William H. Spence
Executive Vice President and
Chief Operating Officer/Chief Nuclear Officer
Tel. 610.774.3683 Fax 610.774.5019
Whspence@pplweb.com

PPL Corporation
Two North Ninth Street
Allentown, PA 18101-1179
Tel. 610.774.5151
www.pplweb.com

NOV 1 8 2008

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

SUSQUEHANNA STEAM ELECTRIC STATION
UNIT 1 OPERATING LICENSE NO. NPF-14
LICENSE CONDITIONS 2.C. (37) (a) and 2.C. (37) (b)
AND UNIT 2 OPERATING LICENSE NO. NPF-22
LICENSE CONDITIONS 2.C. (21) (a) AND 2.C. (21) (b) **Docket Nos. 50-387**
PLA-6451 **and 50-388**

Reference: *NRC Letter from B. K. Vaidya (NRC) to B. T. McKinney (PPL), "Corrections to Amendment Nos. 246 and 224 Regarding the 13 Percent Extended Power Uprate," dated May 5, 2008.*

The purpose of this letter is to provide information in support of not performing a condensate pump trip at the full Constant Pressure Power Uprate (CPPU) power level as required by PPL Susquehanna, LLC (PPL) License Conditions (see reference).

License Conditions 2.C. (37) (a) and 2.C. (21) (a) for Unit 1 and 2 (see Attachment A for the License Conditions) respectively require that PPL perform a condensate pump trip at 3733 MWt to demonstrate that a complete loss of feedwater will not occur. License Conditions 2.C. (37) (b) and 2.C. (21) (b) for Unit 1 and 2 (see Attachment A for the License Conditions) respectively require that PPL perform a condensate pump trip on the first unit to reach full CPPU power unless the NRC issues a letter notifying PPL that the tests specified in License Conditions 2.C. (37) (a) and 2.C. (21) (a) adequately demonstrate that a single condensate pump trip will not result in a loss of all feedwater while operating at the full CPPU power level of 3952 MWt.

Unit 1 Test Results at 3727 MWt

A condensate pump trip test was performed on Unit 1 at 3727 MWt (94.3%) on May 16, 2008 as required by Unit 1 License Condition 2.C. (37) (a). The trip of any one of the four condensate pumps will yield similar results since the pumps are arranged in a parallel configuration. The results of the trip were conservatively predicted using a static analysis model and the plant simulator. Water level decreased approximately 1 inch to an indicated level of 34 inches as predicted by the simulator. The Reactor Feedwater Pump

A001
NRR

(RFP) suction pressure decreased from 412 psig to 329 psig versus a static model predicted pressure of 304 psig and a simulator predicted pressure of 305 psig, which are conservative. Reactor power decreased to 69% as predicted by the simulator. The test acceptance criteria as described in Attachment B were met in that feedwater flow to the reactor vessel was maintained.

A comparison of the simulator predicted pressures, static model calculated pressures, and the actual 3727 MWt test results are shown on Table 1 in Attachment C. The conservative suction pressure prediction of the simulator and static analysis with respect to the actual plant trip results from 3727 MWt validate these tools for predicting the results of the condensate pump trip at 3952 MWt. It is expected that the performance of the condensate pump trip on Unit 2 will be similar to the Unit 1 results at 3727 MWt.

Expected Results at 3952 MWt

The static analysis predicts that with all RFP pumps operating, a condensate pump trip from 3952 MWt will result in a RFP suction pressure of 231 psig. This pressure is calculated conservatively assuming that the three RFPs are running near maximum speed (99% of 5585 RPM) at the rated feedwater flow of 16.5 Mlb/hr. The condition with one RFP tripped and the remaining pumps at maximum speed results in an RFP suction pressure of 383 psig.

The simulator was run to confirm the predicted results from the static model for a condensate pump trip from 3952 MWt. A comparison of the static model calculated pressures and simulator predicted pressures are shown in Table 2 in Attachment C. The time line for the simulated event is provided in Table 3 in Attachment C. Susquehanna normally operates with all 4 condensate pumps and all 3 RFPs in service at rated conditions. The trip of a condensate pump will directly initiate a recirculation runback to Limiter 2 (48% speed). The simulator results predict that once the condensate pump is tripped, the RFP suction pressure will drop to 248 psig, which is below the RFP low suction pressure trip set point of 285 psig.

It should be noted that the simulator predicts a higher minimum suction pressure of 248 psig since the 'A' RFP is tripped on low suction pressure before it reaches maximum speed. The average speed of the RFPs is 5382 RPM before the 'A' RFP trips. The simulator pressure prediction of 367 psig after the 'A' RFP trips is slightly lower than the static model prediction of 383 psig because the 'A' RFP minimum flow valve is partially open due to the tripping of the RFP.

The 3727 MWt static analysis and simulator runs previously described were based on the current RFP low suction pressure trips that are staggered to allow for pressure recovery before tripping successive RFPs. The time delays for the RFP low suction pressure trips are 5 seconds for the 'A' RFP, 15 seconds for the 'B' RFP, and 30 seconds for the 'C'

RFP. These delay times are assumed in the simulator run. The time delays are currently achieved by the use of mechanical timers. The installation of a digital Integrated Control System (ICS) is planned for the upcoming Unit 2 outage in 2009 and the Unit 1 outage in 2010. These delay times will be determined digitally with the installation of the digital ICS. The delay timers for the low suction pressure trips start at 5 seconds into the event when suction pressure drops below 285 psig. The A RFP trips 10 seconds into the simulation or 5 seconds after the low suction pressure trip setpoint of 285 psig is reached. Once the 'A' RFP trips on low suction pressure, the drop in feedwater pump discharge pressure rapidly closes the discharge check valve causing a rapid reduction in feedwater flow that initiates suction pressure recovery. The delay timers for the 'B' and 'C' RFPs suction pressure trip reset due to suction pressure increasing above the reset pressure of approximately 315 psig at approximately 14.5 seconds into the event or 9.5 seconds after the timers started. The suction pressure trip for the 'B' RFP is reset 5.5 seconds before the 'B' RFP timer would cause a trip.

