cember 30, 1996

Mr. George A. Hunger, Jr.
Director-Licensing, MC 62A-1
PECO Energy Company
Nuclear Group Headquarters
Correspondence Control Desk
P.O. Box No. 195
Wayne, PA 19087-0195

SUBJECT: LIMERICK GENERATING STATION, UNIT 2 (TAC NO. M96390)

Dear Mr. Hunger:

The Commission has issued the enclosed Amendment No. 80 to Facility Operating License No. NPF-85 for the Limerick Generating Station (LGS), Unit 2. This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated August 1, 1996.

This amendment revises TS Section 3/4.4.6 (i.e., Figure 3.4.6.1-1) to reflect the addition of two hydrotest curves, effective for 6.5 and 8.5 Effective Full Power Years (EFPY), to the existing Pressure-Temperature Operating Limit (PTOL) curves for LGS Unit 2.

A copy of our Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

/s/
Frank Rinaldi, Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-353

Enclosures: 1. Amendment No. 80 to License No. NPF-85
2. Safety Evaluation

cc w/encls: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 30, 1996

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2. Safety Evaluation

cc w/encls: See next page

Mr. George A. Hunger, Jr.
PECO Energy Company

Limerick Generating Station,
Units 1 & 2

cc:

J. W. Durham, Sr., Esquire
Sr. V.P. & General Counsel
PECO Energy Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Mr. David P. Helker, MC 62A-1
Manager-Limerick Licensing
PECO Energy Company
965 Chesterbrook Boulevard
Wayne, Pennsylvania 19087-5691

Mr. Walter G. MacFarland, Vice President
Limerick Generating Station
Post Office Box A
Sanatoga, Pennsylvania 19464

Mr. Robert Boyce
Plant Manager
Limerick Generating Station
P.O. Box A
Sanatoga, Pennsylvania 19464

Regional Administrator
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

Mr. Neil S. Perry
Senior Resident Inspector
US Nuclear Regulatory Commission
P. O. Box 596
Pottstown, Pennsylvania 19464

Mr. Darryl P. Lequia
Director - Site Support Services
Limerick Generating Station
P.O. Box A
Sanatoga, Pennsylvania 19464

Chairman
Board of Supervisors
of Limerick Township
646 West Ridge Pike
Linfield, PA 19468

Mr. Rich R. Janati, Chief
Division of Nuclear Safety
PA Dept. of Environmental Resources
P. O. Box 8469
Harrisburg, Pennsylvania 17105-8469

Mr. Michael P. Gallagher
Director - Site Engineering
Limerick Generating Station
P. O. Box A
Sanatoga, Pennsylvania 19464

Mr. James L. Kantner
Manager-Experience Assessment
Limerick Generating Station
P. O. Box A
Sanatoga, Pennsylvania 19464

Library
US Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

Mr. Ludwig E. Thibault
Senior Manager - Operations
Limerick Generating Station
P. O. Box A
Sanatoga, Pennsylvania 19464

Dr. Judith Johnsrud
National Energy Committee
Sierra Club
433 Orlando Avenue
State College, PA 16803

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

PHILADELPHIA ELECTRIC COMPANY

DOCKET NO. 50-353

LIMERICK GENERATING STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 80
License No. NPF-85

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Philadelphia Electric Company (the licensee) dated August 1, 1996, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-85 is hereby amended to read as follows:

Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 80 , are hereby incorporated into this license. Philadelphia Electric Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

John F. Stolz, Director
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: December 30, 1996

