Robert A. Saccone
Vice President – Nuclear Operations

PPL Susquehanna, LLC
769 Salem Boulevard
Berwick, PA 18603
Tel. 570.542.3959 Fax 570.542.1504
rsaccone@pplweb.com

NOV 02 2005

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop OP1-17
Washington, DC 20555-0001

SUSQUEHANNA STEAM ELECTRIC STATION
PROPOSED AMENDMENT NO. 282 TO
FACILITY OPERATING LICENSE NPF-14:
PROPOSED CHANGE TO TECHNICAL SPECIFICATION 2.1.1.2
MCPR SAFETY LIMIT
SUPPLEMENTAL INFORMATION
PLA-5980 **Docket No. 50-387**

Reference: *1) PLA-5967, B. T. McKinney (PPL) to Document Control Desk (USNRC), "Proposed Amendment No. 282 to Unit 1 Facility Operating License NPF-14 Proposed Change to Technical Specification 2.1.1.2 MCPR Safety Limit," dated October 14, 2005.*

2) PLA-5976, B. T. McKinney (PPL) to Document Control Desk (USNRC), "Proposed Amendment No. 282 to Facility Operating License NPF-14: Proposed change to Technical Specification 2.1.1.2 MCPR Safety Limit Supplemental Information," dated October 21, 2005.

3) NRC Request for Additional Information (RAI) – Susquehanna Steam Electric Station, Unit 1 (SSES 1) – Revised Minimum Critical Power Ratio Safety Limit (TAC No. MC8626), dated November 1, 2005

The purpose of this letter is to supplement the referenced proposed amendment request, which proposed an exigent change to the SSES Unit 1 Technical Specification 2.1.1.2 MCPR Safety Limit (MCPRSL). The supplemental information provided herein provides the information requested during the October 25, 2005 teleconference held between NRC and PPL Susquehanna LLC as documented in Reference 3. The supplemental information is provided in the Enclosure.

PPL has reviewed the No Significant Hazards Consideration and the Environmental Consideration submitted with Reference 1 relative to this supplemental information. We have determined that there are no changes required to either of these documents.

A001

As discussed in the NRC public meeting on October 12, 2005, and subsequently with the NRC Project Manager for Susquehanna, we respectfully request NRC to complete the review and approval of the proposed MCPRSL change to support unit startup immediately following implementation of the redesigned U1C14 core.

Any questions regarding this request should be directed to Mr. Michael H. Crowthers at (610) 774-7766.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: 11/2/05

R. A. Saccone

Attachment: Supplemental Information

cc: NRC Region I
Mr. B. A. Bickett, NRC Sr. Resident Inspector
Mr. R. V. Guzman, NRC Project Manager
Mr. R. Janati, DEP/BRP

Attachment to PLA-5980

Supplemental Information

Subject: CHANGE TO UNIT 1 TECHNICAL SPECIFICATION 2.1.1.2

NRC Question 1:

Please describe how U1C14A core loading pattern is established and what criteria should be met to reinsert twice burned fuel bundles. Identify which design record file was used for this core design.

PPL Response:

The U1C14A core loading pattern was established to:

1. Mitigate (and to the extent possible eliminate) control cell friction.
2. To the extent practicable, maintain reactivity and depletion characteristics of U1C14 in order to minimize impacts on the MCPRSL and the U1C15 core design.
3. Meet all licensing requirements.
4. Maintain fuel integrity.
5. Allow continued safe unit operation without unnecessarily limiting generation.

The criteria used to determine which twice burned fuel bundles to reinsert into the U1 core is as follows:

1. Amount of bow has been measured and is acceptably within the U1C14 licensing basis assumptions.
2. Reactivity characteristics are similar to those fuel bundles that they are replacing (burn up and enrichment).

Using the above criteria, the core redesign is expected to result in the rechanneling of up to 77 fuel assemblies. Also, 56 fuel bundles will be discharged and 56 previously discharged twice burned fuel bundles (discharged after U1C13) will be reinserted. The exact number of channels and the specific fuel bundles to be rechanneled will be determined during the mid-cycle outage. The final quantity will be dependent on the bow measurements taken during the outage.

Since the rechanneling will be accomplished using new channels, the collective rechanneled bundles will result in a significant reduction in the overall core bow characteristic. Similarly, each rechanneled bundle is expected to reduce friction within the individual control cell to which it is applied.

