

February 7, 2002

Mr. Robert G. Byram
Senior Vice President
and Chief Nuclear Officer
PPL Susquehanna, LLC
2 North Ninth Street
Allentown, PA 18101

SUBJECT: SUSQUEHANNA STEAM ELECTRIC STATION, UNITS 1 AND 2 - ISSUANCE
OF AMENDMENT RE: REACTOR PRESSURE VESSEL PRESSURE-
TEMPERATURE LIMIT CURVES (TAC NOS. MB2516 AND MB2518)

Dear Mr. Byram:

The Commission has issued the enclosed Amendment No. 200 to Facility Operating License No. NPF-14 and Amendment No. 174 to Facility Operating License No. NPF-22 for the Susquehanna Steam Electric Station, Units 1 and 2 (SSES-1 and 2). These amendments consist of changes to the Technical Specifications in response to your application dated July 17, 2001, as supplemented July 26, and October 15, 2001.

These amendments update the pressure-temperature limit curves for SSES-1 and 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,

/RA/

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

Docket Nos. 50-387 and 50-388

Enclosures: 1. Amendment No. 200 to
License No. NPF-14
2. Amendment No. 174 to
License No. NPF-22
3. Safety Evaluation

cc w/encls: See next page

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Units 1 &2

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PPL SUSQUEHANNA, LLC

ALLEGHENY ELECTRIC COOPERATIVE, INC.

DOCKET NO. 50-387

SUSQUEHANNA STEAM ELECTRIC STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 200

License No. NPF-14

1. The Nuclear Regulatory Commission (the Commission or the NRC) having found that:
 - A. The application for the amendment filed by PPL Susquehanna, LLC, dated July 17, 2001, and supplemented July 26, and October 15, 2001, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's 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 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 set forth in 10 CFR Chapter I;
 - 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 the Facility Operating License No. NPF-14 is hereby amended to read as follows:

- (2) Technical Specifications and Environmental Protection Plan

- The Technical Specifications contained in Appendix A, as revised through Amendment No. 200 and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. PPL Susquehanna, LLC 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 60 days.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Joel T. Munday, Acting Chief, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications

Date of Issuance: February 7, 2002

ATTACHMENT TO LICENSE AMENDMENT NO. 200

FACILITY OPERATING LICENSE NO. NPF-14

DOCKET NO. 50-387

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

REMOVE

3.4-26

3.4-30

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INSERT

3.4-26

3.4-30

3.4-30a

3.4-30b

PPL SUSQUEHANNA, LLC

ALLEGHENY ELECTRIC COOPERATIVE, INC.

DOCKET NO. 50-388

SUSQUEHANNA STEAM ELECTRIC STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 174
License No. NPF-22

1. The Nuclear Regulatory Commission (the Commission or the NRC) having found that:
 - A. The application for the amendment filed by PPL Susquehanna, LLC, dated July 17, 2001, and supplemented July 26, and October 15, 2001, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's 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 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 set forth in 10 CFR Chapter I;
 - 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 the Facility Operating License No. NPF-22 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 174 and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. PPL Susquehanna, LLC 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 60 days.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Joel T. Munday, Acting Chief, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications

Date of Issuance: February 7, 2002

ATTACHMENT TO LICENSE AMENDMENT NO. 174

FACILITY OPERATING LICENSE NO. NPF-22

DOCKET NO. 50-388

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

REMOVE

3.4-26

3.4-30

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INSERT

3.4-26

3.4-30

3.4-30a

3.4-30b

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 200 TO FACILITY OPERATING LICENSE NO. NPF-14
AND AMENDMENT NO. 174 TO FACILITY OPERATING LICENSE NO. NPF-22
PPL SUSQUEHANNA, LLC
ALLEGHENY ELECTRIC COOPERATIVE, INC.
SUSQUEHANNA STEAM ELECTRIC STATION, UNITS 1 AND 2
DOCKET NOS. 50-387 AND 388

1.0 INTRODUCTION

By letter dated July 17, 2001, as supplemented July 26, and October 15, 2001, PPL Susquehanna, LLC (PPL, the licensee), submitted a request for changes to the Susquehanna Steam Electric Station, Units 1 and 2 (SSES-1 and 2), Technical Specifications (TSs). The requested changes would update the pressure-temperature (P-T) limit curves for SSES-1 and 2. The July 26, and October 15, 2001, letters provided clarifying information that did not change the initial proposed no significant hazards consideration determination.

