

April 26, 2001

Mr. David A. Christian  
Senior Vice President - Nuclear  
Virginia Electric and Power Company  
5000 Dominion Blvd.  
Glen Allen, Virginia 23060

SUBJECT: NORTH ANNA POWER STATION, UNITS 1 AND 2 - ENVIRONMENTAL  
ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT RELATED TO  
EXEMPTION FROM THE REQUIREMENTS OF 10 CFR PART 50, APPENDIX G  
(TAC NOS. MA9347 AND MA9348)

Dear Mr. Christian:

Enclosed is a copy of the Environmental Assessment and Finding of No Significant Impact related to your application for an exemption from the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix G, for North Anna Power Station, Units 1 and 2. The proposed exemption would allow application of Code Case N-641 in establishing the reactor vessel pressure limits at low temperatures for North Anna Power Station, Units 1 and 2. This action is in response to your letter dated June 22, 2000, as supplemented on January 4, February 14, March 13, and March 22, 2001, that submitted new pressure temperature (P-T) limits, low temperature overpressure protection (LTOP) system setpoints, and the LTOP system effective temperature ( $T_{enable}$ ) for North Anna. The new P-T limits, LTOP setpoints, and  $T_{enable}$  were developed using the methodologies in the American Society of Mechanical Engineers Code Case N-641.

The assessment is being forwarded to the Office of the Federal Register for publication.

Sincerely,

***/RA by Richard L. Emch, Jr. for:/***

Stephen R. Monarque, Project Manager, Section 1  
Project Directorate II  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket Nos. 50-338 and 50-339

Enclosure: Environmental Assessment

cc w/encl: See next page

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Virginia Electric and Power Company

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UNITED STATES NUCLEAR REGULATORY COMMISSION

VIRGINIA ELECTRIC AND POWER COMPANY

DOCKET NOS. 50-338 AND 50-339

NORTH ANNA POWER STATION, UNITS 1 AND 2

ENVIRONMENTAL ASSESSMENT AND FINDING OF

NO SIGNIFICANT IMPACT

The U.S. Nuclear Regulatory Commission (NRC) is considering issuance of an exemption from the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix G, for Facility Operating License Nos. NPF-4 and NPF-7, issued to Virginia Electric and Power Company (the licensee), for operation of the North Anna Power Station, Units 1 and 2, located in Louisa County, Virginia.

ENVIRONMENTAL ASSESSMENT

Identification of the Proposed Action:

10 CFR Part 50, Appendix G, requires that the pressure-temperature (P-T) limits be established for reactor pressure vessels (RPVs) during normal operating and hydrostatic or leak testing conditions. Specifically, 10 CFR Part 50, Appendix G, states that “[t]he appropriate requirements on both the pressure-temperature limits and the minimum permissible temperature must be met for all conditions.” Appendix G of 10 CFR Part 50 specifies that the requirements for these limits are contained in the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, Appendix G.

To address provisions of an amendment to the Technical Specifications P-T limits and low-temperature overpressure protection (LTOP) system setpoints, the licensee requested in its submittal dated June 22, 2000, as supplemented on January 4, February 14, March 13, and

March 22, 2001, that the NRC staff exempt North Anna Power Station from the requirements of 10 CFR Part 50, Appendix G, to allow the use of ASME Code Case N-641.

Code Case N-641 permits the use of an alternate reference fracture toughness ( $K_{IC}$  fracture toughness curve instead of the  $K_{Ia}$  fracture toughness curve) for reactor vessel materials in determining the P-T limits, LTOP system setpoints and  $T_{enable}$ , and provides for plant-specific evaluation of  $T_{enable}$ . Since the  $K_{IC}$  fracture toughness curve shown in ASME Section XI, Appendix A, Figure A-2200-1 (the  $K_{IC}$  fracture toughness curve) provides greater allowable fracture toughness than the corresponding  $K_{Ia}$  fracture toughness curve of ASME Section XI, Appendix G, Figure G-2210-1 (the  $K_{Ia}$  fracture toughness curve), and a plant-specific evaluation of  $T_{enable}$  would give lower values of  $T_{enable}$  than use of a generic bounding evaluation for  $T_{enable}$ , use of Code Case N-641 for establishing the P-T limits, LTOP system setpoints and  $T_{enable}$  would be less conservative than the methodology currently endorsed by 10 CFR Part 50, Appendix G. Although the use of the  $K_{IC}$  fracture toughness curve in ASME Code Case N-641 was recently incorporated into Appendix G to Section XI of the ASME Code, an exemption is still needed because 10 CFR Part 50, Appendix G requires a licensee's analysis to use an edition and addenda of Section XI of the ASME Code incorporated by reference into 10 CFR Part 50, Section 50.55a, i.e., the editions through 1995 and addenda through the 1996 addenda (which do not include the provisions of Code Case N-641). Therefore, an exemption to apply the Code case is required by 10 CFR Part 50, Section 50.60. The proposed action is in accordance with the licensee's application for exemption dated June 22, 2000, as supplemented by letters dated January 4, February 14, March 13, and March 22, 2001.

The Need for the Proposed Action:

ASME Code Case N-641 is needed to revise the method used to determine the reactor coolant system (RCS) P-T limits, LTOP setpoints, and  $T_{enable}$ .