The 56 bundles to be discharged were selected based on their potential susceptibility to bow as determined by the PPL channel management action plan and the interim root cause analysis. The 56 twice burned fuel bundles to be reinserted were selected based upon the criteria above. Reinsertion of these bundles, which have been measured for channel bow, will lower the core's overall bow.

The U1 core will remain a full core of Atrium-10 fuel bundles.

The PPL calculation of record describing the core redesign is EC-FUEL-1623. This calculation is available for inspection in the PPL Allentown office.

NRC Question 2:

Please justify that assumed bow twice the Advanced Nuclear Fuels (ANF) database is conservative for redesign U1C14A core. Also, provide clarification that channel bow required for MCPRSL calculation specified in ANF-524(P)(A), Revision 2, "ANF Critical Power Methodology for Boiling Water Reactors," and Supplement 1, Revision 2, is still applicable to the MCPRSL calculation.

PPL Response:

The supplemental information provided in Reference 2 describes the basis for determining that channel bow in the redesigned U1C14A core (following the maintenance outage) is conservatively bounded by the channel bow assumed in the MCPRSL analysis. The approach uses a combination of prior operating experience, previous channel bow measurements, and bow measurements to be taken as part of the maintenance outage. In addition, the revised MCPRSL analysis used a value of twice the nominal bow for both the MCPR limiting fuel and the bundles surrounding this fuel. This approach produces a strong expectation that the bow assumptions used in the MCPRSL analysis are bounding and that the MCPRSL is conservative.

The ANF-524(P)(A) methodology explicitly accounts for the effect of channel bow on the MCPRSL. ANF-524(P)(A), Supplement 1, Rev. 2, describes the way in which channel bow is analyzed and included in the Safety Limit methodology. This methodology was used for the proposed U1C14A MCPRSL analysis.

The neutronics effects of bow (increase in fuel pin local peaking vs. channel bow) are computed using the CASMO4 lattice physics code. Results of this calculation and the uncertainty in channel bow are then used to generate an uncertainty in local peaking, which is included in the Safety Limit analysis. This bow related uncertainty is entered into the statistical (Monte Carlo) Safety Limit analysis along with the other uncertainties as described in ANF-524(P)(A), Rev. 2. The result is a value of the MCPRSL, which explicitly accounts for the effects of channel bow.

NRC Question 3:

Please describe the PPL channel management action plan with respect to General Electric (GE) guidance provided by GE report SC05-06, "Updated Surveillance Program for Fuel Channel-Control Blade Interference Monitoring," dated July 14, 2005, and justify the difference if any.

PPL Response:

GE Guidance SC05-06 is essentially divisible into two components: Susceptible Cell Determination and Test Recommendation (test method).

The guidance for the determination of a susceptible cell was intended for GE/GNF fuel customers who monitor the core with the GNF core simulator. Because PPL does not use GNF fuel and does not monitor with the GNF core simulator, PPL has adopted its own guidance for the determination of susceptibility. PPL established susceptibility criteria based upon GE's previous revision of the test plan SC03-09 (May 2003) as supplemented by actual SSES performance observations.

A control cell may enter the PPL susceptible population by one of two means:
(1) fuel within the cell having a burnup and early life control history exceeding a specified limit or (2) observation of cell friction by the operators or engineers during normal use or SCRAM time testing which, when analyzed under the Corrective Action Program, warrants the control rod's inclusion. If a cell is observed to have interference, all symmetrical cells are included in the population.

Relative to the first criterion, channels in their third cycle of irradiation are added to the susceptible population based upon an exposure gradient > 5 GWd/MTU at any point in the cycle. Channels in control cells containing second or third cycle assemblies are also added if Extended Control Blade Exposure (ECBE) is greater than:

- One bundle > 16,000 inch-days
- Two bundles > 14,000 inch-days

Relative to the second criterion, a stroke ratio (comparing performance in the friction zone to the non-friction zone of travel under normal drive conditions) of 1.25 or higher is used to further identify susceptible friction cells. Additionally, control rods with either settle times > 30 seconds or scram times approaching the Technical Specification "slow" criteria are placed within the susceptible population.

With regard to the testing methods specified in SC05-06, PPL uses the stroke ratio testing as described above in lieu of the four position settle testing described by GE. The stroke test performed by PPL measures stroke speed in the friction zone and compares that speed to the speed measured outside of the friction zone. The SC05-06 method determines if settle occurs within 10 seconds at four locations. This method does not provide for tracking rod performance changes whereas the PPL test does provide data that is more trendable and measurable. The PPL method is also less challenging to the operators. PPL performs the continuous full-stroke control rod insertion test as described in SC05-06.

NRC Question 4:

Please describe the fuel assembly inspection program planned for the mid-cycle outage as well as follow-on pool-side inspection programs prior to Cycle 15.

PPL Response:

The follow-on pool inspection program prior to U1C15 will be determined at a later date and will be based in part on the results obtained during the upcoming mid-cycle outage.

The fuel assembly inspection program to be implemented during the mid-cycle outage is described in the responses to questions (a) through (e) below.

NRC Question 4 (a)

Description of the measurement device and the accuracy of its channel deflection measurements.

PPL Response:

The AREVA Fuel Channel Characterization machine uses an array of ultrasonic transducers to make rapid and accurate measurements of fuel channel bulge and bow. A channeled fuel assembly is lowered into the frame until resting on the fuel support piece, data is acquired for all four sides and all axial elevations are measured simultaneously. A data acquisition system processes the data and displays the data graphically.

The transducers are arranged in seven axial locations on all four sides of the channel to provide a dimensional profile of the channel.

The device has a measurement accuracy of +/- 10 mils.

NRC Question 4 (b):

Threshold used to determine when to re-channel and/or re-insert a fuel assembly.

PPL Response:

The threshold for re-channeling and/or reinsertion is established on a control cell specific basis. The investigative measures taken during the mid-cycle outage (visual inspections, bow and bulge characterization, control rod stroking) may warrant the revision of this criteria. The current control cell "as left" criteria are as follows:

- No fuel assembly shall have bow toward the control rod > 150 mils.
- If the maximum fuel assembly bow toward the control rod is > 120 mils, but ≤ 150 mils, then the remaining three fuel assemblies shall each have channel bow toward the control rod ≤ 90 mils.
- If two fuel assemblies in a control cell have bow > 90 mils but ≤ 120 mils toward the control rod, then the remaining two fuel assemblies shall each have channel bow toward the control rod ≤ 90 mils.

NRC Question 4 (c):

Degree of fuel pin inspections.

PPL Response:

There is no plan to conduct visual inspection of fuel pins during the fall 2005 outage.

NRC Question 4 (d):

List of channel bow measurements on channels being used to re-channel assemblies.

PPL Response:

Since only new channels are being installed (dimensions will be consistent with as manufactured criteria), the channel bow for the fuel bundles that will be reinserted after being rechanneled will approach zero.

The measured channel bow for the 56 twice burned fuel bundles pre-designated for reinsertion range from a high of 82 mils to a low of 5 mils.

These values place this population of planned reinserts well within the bow assumed in the MCPRSL analysis as described in the referenced letters.

The value of twice the Framatome database for highly exposed bundles used in the MCPRSL is 122 mils. Note that this is actually larger than the value discussed at the PPL/NRC meeting held on October 12, 2005. The reason for the difference is that the proposed MCPRSL analysis is based on a recently updated Framtome bow database, whereas the original U1C14 MCPRSL was based on the previous version of the database.

NRC Question 4 (e):

Qualify the relationship between cold, unstressed pool-side measurements and hot, stressed (DP) in-reactor channel deflection.

PPL Response:

Channel bow is primarily a function of the differential length between two opposing channel walls. Channel wall elongation is primarily due to permanent volumetric expansion within the channel wall itself. This permanent volumetric expansion may result from hydrogen uptake and/or interstitial defects, results from fast fluence neutron interactions. Thus, the degree of channel bow that occurs during reactor operation remains relatively unchanged between the hot and cold conditions.

Channel bulge is composed of both elastic and plastic (permanent) deformation. As bulge results from creep effects, the permanent deformation increases with service life and is retained in the cold condition. The elastic component is present only in the hot condition as a result of differential pressure across the channel walls. This elastic deformation is on the order of ~20 mils for an 80 mil uniform channel.

It should be noted that, at hot conditions, overall cell geometry also increases due to thermal expansion, partially offsetting the effects of channel elastic deformation.