2.0 BACKGROUND

2.1 Requirements for Generating Pressure-Temperature Limits for Nuclear Power Generation Facilities

The U.S. Nuclear Regulatory Commission (NRC) has established requirements in Appendix G of Part 50 to Title 10 of the *Code of Federal Regulations* (10 CFR Part 50, Appendix G), to protect the integrity of the reactor coolant pressure boundary in nuclear power plants. The Appendix to Part 50 requires the P-T limits for an operating plant to be at least as conservative as those that would be generated if the methods of Appendix G to Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Appendix G to the Code) were applied. The methodology of Appendix G to the Code postulates the existence of a sharp surface flaw in the reactor pressure vessel (RPV) that is normal to the direction of the maximum applied stress. For materials in the beltline and upper and lower head regions of the RPV, the maximum flaw size is postulated to have a depth that is equal to one-fourth of the thickness and a length equal to 1.5 times the thickness. For the case of evaluating RPV nozzles, the surface flaw is postulated to propagate parallel to the axis of the nozzle's corner radius. The basic parameter in Appendix G to the Code for calculating P-T limit curves is the stress intensity factor, K_I , which is a function of the stress state and flaw configuration. This methodology requires that licensees determine the reference stress intensity ($K_{I,a}$) factors, which vary as a function of temperature, from the reactor coolant system (RCS) operating temperatures, and from the adjusted reference temperatures (ARTs) for the limiting materials in

the RPV. Thus, the critical locations in the RPV beltline and head regions are the 1/4-thickness (1/4T) and 3/4-thickness (3/4T) locations, which correspond to the points of the crack tips if the flaws are initiated and grown from the inside and outside surfaces of the vessel, respectively. Regulatory Guide (RG) 1.99, Revision 2, provides an acceptable method of calculating ARTs for ferritic RPV materials. The methods of RG 1.99, Revision 2, include methods for adjusting the ARTs of materials in the beltline region of the RPV, where the effects of neutron irradiation may induce an increased level of embrittlement in the materials.

The methodology of Appendix G requires that P-T curves must satisfy a safety factor of 2.0 on stress intensities arising from primary membrane and bending stresses during normal plant operations (including heatups, cooldowns, and transient operating conditions), and a safety factor of 1.5 on stress intensities arising from primary membrane and bending stresses when leak rate or hydrostatic pressure tests are performed on the RCS. Table 1 to 10 CFR Part 50, Appendix G, provides the staff's criteria for meeting the P-T limit requirements of Appendix G to the Code and the minimum temperature requirements of the rule for bolting up the vessel during normal and pressure testing operations.

2.2 PPL Submittal

By letter dated July 17, 2001, PPL submitted a license amendment request to update the P-T limit curves for SSES-1 and 2. In the license amendment request, PPL also requested NRC approval for an exemption that would allow PPL to deviate from complying with the requirements in 10 CFR Part 50, Appendix G, for generating the P-T limit curves. PPL has proposed that the validity of the new P-T limit curves will extend to May 1, 2006, for SSES Unit 1 and May 1, 2005, for SSES Unit 2. By letter dated February 7, 2002, pursuant to 10 CFR 50.12, the NRC granted an exemption to allow PPL to deviate from the requirements of 10 CFR Part 50, Appendix G, and to use Code Case N-640 as part of the bases for generating the SSES-1 and 2 P-T limit curves for normal operations.⁽¹⁾ The staff's evaluation of the proposed P-T limit curves is in part based on this exemption, and on the staff's evaluation of the RPV fast neutron fluence. The staff's evaluation is given in Section 3.0 of this safety evaluation (SE).