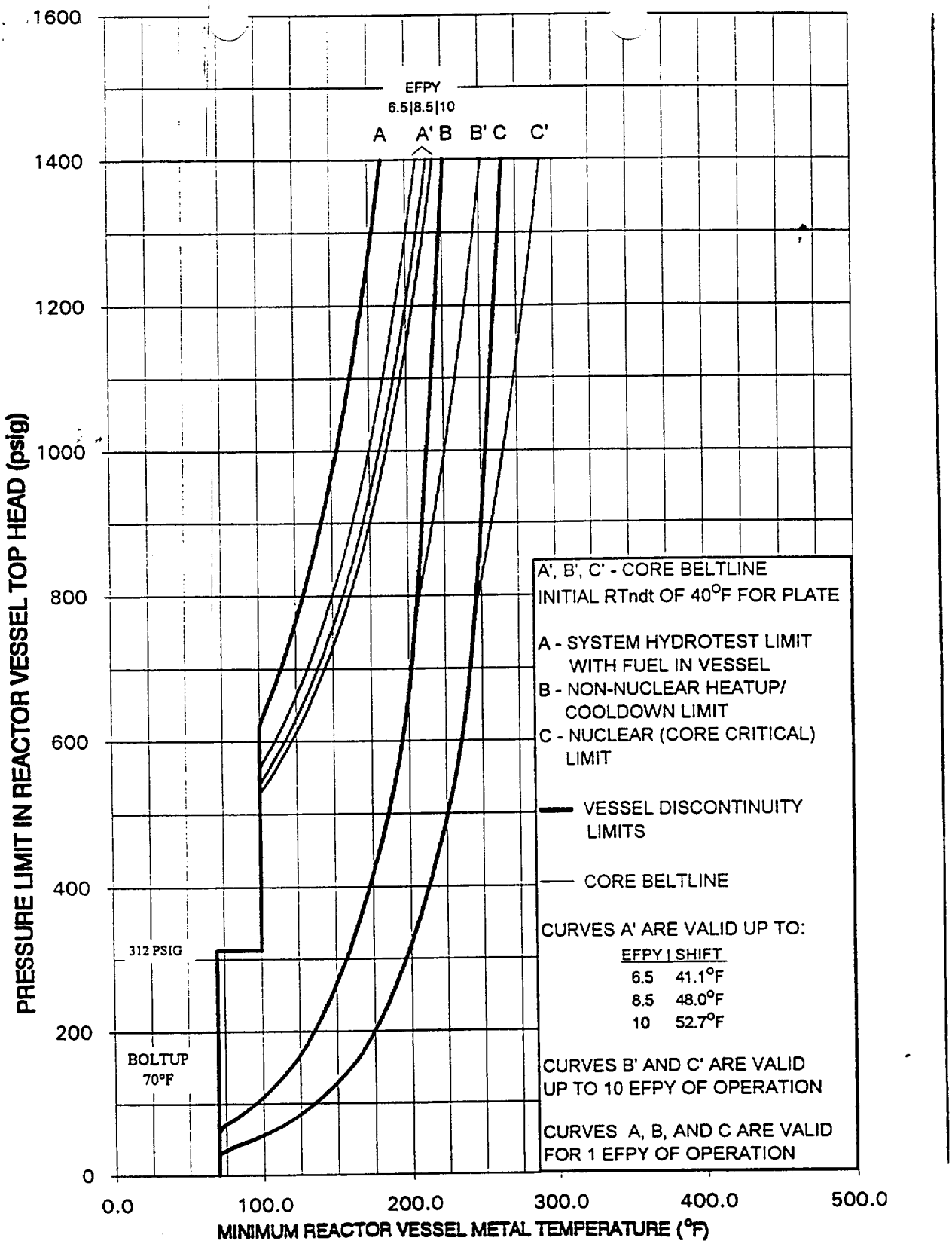
ATTACHMENT TO LICENSE AMENDMENT NO. 80

FACILITY OPERATING LICENSE NO. NPF-85

DOCKET NO. 50-353

Replace the following pages of the Appendix A Technical Specifications with the attached pages. The revised pages are identified by Amendment number and contain vertical lines indicating the area of change.

Remove	Insert
3/4 4-20	3/4 4-20
B 3/4 4-5	B 3/4 4-5



MINIMUM REACTOR VESSEL METAL TEMPERATURE VS. REACTOR VESSEL PRESSURE
FIGURE 3.4.6.1-1

PRESSURE/TEMPERATURE LIMITS (Continued)

The operating limit curves of Figure 3.4.6.1-1 are derived from the fracture toughness requirements of 10 CFR 50 Appendix G and ASME Code Section III, Appendix G. The curves are based on the RT_{NDT} and stress intensity factor information for the reactor vessel components. Fracture toughness limits and the basis for compliance are more fully discussed in FSAR Chapter 5, Paragraph 5.3.1.5, "Fracture Toughness."

The reactor vessel materials have been tested to determine their initial RT_{NDT}. The results of these tests are shown in Table B 3/4.4.6-1. Reactor operation and resultant fast neutron, E greater than 1 MeV, irradiation will cause an increase in the RT_{NDT}. Therefore, an adjusted reference temperature, based upon the fluence, nickel content and copper content of the material in question, can be predicted using Bases Figure B 3/4.4.6-1 and the recommendations of Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials." The pressure/temperature limit curve, Figure 3.4.6.1-1, curves A', B' and C', includes an assumed shift in RT_{NDT} for the conditions at 10 EFPY. In addition, intermediate A' curves have been provided for 6.5 and 8.5 EFPY. The A, B and C limit curves are predicted to be bounding for all areas of the RPV until 1 EFPY when the beltline materials RT_{NDT} will shift, due to neutron fluence, and the beltline curves will intersect the non-beltline discontinuity curves.

The actual shift in RT_{NDT} of the vessel material will be established periodically during operation by removing and evaluating, in accordance with 10 CFR Part 50, Appendix H, irradiated reactor vessel flux wire and charpy specimens installed near the inside wall of the reactor vessel in the core area. Since the neutron spectra at the charpy specimens and vessel inside radius are essentially identical, the irradiated charpy specimens can be used with confidence in predicting reactor vessel material transition temperature shift. The operating limit curves of Figure 3.4.6.1-1 shall be adjusted, as required, on the basis of the flux wire and charpy specimen data and recommendations of Regulatory Guide 1.99, Revision 2.

The pressure-temperature limit lines shown in Figures 3.4.6.1-1, curves C, and C', and A and A', for reactor criticality and for inservice leak and hydrostatic testing have been provided to assure compliance with the minimum temperature requirements of Appendix G to 10 CFR Part 50 for reactor criticality and for inservice leak and hydrostatic testing.

The number of reactor vessel irradiation surveillance capsules and the frequencies for removing and testing the specimens in these capsules are provided in Table 4.4.6.1.3-1 to assure compliance with the requirements of Appendix H to 10 CFR Part 50.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED AMENDMENT NO. 80 TO FACILITY OPERATING LICENSE NO. NPF-85

PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION, UNIT 2

DOCKET NO. 50-353

1.0 INTRODUCTION

By letter dated August 1, 1996, the Philadelphia Electric Company (the licensee) submitted a request for changes to the Limerick Generating Station, Unit 2, Technical Specifications (TSs). The requested changes would revise TS Section 3/4.4.6 (i.e., Figure 3.4.6.1-1) to reflect the addition of two hydrotest curves, effective for 6.5 and 8.5 Effective Full Power Years (EFPY), to the existing Pressure-Temperature Operating Limit (PTOL) curves for LGS Unit 2. The P/T limits are used to operate the reactor coolant system during heatup, cooldown, criticality, and hydrotest.

The staff evaluates the P–T Limits of pressurized water reactors (PWRs) based on the following NRC regulations and guidance: 10 CFR Part 50, Appendix G; Generic Letter (GL) 88-11; GL 92-01, Revision 1; GL 92-01, Revision 1, Supplement 1; Regulatory Guide (RG) 1.99, Revision 2; and Standard Review Plan (SRP) Section 5.3.2. GL 88-11 advised licensees that the staff would use RG 1.99, Revision 2 to review P/T Limit Curves. RG 1.99, Revision 2 contains methodologies for determining the increase in transition temperature and the decrease in upper-shelf energy resulting from neutron radiation. GL 92-01, Revision 1, requested that licensees submit their reactor pressure vessel (RPV) data for their plants to the staff for review. GL 92-01, Revision 1, Supplement 1, requested that licensees provide and assess data from other licensees that could affect their RPV integrity evaluations. These data are used by the staff as the basis for the staff's review of P–T Limit submittals, and as the basis for the staff's review of pressurized thermal shock assessments (10 CFR 50.61 assessments). Appendix G to 10 CFR Part 50 requires that P–T Limits for the RPV be at least as conservative as those obtained by applying the methodology of Appendix G to Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME) Code.

SRP Section 5.3.2 provides an acceptable method of calculating the P–T Limits for ferritic materials in the beltline of the RPV based on the linear elastic fracture mechanics (LEFM) methodology of Appendix G to Section XI of the ASME Code. The basic parameter of this methodology is the stress intensity factor K_I, which is a function of the stress state and flaw configuration. The methods of Appendix G postulate the existence of a sharp surface flaw in the RPV that is normal to the direction of the maximum stress. The flaw in the RPV is postulated to have a depth that is equal to one-fourth of the RPV

beltline thickness and a length equal to 1.5 times the RPV beltline thickness. The critical locations in the RPV beltline region for calculating heatup and cooldown P/T Limit Curves are the 1/4 thickness (1/4t) and 3/4 thickness (3/4t) locations, which correspond to the depth of the maximum postulated flaw, if initiated and grown from the inside and outside surfaces of the RPV, respectively.

The Appendix G, ASME Code methodology requires that licensees determine the adjusted reference temperature (ART or RT_{NDT}) at the maximum postulated flaw depth. The ART is defined as the sum of the initial (unirradiated) reference temperature [$RT_{NDT(U)}$], the mean value of the adjustment in reference temperature caused by irradiation (ΔRT_{NDT}), and a margin (M) term. The ΔRT_{NDT} is a product of a chemistry factor and a fluence factor. The chemistry factor is dependent upon the amount of copper and nickel in the material and may be determined from tables in the RG or from surveillance data. The fluence factor is dependent upon the neutron fluence at the maximum postulated flaw depth. The margin term is dependent upon whether the $RT_{NDT(U)}$ is a plant-specific or a generic value and whether the chemistry factor was determined using the tables in RG 1.99, Revision 2, or surveillance data. The margin term is used to account for uncertainties in the values of $RT_{NDT(U)}$, copper and nickel contents, fluence and calculational procedures. RG 1.99, Revision 2, describes the methodology to be used in calculating the margin term.

The extent of the P/T limits revision in this submittal was limited to the adding of two hydrotest curves to the current P/T limits. Hence, the evaluation was focused on this revised part of the P/T limits.

2.0 EVALUATION

The staff evaluated the effect of neutron irradiation embrittlement on the limiting beltline material in the Limerick 2 reactor vessel. The amount of irradiation embrittlement was calculated in accordance with RG 1.99, Revision 2. The two hydrotest curves of 6.5 and 8.5 EFPYs, which are to be added to the P/T limits of Limerick 2, were derived using the same material parameters and loading information as those of the existing hydrotest P/T limits of 10 EFPYs. The only difference between the added curves and the existing one is the different fluence values as reflected by their different EFPY values. The limiting material with the highest adjusted reference temperature (ART) at 6.5 and 8.5 EFPYs for Limerick 2 is plate 14-2 (heat number B3416-1), which has 0.14% copper (Cu), 0.65% nickel (Ni), and an initial RT_{ndt} of 40°F.

Presently, no surveillance capsules have been withdrawn from the reactor pressure vessel. Hence, the chemistry table in RG 1.99, Rev. 2 was used to determine the chemistry factor in calculating the ΔRT_{NDT}.

The staff calculated the highest ART for both EFPYs. For plate 14-2 at 6.5 EFPY, the staff calculated the ARTs to be 79.0°F at 1/4t, and 64.4°F at 3/4t. The staff used a fluence of 2.42E17 n/cm^2 at 1/4t and 1.15E17 n/cm^2 at 3/4t. At 8.5 EFPY, the ARTs were calculated to be 86.0°F and 69.2°F using fluence

values of 3.17E17 n/cm^2 and 1.51E17 n/cm^2 at 1/4t and 3/4t, respectively. The fluence values were interpolated from the internal-diameter (ID) value of 1.73E18 at the end of license (EOL); the ARTs were determined using Section 1 of RG 1.99, Revision 2, because no surveillance capsules have been withdrawn from the reactor pressure vessel.

The licensee calculated that the RT_{ndt} would shift upwards by 41.1°F for 6.5 EFPY and 48.0°F for 8.5 EFPY from an initial RT_{ndt} of 40°F. Therefore, the respective ARTs would be 81.1°F and 88.0°F. These agree well with the staff's calculated values of 79.0°F and 86.0°F, considering that the staff estimated the fluence values for 6.5 and 8.5 EFPYs based on a linear interpolation. Substituting these ARTs into equations in SRP 5.3.2, the staff verified that the added P/T limits for hydrotest meet the beltline material requirements in Appendix G of 10 CFR Part 50.

The staff concludes that the two added P/T limits for the reactor coolant system hydrotest are valid through 6.5 and 8.5 EFPY because the limits conform to the requirements of Appendix G of 10 CFR Part 50. The P/T limits also satisfy Generic Letter 88-11 because the licensee used the method in RG 1.99, Revision 2 to calculate the ART. Hence, the proposed P/T limits and their corresponding Bases may be incorporated into the Limerick 2 Technical Specifications.

3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Pennsylvania State official was notified of the proposed issuance of the amendment. The State official had no comments.

4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (61 FR 57490). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

5.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: S. Sheng

Date: December 30, 1996

6.0 REFERENCES

1. Regulatory Guide 1.99, "Radiation Embrittlement of Reactor Vessel Materials," Revision 2, May 1988

2. NUREG-0800, Standard Review Plan, Section 5.3.2: Pressure-Temperature Limits, dated July 1981

3. Letter from G. A. Hunger, Jr., PECO, to U.S. NRC Document Control Desk, Subject: Limerick Generating Station, Unit 2 - Technical Specifications Change Request No. 96-15-2, dated August 1, 1996