Dated: May 3, 2001.

Beth M. McCormick,

Advisory Committee Management Officer, National Aeronautics and Space Administration.

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NUCLEAR REGULATORY COMMISSION

[Docket Nos. 50–338 and 50–339]

Virginia Electric and Power Company, North Anna Power Station Units 1 and 2; Exemption

1.0 Background

The Virginia Electric and Power Company (the licensee) is the holder of Facility Operating Licenses NPF–4 and NPF–7, which authorize operation of the North Anna Power Station, Units 1 and 2. The licenses provide, among other things, that the facility is subject to all rules, regulations, and orders of the U.S. Nuclear Regulatory Commission (NRC, the Commission) now or hereafter in effect.

The facility consists of two pressurized-water reactors located in Louisa County in the Commonwealth of Virginia.

2.0 Purpose

Title 10 of the Code of Federal Regulations (10 CFR) part 50, Appendix G requires that pressure-temperature (P–T) limits be established for reactor pressure vessels (RPVs) during normal operating, and hydrostatic pressure or leak testing conditions. Specifically, 10 CFR part 50, Appendix G states that ''[t]he appropriate requirements on * * * the pressure-temperature limits and minimum permissible temperature must be met for all conditions.'' Appendix G of 10 CFR part 50 specifies that the requirements for these limits are the American Society of Mechanical Engineers (ASME) Code, Section XI, Appendix G Limits. RG 1.99, Rev. 2, provides guidance for implementing 10 CFR Part 50, Appendix G. In GL 88–11, the NRC staff advised licensees that the staff would use RG 1.99, Rev. 2, to review P–T limit curves. RG 1.99, Rev. 2, contains conservative methodologies for determining the increase in transition temperature and the decrease in upper-shelf energy resulting from neutron radiation.

To address provisions of amendments to the technical specifications (TS) regarding the P–T limits, low temperature overpressure protection (LTOP) system setpoints, and LTOP system effective temperature (T_{enable}), the licensee requested in its submittal dated June 22, 2000, as supplemented by letters dated September 19, 2000, and January 4, February 14, March 13, March 22, and April 11, 2001, that the staff exempt North Anna Units 1 and 2 from application of specific requirements of 10 CFR part 50, appendix G, and substitute 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 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 and, therefore, an exemption to apply the Code Case would be required by 10 CFR 50.60. 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 the licensee's analysis to use an edition and addenda of Section XI of the ASME Code incorporated by reference into 10 CFR 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).

The proposed amendments submitted by the licensee will revise the P–T limits of TS 3/4.4.9 related to the heatup and cooldown of the reactor coolant system (RCS), the LTOP system setpoints and T_{enable} for the LTOP system, for operation to 32.3 effective full power years (EFPY) for Unit 1 and 34.3 EFPY for Unit 2.

ASME Code Case N–641

The licensee has proposed an exemption to allow use of ASME Code Case N–641 in conjunction with ASME Section XI, 10 CFR 50.60(a) and 10 CFR part 50, appendix G, to determine the P–T limits, LTOP system setpoints and T_{enable}.

The proposed amendments to revise the P–T limits, LTOP system setpoints and T_{enable} for North Anna Units 1 and 2 rely in part on the requested exemption. The revised P–T limits, LTOP system setpoints and T_{enable} have been developed using the K_{Ic} fracture toughness curve, in lieu of the K_{Ia} fracture toughness curve, as the lower bound for fracture toughness of the RPV materials.

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 to protect the public health and safety from potential RPV failure. In addition, P–T curves, LTOP setpoints, and T_{enable} based on the K_{Ic} curve will enhance overall plant safety by opening the P–T operating window, with the greatest safety benefit in the region of low temperature operations.

Since an unnecessarily reduced P–T operating window can reduce operator flexibility without just basis, implementation of the proposed P–T curves, LTOP setpoints, and T_{enable} as allowed by ASME Code Case N–641 may result in enhanced safety during critical plant operational periods, specifically heatup and cooldown conditions. Thus, pursuant to 10 CFR 50.12(a)(2)(ii), the underlying purpose of 10 CFR 50.60 and appendix G to 10 CFR part 50 will continue to be served.

In summary, the ASME Section XI, Appendix G, procedure was conservatively developed based on the level of knowledge existing in 1974 concerning RPV materials and the estimated effects of operation. Since 1974, the level of knowledge about these topics has been greatly expanded. The staff concurs that this increased knowledge permits relaxation of the ASME Section XI, Appendix G requirements by application of ASME Code Case N–641, while maintaining,

pursuant to 10 CFR 50.12(a)(2)(ii), the underlying purpose of the NRC regulations to ensure an acceptable margin of safety.

3.0 Discussion

Pursuant to 10 CFR 50.12, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR Part 50, when (1) the exemptions are authorized by law, will not present an undue risk to public health or safety, and are consistent with the common defense and security; and (2) when special circumstances are present. The staff accepts the licensee's determination that an exemption would be required to approve the use of Code Case N–641. The staff examined the licensee's rationale to support the exemption request and concurs that the use of the Code case would meet the underlying intent of these regulations. Based upon a consideration of the conservatism that is explicitly incorporated into the methodologies of 10 CFR part 50, appendix G; Appendix G of the Code; and Regulatory Guide 1.99, Revision 2, as discussed above, the staff concludes that application of the Code case as described would provide an adequate margin of safety against brittle failure of the RPV. This conclusion is also consistent with the determinations that the staff has reached for other licensees under similar conditions based on the same considerations.