3.0 EVALUATION

3.1 Assessment of Neutron Fluence Levels

There are several competing changes in the proposed modifications. First, the staff notes that the existing TSs for the P-T limit curves are not limited by fluence in the beltline region of the vessel. This is due (and unique among boiling water reactor vessels) to extremely favorable vessel material chemistry. The proposed P-T curves are for 32 effective full power years (EFPYs) at a power level of 3441 MWt. The P-T curves incorporate Code Case N-640 which provides significant margin with respect to the existing P-T curves. However, the proposed

curves do not account for the 1.4 percent power uprate which has recently been implemented

(1) Approval to use Code Case N-640 allows licensees to use the lower bound static initiation fracture toughness value equation (K_{Ic} equation) as the basis for establishing the P-T limits in lieu of using the lower bound crack arrest fracture toughness value equation (K_{Ia} equation), which is the method invoked by Appendix G to the Code. The NRC staff's bases for approving use of Code Case N-640 were given in an exemption dated February 7, 2002.

at Unit 2, and will be implemented (in the next refueling cycle) at Unit 1. This is a nonconservative change. Finally, the licensee limited the applicability of the proposed P-T curves to May 1, 2005 and May 1, 2006, for Units 2 and 1 respectively. By these dates, the licensee will reevaluate the 32 EFPYs' fluence and if the fluence is conservative the applicability will be extended to 32 EFPYs, otherwise the licensee will revise and resubmit the P-T curves.

The following calculations demonstrate that reasonable fluence margins exist to May 1, 2006, for SSES Unit 1 and to May 1, 2005, for SSES Unit 2.

SSES Unit 1

Unit 1 is currently into Cycle 12 at 3441 MWt and is expected to accumulate 15.17 EFPYs by the next refueling outage (spring of 2002) when the power uprate will be implemented. At the 3489 MWt power level during the next two cycles the plant will accumulate $1.974 \times 2 = 3.948$ EFPYs for a total of 19.118 EFPYs at the end of Cycle 14, which corresponds to about May 2006. (This corresponds to a loading factor of $1.974/2.041 = 0.967$). The conservatism expected at the end of the interim period is $32.0/19.118 = 1.674$. The NRC staff finds that this conservatism along with the quality of the vessel provide adequate assurance of safety for SSES Unit 1 operation to May 2006.

SSES Unit 2

Unit 2 at the end of the last fuel cycle (Cycle 10) had an accumulated exposure of 13.7 EFPYs. Unit 2 resumed operation from the refueling outage on April 23, 2001, at the 3441 MWt level and commenced operation at the uprated level of 3489 MWt on July 13, 2001. Like Unit 1, it is expected to accumulate $1.974 \times 2.0 = 3.948$ EFPYs until May 2005. At that time, the total accumulated exposure will be $13.7 + 3.948 = 17.648$ EFPYs. (Note: this value is slightly conservative because for the first 2 months the plant operated at the 3441 MWt level). Therefore, the conservatism in the fluence evaluation will be $32/17.648 = 1.813$ which is somewhat more conservative than Unit 1. As in Unit 1, the NRC staff finds a reasonable assurance of safety for the operation of Unit 2 to May 2005.

It should be noted that: (1) at the uprated power both units will accumulate more than 32 EFPYs at the end of their current license, and (2) the fast neutron leakage (and therefore, the resulting exposure) will be slightly higher than the power increase. In the above, we used 32 EFPYs and 1.4 percent for the source increase as reasonable approximations for the purposes of this evaluation.

3.2 P-T Limit Curve Assessment

PPL submitted the following updated P-T curves for the SSES RPVs:

- normal operating conditions, core not critical
- normal operating conditions, core critical
- pressure testing condition curves

PPL limited the applicability of the proposed P-T limit curves to May 1, 2006, for SSES Unit 1 and May 1, 2005, for SSES Unit 2. Based on the calculations performed in Section 3.1 of this SE, the staff concludes that the proposed applicability of the P-T limit curves to May 1, 2006, for

SSES Unit 1 and May 1, 2005, for SSES Unit 2 is acceptable.

For the normal operating conditions with the core not critical, and for pressure testing condition curves, PPL proposed to use individual P-T curves for the lower head, beltline, and upper vessel regions of the SSES RPVs. PPL based the upper head curves on stress intensity calculations and dimensional design data for the feedwater nozzles of the units, which have the limiting nozzle dimensions, and on the reference temperature for the SSES Unit 1 recirculation inlet nozzle and SSES Unit 2 steam outlet nozzle, which have the limiting reference temperatures for the upper vessel materials of the units (i.e., 40 °F and 30 °F, respectively). PPL incorporated the minimum temperature requirements for the flange region into the upper vessel P-T limit curves, which are the most limiting curves for the units. PPL also proposed the normal operation curves and pressure test curves based on operations while cooling down the units. These practices are conservative and acceptable.

