

February 19, 2002

Mr. L. W. Myers
Senior Vice President
FirstEnergy Nuclear Operating Company
Beaver Valley Power Station
Post Office Box 4
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SUBJECT: BEAVER VALLEY POWER STATION, UNIT 1 - EXEMPTION FROM THE
REQUIREMENTS OF 10 CFR 50.60(a) AND APPENDIX G (TAC NO. MB2300)

Dear Mr. Myers:

The Commission has approved the enclosed exemption from specific requirements of Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.60(a) and Appendix G, for the Beaver Valley Power Station, Unit 1. This action is in response to your letter dated June 29, 2001, as supplemented by letters dated October 4 and December 1, 2001, concerning changes to the reactor pressure vessel pressure-temperature limits.

A copy of the exemption is enclosed. The exemption has been forwarded to the Office of the Federal Register for publication.

Sincerely,

/RA/

Daniel S. Collins, Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-334

Enclosure: Exemption

cc w/encl: See next page

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
FIRSTENERGY NUCLEAR OPERATING COMPANY
BEAVER VALLEY POWER STATION, UNIT NO. 1
DOCKET NO. 50-334
EXEMPTION

1.0 BACKGROUND

The FirstEnergy Nuclear Operating Company (FENOC/the licensee) is the holder of Facility Operating License No. DPR-66 which authorizes operation of Beaver Valley Power Station, Unit No. 1 (BVPS-1). The license provides, 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 a pressurized-water reactor located in Beaver County, Pennsylvania.

2.0 DISCUSSION

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.60(a), requires that “all light-water nuclear power reactors ... must meet the fracture toughness and material surveillance program requirements for the reactor coolant pressure boundary set forth in appendices G and H to this part.” Appendix G to 10 CFR Part 50 requires that pressure-temperature (P-T) limits be established for reactor pressure vessels (RPVs) during normal operating and hydrostatic or leak rate testing conditions. Specifically, Appendix G to 10 CFR Part 50 states that “[t]he appropriate requirements on...the pressure-temperature limits and minimum permissible temperature must be met for all conditions.” Further, Appendix G of 10 CFR Part 50 specifies that the requirements for these limits are based on the application of

evaluation procedures given in Appendix G to Section XI of the American Society of Mechanical Engineers (ASME) Code. In this exemption, consistent with the current provisions of 10 CFR 50.55(a), all references made to the ASME Code denote the 1995 Edition of the ASME Code, including the 1996 Addenda.

In order to support a proposed amendment to the BVPS-1 Technical Specification (TS) P-T limit curves, FENOC requested in its application dated June 29, 2001, that the staff exempt BVPS-1 from application of specific requirements of 10 CFR Part 50, Section 50.60(a), and 10 CFR Part 50, Appendix G, and substitute use of ASME Code Case N-640. ASME Code Case N-640 permits the use of an alternate reference fracture toughness curve for RPV materials for use in determining the P-T limits. The proposed exemption is consistent with, and is needed to support, the BVPS-1 TS amendment request that was contained in the same application. The proposed BVPS-1 TS amendment will revise the P-T limits for heatup, cooldown, and inservice test limitations for the reactor coolant system (RCS) to 22 effective full power years (EFPYs).

The proposed TS amendment to revise the P-T limits for BVPS-1 relies in part on the requested exemption. These revised P-T limits have been developed using the lower bound K_{IC} fracture toughness curve shown in ASME Code Section XI, Appendix A, Figure A-2200-1, as the basis fracture toughness curve for defining the BVPS-1 P-T limits in lieu of using the lower bound K_{IA} fracture toughness curve of ASME Code Section XI, Appendix G, Figure G-2210-1. The other margins involved with the ASME Code, Section XI, Appendix G, process of determining P-T limit curves remain unchanged.

Use of the K_{IC} curve as the basis fracture toughness curve for the development of P-T operating limits is more technically correct than use of the K_{IA} curve. The K_{IC} curve appropriately implements the use of a relationship based on static initiation fracture toughness behavior to evaluate the controlled heatup and cooldown process of an RPV, whereas the K_{IA}