The purpose of 10 CFR Part 50, Section 50.60(a), and 10 CFR Part 50, Appendix G, is to

protect the integrity of the reactor coolant pressure boundary in nuclear power plants. This is accomplished through these regulations that, in part, specify fracture toughness requirements for ferritic materials of the reactor coolant pressure boundary. Pursuant to 10 CFR Part 50, Appendix G, it is required that P-T limits for the RCS be at least as conservative as those obtained by applying the methodology of the ASME Code, Section XI, Appendix G.

Current overpressure protection system (OPPS) setpoints produce operational constraints by limiting the P-T range available to the operator to heat up or cool down the plant. The operating window through which the operator heats up and cools down the RCS becomes more restrictive with continued reactor vessel service. Reducing this operating window could potentially have an adverse safety impact by increasing the possibility of inadvertent OPPS actuation due to pressure surges associated with normal plant evolutions such as reactor coolant pump start and swapping operating charging pumps with the RCS in a water-solid condition. The impact on the P-T limits and OPPS setpoints has been evaluated for an increased service period for operation to 32.3 effective full-power years (EFPYs) for Unit 1 and 34.3 EFPYs for Unit 2, based on ASME Code, Section XI, Appendix G requirements. The results indicate that these OPPS setpoints would significantly restrict the ability to perform plant heatup and cooldown, create an unnecessary burden to plant operations, and challenge control of plant evolutions required with OPPS enabled. Continued operation of North Anna Units 1 and 2 with P-T curves developed to satisfy ASME Code, Section XI, Appendix G, requirements without the relief provided by ASME Code Case N-641 would unnecessarily restrict the P-T operating window, especially at low temperature conditions.

Use of the  $K_{Ic}$  curve in determining the lower bound fracture toughness of RPV steels is more technically correct than use of the  $K_{Ia}$  curve since the rate of loading during a heatup or cooldown is slow and is more representative of a static condition than a dynamic condition. The  $K_{Ic}$  curve appropriately implements the use of static initiation fracture toughness behavior to

evaluate the controlled heatup and cooldown process of a reactor vessel. The staff has required use of the conservatism of the  $K_{Ia}$  curve since 1974, when the curve was adopted by the ASME Code. This conservatism was initially necessary due to the limited knowledge of the fracture toughness of RPV materials at that time. Since 1974, additional knowledge has been gained about RPV materials, which demonstrates that the lower bound on fracture toughness provided by the  $K_{Ia}$  curve greatly exceeds the margin of safety required, and that the  $K_{Ic}$  curve is sufficiently conservative, to protect the public health and safety from potential RPV failure. Application of ASME Code Case N-641 will provide results that are sufficiently conservative to ensure the integrity of the reactor coolant pressure boundary while providing P-T curves that are not overly restrictive. Implementation of the proposed P-T curves, as allowed by ASME Code Case N-641, does not significantly reduce the margin of safety.

In the associated exemption, the NRC staff has determined that, pursuant to 10 CFR Part 50, Section 50.12(a)(2)(ii), the underlying purpose of the regulation will continue to be served by the implementation of ASME Code Case N-641.

Environmental Impacts of the Proposed Action:

The NRC has completed its evaluation of the proposed action and concludes that the proposed action provides adequate margin of safety against brittle failure of the reactor coolant pressure boundary. The proposed action will not significantly increase the probability or consequences of accidents, no changes are being made in the types of any effluents that may be released off site, and there is no significant increase in occupational or public radiation exposure. Therefore, there are no significant radiological environmental impacts associated with the proposed action.

With regard to potential nonradiological impacts, the proposed action does not involve any historic sites. It does not affect nonradiological plant effluents and has no other environmental

impact. Therefore, there are no significant nonradiological environmental impacts associated with the proposed action.

Accordingly, the NRC concludes that there are no significant environmental impacts associated with the proposed action.

Alternatives to the Proposed Action:

As an alternative to the proposed action, the staff considered denial of the proposed action (i.e., the "no-action" alternative). Denial of the application would result in no change in current environmental impacts. The environmental impacts of the proposed action and the alternative action are similar.

Alternative Use of Resources:

This action does not involve the use of any resources not previously considered in the Final Environmental Statement for the North Anna Power Station, Units 1 and 2, dated April 1973.

Agencies and Persons Consulted:

In accordance with its stated policy, on April 2, 2001, the staff consulted with the Virginia State official, Mr. J. Dekrafft of the Radiological Health Program of the Virginia Department of Health, regarding the environmental impact of the proposed action. The State official had no comments.

FINDING OF NO SIGNIFICANT IMPACT

On the basis of the environmental assessment, the NRC concludes that the proposed action will not have a significant effect on the quality of the human environment. Accordingly, the NRC has determined not to prepare an environmental impact statement for the proposed action.

For further details with respect to the proposed action, see the licensee's letter dated June 22, 2000, as supplemented by letters dated January 4, February 14, March 13, and



March 22, 2001. Documents may be examined, and/or copied for a fee, at the NRC's Public Document Room, located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland. Publicly available records will be accessible electronically from the ADAMS Public Library component on the NRC Web site, <http://www.nrc.gov> (the Electronic Reading Room).

Dated at Rockville, Maryland, this 26th day of April 2001.

FOR THE NUCLEAR REGULATORY COMMISSION

*/RA/*

Gordon E. Edison, Senior Project Manager, Section 1  
Project Directorate II  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation