

March 21, 2001

Mr. James A. Hutton  
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SUBJECT: LIMERICK GENERATING STATION, UNIT 2 - EXEMPTION FROM THE  
REQUIREMENTS OF APPENDIX G TO 10 CFR PART 50 (TAC NO.  
MB0595)

Dear Mr. Hutton:

The Commission has approved the enclosed exemption from specific requirements of Appendix G to Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 50), for the Limerick Generating Station, Unit 2 (Limerick Unit 2). This action is in response to PECO Energy Company's letter of November 20, 2000, as supplemented December 20, 2000. By letter dated January 30, 2001, Exelon Generation Company, successor to PECO Energy Company, adopted this exemption request. The associated license amendment application submitted proposed new pressure-temperature (P-T) limits for Limerick Unit 2. The new P-T limits were developed using the methodologies in the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Case N-640, "Alternative Reference Fracture Toughness for Development of P-T Limit Curves for ASME Section XI, Division 1," which modify the methods of ASME Code, Section XI, Appendix G.

The exemption has been forwarded to the Office of the Federal Register for publication.

Sincerely,

**/RA/**

Christopher Gratton, Sr. Project Manager, Section 2  
Project Directorate I  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-353

Enclosure: Exemption

cc w/encl: See next page

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Limerick Generating Station, Units 1 & 2

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION  
EXELON GENERATION COMPANY  
LIMERICK GENERATING STATION, UNIT 2  
DOCKET NO. 50-353

1.0 BACKGROUND

The Exelon Generation Company (Exelon, the licensee) is the holder of Facility Operating License No. NPF-85 which authorizes operation of the Limerick Generating Station, Unit 2 (Limerick Unit 2). The license provides, among others 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 boiling water reactor located in Montgomery and Chester Counties in Pennsylvania.

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) for normal operating and hydrostatic or leak rate testing conditions. Specifically, 10 CFR Part 50, Appendix G, Section IV.A.2.a, states, "The 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 P-T limits identified as "ASME [American Society of Mechanical Engineering Pressure and Vessel Code (ASME Code)] Appendix G limits" in Table 1 require that the limits must be at least as conservative as the limits obtained by following the methods of analysis and the margins of safety of Appendix G of Section XI of the ASME Code.

To address provisions of a proposed license amendment to the technical specification P-T limits for the Limerick facility, the licensee requested in its submittal of November 20, 2000, as supplemented December 20, 2000, that the staff exempt Limerick Unit 2 from application of specific requirements of Appendix G to 10 CFR Part 50, and substitute use of ASME Code Case N-640. Code Case N-640 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. Since the  $K_{Ic}$  fracture toughness curve of ASME Section XI, Appendix A, Figure A-2200-1 (the  $K_{Ic}$  fracture toughness curve,  $K_{Ic}$  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  $K_{Ia}$  curve), using Code Case N-640 for establishing the P-T limits would be less conservative than the methodology currently endorsed by 10 CFR Part 50, Appendix G. The regulations (10 CFR 50.60(b)) state that proposed alternatives to the requirements in Appendix G to 10 CFR part 50 may be used when an exemption is granted by the Commission under 10 CFR 50.12.

### 3.0 DISCUSSION

#### Code Case N-640 (formerly Code Case N-626)

The licensee has proposed an exemption to allow use of ASME Code Case N-640 in conjunction with ASME Section XI, 10 CFR 50.60(a) and 10 CFR Part 50, Appendix G, to determine P-T limits.

The proposed license amendment to revise the P-T limits for Limerick Unit 2 relies in part on the requested exemption. These revised P-T limits 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.

Use of the  $K_{Ic}$  curve in determining the lower bound fracture toughness in the development of P-T operating limits curve 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 NRC staff has required use of the initial conservatism of the  $K_{Ia}$  curve since 1974 when the curve was codified. This initial conservatism was necessary due to the limited knowledge of RPV materials. 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 is well beyond the margin of safety required to protect the public health and safety from potential RPV failure. In addition, P-T curves 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 the reactor coolant system P-T operating window is defined by the P-T operating and test limit curves developed in accordance with ASME Section XI, Appendix G, continued operation of Limerick Unit 2 with these P-T curves without the relief provided by ASME Code Case N-640 would unnecessarily require the licensee to maintain the RPV at a temperature exceeding 212 °F in a limited operating window during pressure tests. Consequently, steam vapor hazards would continue to be one of the safety concerns for personnel conducting inspections in primary containment. Implementation of the proposed P-T curves, as allowed by ASME Code Case N-640, continues to maintain an adequate margin of safety and would eliminate steam vapor hazards by allowing inspections in primary containment to be conducted at a lower coolant temperature. Thus, pursuant to 10 CFR 50.12(a)(2)(ii), the underlying purpose of the regulation will continue to be served.

Pursuant to 10 CFR 50.12(a), the Commission may, upon application by an 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. As stated in 10 CFR 50.12(a)(2)(ii), these special circumstances include situations in which “Application 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;...” The staff examined the licensee’s rationale to support the exemption request and determined that the use of the code case would meet the underlying purpose of 10 CFR Part 50, Appendix G; therefore, application of the assumed flaw types and the  $K_{Ia}$  equation in Appendix G to Section XI of the ASME Code, as invoked by the rule, is not necessary to meet the underlying purpose of the regulation, and thus meets the special circumstance criterion of 10 CFR 50.12(a)(2)(ii) for granting the exemption request. 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 ASME Code; and Regulatory Guide 1.99, Revision 2; 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 is also consistent with the determination that the NRC staff has reached for other licensees under similar conditions based on the same considerations, including Quad Cities Nuclear Power Station, Units 1 and 2, exemption dated February 4, 2000. Therefore, the staff concludes that granting an exemption under the special circumstances provision of 10 CFR 50.12(a)(2)(ii) is appropriate, and that the methodology contained in Code Case N-640 would serve the underlying purpose of the rule for Limerick Unit 2.

#### 4.0 CONCLUSION

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a): (1) the exemption is authorized by law, will not endanger life or property or common defense and security, and is otherwise in the public interest; and (2) special circumstances are present.

Therefore, the Commission hereby grants Exelon Generation Company an exemption from the requirements of 10 CFR Part 50, Appendix G, for Limerick Unit 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 15913).

This exemption is effective upon issuance.

Dated at Rockville, Maryland, this 21st day of March 2001.

FOR THE NUCLEAR REGULATORY COMMISSION

**/RA/**

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