fracture toughness curve codified into Appendix G to Section XI of the ASME Code was developed from more conservative crack arrest and dynamic fracture toughness test data. The application of the K_{IA} fracture toughness curve was initially codified in Appendix G to Section XI of the ASME Code in 1974 to provide a conservative representation of RPV material fracture toughness. This initial conservatism was necessary due to the limited knowledge of RPV material behavior in 1974. However, additional knowledge has been gained about RPV materials which demonstrates that the lower bound on fracture toughness provided by the K_{IA} fracture toughness curve is well beyond the margin of safety required to protect public health and safety from potential RPV failure. In addition, P-T limit curves based on the K_{IC} fracture toughness 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. The operating window through which the operator heats up and cools down the RCS is determined by the difference between the maximum allowable pressure determined by Appendix G of ASME Code, Section XI, and the minimum required pressure for the reactor coolant pump (RCP) seals adjusted for instrument uncertainties. A narrow operating window could potentially have an adverse safety impact by increasing the possibility of inadvertent overpressure protection system (OPPS) actuation. This OPPS actuation could be caused by pressure surges associated with normal plant evolutions such as starting RCS pumps or switching operating charging pumps while the RCS is in a water-solid condition.

Since the RCS P-T operating window is defined by the P-T operating and test limit curves developed in accordance with the ASME Code, Section XI, Appendix G procedure, continued operation of BVPS-1 with these P-T curves without the relief provided by ASME Code Case N-640 may unnecessarily restrict the P-T operating window, especially at low-temperature conditions. The operating window becomes more restrictive with continued reactor vessel

service. Therefore, the licensee concluded that these considerations were special circumstances pursuant to 10 CFR 50.12(a)(2)(iii), regarding undue hardship, and requested the exemption to use the provisions of ASME Code Case N-640 in the development of BVPS-1 RPV P-T limit curves.

The Nuclear Regulatory Commission (NRC) staff has reviewed the exemption request submitted by FENOC and has concluded that an exemption should be granted to permit the licensee to use the provisions of ASME Code Case N-640 for the purpose of developing BVPS-1 RPV P-T limit curves. However, the NRC staff does not agree with the special circumstances cited by FENOC in its June 29, 2001, application regarding the basis for granting the exemption. The NRC staff did not conclude that the circumstances cited above constitute "undue hardship or other costs that are significantly in excess of those contemplated when the regulation was adopted, or that are significantly in excess of those incurred by others similarly situated," pursuant to 10 CFR 50.12(a)(2)(iii). Rather, the NRC staff concluded that the application of the technical provisions of ASME Code Case N-640 provided sufficient margin in the development of RPV P-T limit curves such that the underlying purpose of the regulations, Appendix G to 10 CFR Part 50, will continue to be met and that the specific conditions required by the regulations (i.e., use of all provisions in Appendix G to Section XI of the ASME Code) were not necessary. Therefore, the NRC staff grants the requested exemption to FENOC based on the special circumstances of 10 CFR 50.12(a)(2)(ii), "[a]pplication of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule."

In summary, the ASME Code, 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 NRC staff concurs that this increased knowledge permits relaxation of the ASME Code, Section XI, Appendix G requirements, by application of ASME Code Case N-640, while maintaining, pursuant to 10 CFR50.12(a)(2)(ii), the underlying purpose of the ASME Code and the NRC regulations to ensure an acceptable margin of safety.

3.0 EVALUATION

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 NRC staff accepts the licensee's determination that an exemption would be required to approve the use of ASME Code Case N-640. The NRC staff concluded that the use of ASME Code Case N-640 would meet the underlying intent of Appendix G to 10 CFR Part 50.

Based upon a consideration of the conservatism that is explicitly incorporated into the methodologies of Appendix G to 10 CFR Part 50, Appendix G to Section XI of the ASME Code, and RG 1.99, Revision 2, the staff concluded that application of ASME Code Case N-640 as described would provide an adequate margin of safety against brittle failure of the RPV. This conclusion is also consistent with the determination that the staff has reached for other licensees under similar conditions based on the same considerations.

Therefore, the staff concludes that granting the exemption under the special circumstances of 10 CFR 50.12(a)(2)(ii) is appropriate and that the methodology of ASME Code Case N-640 may be used to revise the P-T limits for the BVPS-1 RCS.

4.0 CONCLUSION

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), the

exemption is authorized by law, will not present an undue risk to the public health and safety, and is consistent with the common defense and security. Also, special circumstances are present. Therefore, the Commission hereby grants First Energy Nuclear Operating Company an exemption from the requirements of 10 CFR, Section 50.60(a), and 10 CFR Part 50, Appendix G, for the development of P-T limit curves for the BVPS-1 reactor coolant system.

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 (67 FR 7405).

This exemption is effective upon issuance.

Dated at Rockville, Maryland, this 19th day of February 2002.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

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

February 19, 2002

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Docket No. 50-334

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