

February 28, 2007

Mr. Britt T. McKinney  
Sr. Vice President  
and Chief Nuclear Officer  
PPL Susquehanna, LLC  
769 Salem Blvd., NUCSB3  
Berwick, PA 18603-0467

SUBJECT: SUSQUEHANNA STEAM ELECTRIC STATION, UNITS 1 AND 2 - ISSUANCE OF  
AMENDMENT RE: STANDBY LIQUID CONTROL SYSTEM (TAC NOS. MD1424  
AND MD1425)

Dear Mr. McKinney:

The Commission has issued the enclosed Amendment No. 240 to Facility Operating License No. NPF-14 and Amendment No. 217 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 (TSs) in response to your application dated April 28, 2006.

These amendments revise the SSES 1 and 2 TSs 3.1.7, "Standby Liquid Control (SLC) System," to modify the SLC system for single loop pump operation and the use of enriched sodium pentaborate solution.

A copy of our safety evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next regular Biweekly *Federal Register* Notice.

Sincerely,

*/RA/*

Richard V. Guzman, Project Manager  
Plant Licensing Branch I-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-387 and 50-388

Enclosures:

1. Amendment No. 240 to License No. NPF-14
2. Amendment No. 217 to License No. NPF-22
3. Safety Evaluation

cc w/encls: See next page

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These amendments revise the SSES 1 and 2 TSs 3.1.7, "Standby Liquid Control (SLC) System," to modify the SLC system for single loop pump operation and the use of enriched sodium pentaborate solution.

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ADAMS Accession Number: ML070390215 \* SE inputs provided by memo. No substantive changes made.

OFFICE	LPLI-1/PM	LPLI-1/LA	SBWB/BC	ITSB/BC	OGC	LPLI-1/BC(A)
NAME	RGuzman	SLittle	GCranston*	TKobetz	JMartin	DPickett
DATE	2/7/07	2/27/07	2/16/07	2/27/07	2/26/07	2/27/07

**OFFICIAL RECORD COPY**

PPL SUSQUEHANNA, LLC  
ALLEGHENY ELECTRIC COOPERATIVE, INC.  
DOCKET NO. 50-387  
SUSQUEHANNA STEAM ELECTRIC STATION, UNIT 1  
AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 240  
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 April 28, 2006, 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. 240 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 prior to the startup following the SSES 1 spring 2008 15th refueling outage.

FOR THE NUCLEAR REGULATORY COMMISSION

*/RA/*

Douglas V. Pickett, Acting Chief  
Plant Licensing Branch I-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment: Changes to the License and  
Technical Specifications

Date of Issuance: February 28, 2007

ATTACHMENT TO LICENSE AMENDMENT NO. 240

FACILITY OPERATING LICENSE NO. NPF-14

DOCKET NO. 50-387

Replace the following page of the License with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

REMOVE  
3

INSERT  
3

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  
3.1-20  
3.1-21  
TS/3.1-22  
3.1-23

INSERT  
3.1-20  
3.1-21  
TS/3.1-22  
3.1-23

PPL SUSQUEHANNA, LLC

ALLEGHENY ELECTRIC COOPERATIVE, INC.

DOCKET NO. 50-388

SUSQUEHANNA STEAM ELECTRIC STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 217  
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 April 28, 2006, 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. 217 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 prior to the startup following the SSES 2 spring 2007 13th refueling outage.

FOR THE NUCLEAR REGULATORY COMMISSION

*/RA/*

Douglas V. Pickett, Acting Chief  
Plant Licensing Branch I-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment: Changes to the License and  
Technical Specifications

Date of Issuance: February 28, 2007

ATTACHMENT TO LICENSE AMENDMENT NO. 217

FACILITY OPERATING LICENSE NO. NPF-22

DOCKET NO. 50-388

Replace the following page of the License with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

REMOVE  
3

INSERT  
3

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  
3.1-20  
3.1-21  
TS/3.1-22  
3.1-23

INSERT  
3.1-20  
3.1-21  
TS/3.1-22  
3.1-23

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 240 TO FACILITY OPERATING LICENSE NO. NPF-14  
AND AMENDMENT NO. 217 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 April 28, 2006, Agencywide Documents Access and Management System (ADAMS) Accession No. ML061250159, PPL Susquehanna, LLC (PPL, the licensee), requested changes to the Technical Specifications (TSs) for Susquehanna Steam Electric Station, Units 1 and 2 (SSES 1 and 2).

The proposed changes would revise the SSES 1 and 2 TSs 3.1.7, "Standby Liquid Control (SLC) System," to modify the SLC system for single loop pump operation and the use of enriched sodium pentaborate solution which would increase the operating margin. With the use of an enriched sodium pentaborate solution, a reduced solution weight-percent and reduced solution volume would be required. In addition, with the replacement of the existing SLC solution, system operation would change from operation requiring both pumps, to operation requiring only a single pump. This would allow a reduction in the required system flow and pump discharge pressure due to a reduced system back pressure.

The proposed changes would be needed to support the planned SSES 1 and 2 constant pressure power uprate, but are not dependent upon Nuclear Regulatory Commission (NRC) approval of the uprate. The analysis supporting these changes was performed based on operation at 3952 megawatt-thermal (MWt), which is the planned uprate power level.

## 2.0 REGULATORY EVALUATION

The Nuclear Regulatory Commission (NRC) finds that PPL, in its April 28, 2006, submittal, identified the applicable regulatory requirements. The regulatory requirements and guidance which the NRC staff considered in its review of the application include the following:

- Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50 establishes the fundamental regulatory requirements with respect to the reactivity control systems. Specifically, General Design Criterion (GDC)-26, "Reactivity control system redundancy and capability," in Appendix A to Part 50, "General Design Criteria for Nuclear Power

Plants," states, in part, that two independent reactivity control systems of different design principles shall be provided, and that one of the systems shall use control rods, preferably including a positive means for inserting the rods, and shall be capable of reliably controlling reactivity changes to assure that under conditions of normal operation, including anticipated operational occurrences, and with appropriate margin for malfunctions such as stuck rods, specified acceptable fuel design limits are not exceeded. The second reactivity control system shall be capable of reliably controlling the rate of reactivity changes resulting from planned, normal power changes (including xenon burnout) to assure acceptable fuel design limits are not exceeded. One of the systems shall be capable of holding the reactor core subcritical under cold conditions. For SSES 1 and 2, these systems are the control rod drive system and the SLC system, which is the subject of the proposed TS changes being reviewed for this safety evaluation (SE). The evaluations performed in support of the amendment, discussed in Section 3.0 of this amendment, demonstrate that the SLC system continues to satisfy the provisions of this GDC.

- GDC-27, "Combined reactivity control systems capability," states that the reactivity control system shall be designed to have a combined capability, in conjunction with poison addition by the emergency core cooling system, of reliably controlling reactivity changes to assure that under postulated accident conditions and with appropriate margin for stuck rods the capability to cool the core is maintained. The evaluations performed in support of the amendment, discussed in Section 3.0 of this SE, demonstrate that the SLC system continues to satisfy the provisions of this GDC.
- Section 50.62, "Requirements for reduction of risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants," states, in part, that each boiling-water reactor (BWR) must have an SLC system with the capability of injecting into the reactor pressure vessel a borated water solution at such a flow rate, level of boron concentration and boron-10 isotope enrichment, and accounting for reactor pressure vessel volume, that the resulting reactivity control is at least equivalent to that resulting from injection of 86 gallons per minute of 13 weight percent sodium pentaborate decahydrate solution at the natural boron-10 isotope abundance into a 251-inch inside diameter reactor pressure vessel for a given core design. In the NRC-approved licensing topical report, NEDE-31096P-A, "Anticipated Transients Without Scram: Response to NRC ATWS Rule, 10 CFR 50.62," General Electric provides guidance on modifications to the SLC system to ensure licensee compliance with the ATWS rule. The NRC approved the methods presented in NEDE-31096P-A for use by BWR licensees to demonstrate compliance with the ATWS Rule. The application of this guidance demonstrates that the equivalency requirement of 10 CFR 50.62 are met.

In addition to the above regulatory requirements, the NRC staff also considered the following in its review of the licensing application:

- In response to variations in SLC system pressure due to changes made to SLC system operation, the NRC staff issued Information Notice (IN) 2001-13, "Inadequate Standby Liquid Control System Relief Valve Margin," (ML012210146). NRC IN 2001-13 requested licensees to evaluate their SLC system to ensure that modifications made to the system would not cause the SLC relief valves to lift at required injection pressures, thus causing the borated water to discharge to SLC system pump recirculation, rather than to the reactor vessel.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Background

The SLC system is designed to bring the reactor, at any time during the fuel cycle, from rated power conditions to a cold shutdown, without taking any credit for control rod motion following a scram. This manually operated system pumps a sodium pentaborate solution into the vessel, to provide neutron absorption and achieve a subcritical reactor condition. The SLC system is designed to inject over a wide range of reactor operating pressures and satisfies the requirements of 10 CFR 50.62, "Requirements for reduction of risk from ATWS events for light-water-cooled nuclear power plants."

The proposed changes to the SLC system are to support a planned power uprate at SSES 1 and 2. In addition, the ATWS analysis results for operation at 3952 MWt (includes planned uprated power level and operation in the Average Power Range Monitor/Rod Block Monitor/Technical Specifications/Maximum Load Line Limit Analysis (ARTS/MELLLA) operating domain) indicated the need for an increase in the SLC system boron injection rate to produce acceptable suppression pool temperature results. A new analysis was performed to determine the required boron weight-percent and enrichment, as well as the minimum pump flow rate required to safely shutdown the reactor from operation at 3952 MWt. Consistent with the requirements of 10 CFR 50.62, the analysis assumed no control rod movement and failure of the alternate rod insertion. The minimum solution concentration is reduced to 7 weight-percent and the SLC system neutron absorber solution boron enrichment is increased to 88 atom-percent. PPL states that this also limits the reliance on tank and piping heat tracing, thus increasing system reliability. Due to the neutron absorber solution changes, the number of SLC system pumps required for injection may be reduced to one instead of two.

Based on these changes, a suppression pool temperature response of 206 degrees Fahrenheit (°F) has been achieved. The SSES 1 and 2 suppression pool design limit is 220 °F. Therefore, since the new maximum suppression pool temperature of 206 °F is less than the design limit of 220 °F, the NRC staff finds the suppression pool temperature response acceptable.

In addition to requiring acceptable peak suppression pool temperatures under ATWS conditions, 10 CFR 50.62(c)(4) requires that each BWR have an SLC system with a minimum flow capacity and boron content equivalent in control capacity to 86 gallons per minute (gpm) of 13 weight-percent sodium pentaborate solution. NEDE-31096-P-A provides guidance for boron equivalency determinations. Equation 1-1 of that document was used to demonstrate injection capacity equivalency as follows:

$$\left(\frac{Q}{86}\right) \times \left(\frac{M251}{M}\right) \times \left(\frac{C}{13}\right) \times \left(\frac{E}{19.8}\right) \geq 1$$

Where:

Q	=	SLC system flow rate;
M251	=	Reference plant, with 251" diameter vessel, mass of water in the reactor and recirculation system at hot rated conditions (lbs <sub>m</sub> );
M	=	Mass of water in the reactor and recirculation system at hot rated conditions (lbs);

- C = Sodium pentaborate solution concentration (weight-percent); and,  
E = Boron-10 isotope enrichment (19.8 atom-percent for natural boron).

Since SSES 1 and 2 have a 251-inch diameter vessel, the value of  $M_{251}/M$  is equal to 1. Applying the remainder parameters, which were assumed in the ATWS analysis, yields:

$$\left(\frac{40}{86}\right) \times \left(\frac{7}{13}\right) \times \left(\frac{88}{19.8}\right) = 1.11 \geq 1$$

Based on the results of the injection capacity equivalency calculation, the NRC staff finds that PPL satisfies this requirement of 10 CFR 50.62.

As a result of the ATWS analysis, the maximum postulated reactor vessel lower plenum pressure at the SLC discharge sparger is 1220 pounds-per-square inch absolute (psia) at the time the SLC system is analyzed to be in operation. This is the peak predicted pressure following the limiting ATWS event. Due to the change to single-pump operation, the SLC system pump discharge pressure is reduced from the current value of 1395 pounds-per-square inch gauge (psig) to the proposed value of 1250 psig. The pressure margin for the SLC system pump discharge relief valves increases from 105 psig to 250 psig. PPL states that this value is above the minimum value needed to assure that the relief valves remain closed during SLC system injection. Therefore, there is adequate margin to prevent the SLC system relief valve from lifting during SLC system operation to meet the guidelines published in NRC IN 2001-13.

### 3.2 Conclusion

Based on its review, the NRC staff concludes that the proposed TS changes are acceptable because the SLC system continues to meet the requirements contained in 10 CFR 50.62(c)(4) for SLC system injection capability for ATWS events. The combination of the neutron absorber boron enrichment of 88 atom-percent, minimum solution concentration of 7 weight-percent, and minimum SLC system pump flow rate of 40 gpm exceeds the equivalency in control capacity to 86 gpm of 13 weight-percent sodium pentaborate solution for a 251-inch inside diameter reactor vessel contained in 10 CFR 50.62(c)(4). The NRC staff determined that the predicted peak reactor vessel pressure calculation was acceptable and that the requested TS revisions are in support of modifications consistent with NRC guidance provided in NRC IN 2001-13. Additionally, PPL's analysis supporting these changes was performed based on operation at 3952 MWt, which is the planned power uprate level. Operation at current licensed thermal power (CLTP) with the proposed changes is bounded by the analysis performed for operation at 3952 MWt and, therefore, is acceptable at CLTP conditions.

### 4.0 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.

## 5.0 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 and change surveillance requirements. 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 (71 FR 46936). Accordingly, the amendments meet 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 amendments.

## 6.0 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: T. Ford

Date: February 28, 2007