "Disposition of Public Comments on the Draft Subsequent License Renewal Guidance Documents NUREG–2191 and NUREG–2192," December 2017 (ML17362A143).
17. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," May 1988 (ML003740284).

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