Therefore, the staff concludes that granting an exemption under the special circumstances of 10 CFR 50.12(a)(2)(ii) is appropriate and that the methodologies of Code Case N–641 may be used to revise the P–T limits, LTOP setpoints, and T_{enable} for North Anna Power Station, Units 1 and 2.

4.0 Conclusion

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), the exemption is authorized by law, will not endanger life or property or common defense and security, and is, otherwise, in the public interest. Therefore, the Commission hereby grants the licensee an exemption from the requirements of 10 CFR part 50, appendix G, for North Anna Power Station, Units 1 and 2.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will not have a significant effect on the quality of the human environment (66 FR 22018).

This exemption is effective upon issuance.

Dated at Rockville, Maryland, this 2nd day of May 2001.

For the Nuclear Regulatory Commission.

John A. Zwolinski,

Director, Division of Licensing Project Management, Office of Nuclear Reactor Regulation.

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NUCLEAR REGULATORY COMMISSION

[Docket No. 50–289]

Amergen Energy Company, LLC; Three Mile Island Nuclear Station, Unit 1 Environmental Assessment and Finding of No Significant Impact

The U.S. Nuclear Regulatory Commission (NRC) is considering issuance of an exemption from certain provisions of Sections 50.44 and 50.46 and Appendix K of Title 10 of the Code of Federal Regulations (10 CFR) Part 50 for Facility Operating License No. DPR–50, issued to AmerGen Energy Company, LLC (the licensee), for operation of the Three Mile Island Nuclear Station, Unit 1 (TMI–1), located in Dauphin County, Pennsylvania.

Environmental Assessment

Identification of the Proposed Action

The licensee requests an exemption from the provisions of: (1) 10 CFR 50.44, ''Standards for combustible gas control system in light-water-cooled power reactors,'' which provide requirements to control hydrogen generated by Zircaloy or ZIRLO fuel cladding after a postulated loss-of-coolant accident (LOCA); (2) 10 CFR 50.46, ''Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors,'' which requires the calculated emergency core cooling system (ECCS) performance for reactors with Zircaloy or ZIRLO fuel cladding to meet certain criteria; and (3) Appendix K, ''ECCS Evaluation Models,'' which presumes the use of Zircaloy or ZIRLO fuel cladding when doing calculations for energy release, cladding oxidation, and hydrogen generation after a postulated LOCA.

The proposed action would allow the licensee to generally use the M5 advanced alloy for fuel rod cladding in fuel assemblies at TMI–1. Limited use of M5 alloy in demonstration assemblies at TMI–1 had previously been approved. M5 alloy would also be used in fuel assembly spacer grids and fuel rod end plugs and fuel assembly guide and instrument tubes. M5 alloy material would be used in lieu of Zircaloy or ZIRLO, the materials assumed to be used in the cited regulations. The fuel assemblies would be loaded into the TMI–1 reactor core during the refueling outage in the fall of 2001, and in use during Cycle 14 and beyond operation.

The proposed action is in accordance with the licensee's application for exemption dated December 20, 2000, as supplemented by letter dated March 14, 2001.

The Need for the Proposed Action

Appendix K of 10 CFR part 50 and 10 CFR 50.46(a)(1)(i) require the demonstration of adequate ECCS performance for light-water reactors that contain fuel consisting of uranium oxide pellets enclosed in Zircaloy or ZIRLO tubes. In addition, 10 CFR 50.44(a) addresses requirements to control hydrogen generated by Zircaloy or ZIRLO fuel after a postulated LOCA. Each of these three regulations, either implicitly or explicitly assume that either Zircaloy or ZIRLO is used as the fuel rod cladding material. In order to accommodate the high fuel rod burnups that are required for modern fuel management and core designs, Framatome Cogema Fuels (FCF), developed the M5 advanced fuel rod cladding and fuel assembly structural material. M5 is an alloy comprised primarily of zirconium (~99 percent) and niobium (~ 1 percent) that has demonstrated superior corrosion resistance and reduced irradiation induced growth relative to both standard and low-tin Zircaloy. However, since the chemical composition of the M5 advanced alloy differs from the specifications of either Zircaloy or ZIRLO, use of the M5 advanced alloy falls outside of the strict interpretation of these regulations. Therefore, approval of this exemption request is needed to permit the use of the M5 advanced alloy as a fuel rod cladding material at TMI–1. Limited use of the M5 alloy in demonstration assemblies at TMI–1 had previously been approved.

Pursuant to 10 CFR 50.12, the NRC may grant exemptions which are authorized by law, will not present an undue risk to the health and safety of the public, and are consistent with the common defense and security, provided that special circumstances are present. Pursuant to 10 CFR 50.12(a)(2)(ii), the Commission believes that special circumstances are present whenever application of the regulation in the particular circumstances is not necessary to achieve the underlying purpose of the rule. The underlying purpose of 10 CFR 50.46 is to ensure that facilities have adequate acceptance criteria for ECCS. FCF demonstrates in its topical report BAW–10227P–A, ''Evaluation of Advanced Cladding and