To test the validity of PPL's proposed curves, the staff performed an independent assessment of the licensee's submittal, and an independent calculation of the pressure test curves, normal operating curves-core not critical, and normal operating curves-core critical for the beltline, upper vessel, and bottom head regions of the SSES-1 and 2 RPVs. The staff applied the methodologies of the 1995 Edition of Appendix G to the Code and 10 CFR Part 50, Appendix G, as modified by the methodology of ASME Code Case N-640, as the bases for its independent calculations. For the calculation of the P-T curves for the RPV nozzles, the staff also modified the methods of Appendix G to the Code by the nozzle evaluation methods proposed in Appendix 5 of Welding Research Council Bulletin WRC-175, "PVRC Recommendations on Toughness Requirements for Ferritic Materials," August 1972. This is consistent with the methods in the 1995 Edition of Appendix G to Section XI of the ASME Code.

The staff's assessment also included an independent calculation of the ART values for the 1/4T locations of the SSES-1 and 2 RPV beltline regions based on the neutron fluence specified in the submittal for the vessels effective to 32 EFY. For the evaluation of the limiting beltline materials, the staff confirmed that the ARTs and P-T limit curves were based on the methodology of RG 1.99, Revision 2. For the evaluation of the limiting material in the limiting nozzle and lower head evaluations, the staff applied the plant-specific design-basis data provided by the licensee.

The staff determined that PPL's P-T limit generation methods were based on conservative assumptions that made the proposed P-T limit curves as conservative or slightly more conservative than the P-T limit curves generated by the staff in accordance with the 1995 Edition of the ASME Code, Section XI, Appendix G. The staff also confirmed that PPL's P-T limit curves included appropriate minimum temperature requirements that were at least as conservative as those required in Table 1 to 10 CFR Part 50, Appendix G, as exempted and modified by the methods of Code Case N-640.

3.3 Conclusions

Based on the staff's review and evaluation of PPL's proposed P-T limit curves for SSES-1 and 2, the staff has determined that the proposed P-T limit curves are consistent with the alternate assessment criteria and methods of ASME Code Case N-640, and satisfy the requirements of 10 CFR 50.60, "Acceptance Criteria for Fracture Prevention Measures for Lightwater Nuclear Power Reactors for Normal Operation;" Appendix G to 10 CFR Part 50, "Fracture Toughness Requirements;" and Appendix G to the 1995 Edition of Section XI of the ASME Code, as

exempted by the methods of analyses in the code case. The proposed curves for SSES-1 and 2 are, therefore, approved for incorporation into the TSs and for use until May 1, 2006, and May 1, 2005, respectively.

3.0 STATE CONSULTATION

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

4.0 ENVIRONMENTAL CONSIDERATION

The amendments change 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 amendments involve 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 amendments involve no significant hazards consideration, and there has been no public comment on such finding (66 FR 50471). Accordingly, the amendments meet 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 amendments.

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 amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: J. Medoff

Date: February 7, 2002

February 7, 2002

Mr. Robert G. Byram
Senior Vice President
and Chief Nuclear Officer
PPL Susquehanna, LLC
2 North Ninth Street
Allentown, PA 18101

SUBJECT: SUSQUEHANNA STEAM ELECTRIC STATION, UNITS 1 AND 2 - ISSUANCE
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Sincerely,

/RA/

Daniel S. Collins, Project Manager, Section 1
Project Directorate I
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Docket Nos. 50-387 and 50-388

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- 3. Safety Evaluation

cc w/encls: See next page

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Accession Number: ML013520605

* No major changes to SE.

OFFICE	PDI-1/PM	PDI-2/LA	EMCB/SC	OGC	PDI-1/(A)SC
NAME	DCollins	MO'Brien	KWichman*	DCummings	JMunday
DATE	1/17/02	1/17/02	SE dated 11/8/01	1/25/02	1/29/02

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