Approximately 17 seconds into the simulation, the suction pressure is predicted to recover to 367 psig. Thus, the simulator predicts that the RFP suction pressure will recover well above the low suction trip reset pressure. Reactor power will be decreasing due to the recirculation pump speed runback, thus reducing the need for feedwater flow, so the Reactor Feedwater Pump Turbine (RFPT) speed will begin to decrease, further increasing RFP suction pressure.

The two remaining RFPs are predicted to remain on line since suction pressure will continue to increase as feedwater demand is reduced due to the effective power reduction from the recirculation runback.

In the unlikely event that the suction pressure does not recover in time to prevent the trip of the second RFPT, once the second RFPT trips, the suction pressure will recover to greater than 400 psig, however, the flow would not be sufficient to maintain water level and the reactor would scram on low water level. The remaining RFP would be sufficient to maintain water level after the scram.

It should be noted that minor uncertainties in the suction pressure calculation do not affect the simulation because the pressures decrease significantly below the trip setting of 285 psig after the condensate pump trips and increase significantly above the trip reset after the RFP trips. The major effect in the scenario is caused by uncertainties in the RFPT suction pressure recovery time. The pump manufacturer states that pressure recovery occurs between 3 and 5 seconds. Plant data during a RFPT trip indicates pressure recovery occurs between 1 and 3 seconds. The simulator results show a recovery time of approximately 4.5 seconds. The time delays between RFP trips were chosen to ensure feedwater would remain available for reactor makeup after a condensate pump trip. In the worst case, the first pump trip occurs at 5 seconds and pressure recovery takes 5 seconds. That leaves five seconds for the timers to reset before the

second pump would trip at 15 seconds. The current time delays were verified by the pump manufacturer to be acceptable.

It is predicted that vessel level will decrease by 5 inches to an indicated value of 30 inches due to the initial reduction in feedwater flow caused by the tripping of the condensate pump. Vessel level will recover as the RFPs run up to maximum speed. Vessel level is predicted to return to the initial value of 35 inches as power decreases to within the capability of the remaining pumps from the recirculation runback. It is expected that performance of the test at 3952 MWt will result in a single RFPT trip, but a complete loss of feedwater will not occur.

Hot Weather Considerations

The only time Susquehanna Units will be at 3952 MWt is in the summer time (July/August) on a hot day because the units are generator limited. The units are expected to run at maximum generator output with thermal power less than 3952 MWt. On hot days, the units' condenser performance decreases and additional thermal power is needed to maintain the maximum generator output. In addition, the PJM grid is heavily loaded on hot summer days. A significant transient would be placed on the PJM grid should one of the Susquehanna units scram as a result of this test.

Summary:

The condensate pump trip performed on Unit 2 at 3733 MWt will be with new RFP turbines and a new digital ICS. This test is expected to verify that the system response is similar to the Unit 1 condensate pump trip test. PPL will confirm that the Unit 2 system response, similar to the Unit 1 condensate pump trip test, will not result in a complete loss of feedwater and that the static analysis and simulation results described above remain valid for 3952 MWt.

Based on the results of the condensate pump trip test for Unit 1 at 3733 MWt, an anticipated successful condensate pump trip test for Unit 2 at 3733 MWt and the simulator and static model predictions, PPL believes that the analysis provided demonstrates that performing a condensate pump trip test from between 3872 MWt to 3952 MWt power level is unnecessary. As a result, NRC is requested to issue PPL a letter notifying us that the tests specified in License Conditions 2.C. (37) (b) and 2.C. (21) (b) adequately demonstrate that a single condensate pump trip will not result in a loss of all feedwater and that a test performed at 3952 MWt is not required.

Any questions regarding this letter should be directed to Mr. Cornelius T. Coddington at (610) 774-4019.

W. H. Spence

Attachment A - Transient Testing License Conditions
Attachment B - Unit 1 Condensate Pump Trip Acceptance Criteria and Comparison of Test Results
Attachment C - Tables

Copy: NRC Region I
Mr. R. R. Janati, DEP/BRP
Mr. F. W. Jaxheimer, NRC Sr. Resident Inspector
Mr. B. K. Vaidya, NRC Project Manager

Attachment A to PLA-6451

Transient Testing License Conditions

Transient Testing License Conditions

Unit 1

(37) Transient Testing

(a) PPL will demonstrate through performance of transient testing on each SSES unit that the loss of one condensate pump will not result in a complete loss of reactor feedwater. The test shall be performed on each unit during the unit's CPPU power ascension test program within 336 hours of achieving and prior to exceeding a nominal power level of 3733 MWt with feedwater and condensate flow rates stabilized. PPL shall confirm that the plant response to the transient is as expected in accordance with the acceptance criteria that are established. If a loss of all reactor feedwater occurs as a result of the test, the test failure shall be addressed in accordance with corrective action program requirements and the provisions of the power ascension test program prior to continued operation of the SSES unit above 3489 MWt.

(b) Unless the NRC issues a letter notifying the licensee that the tests specified by License Condition 2.C.(37)(a) adequately demonstrate that a single condensate pump trip will not result in the loss of all feedwater while operating at the full CPPU power level of 3952 MWt, PPL shall perform the transient test on either SSES unit (whichever unit is first to achieve the following specified operating conditions) specified by License Condition 2.C.(37)(a) during the power ascension test program while operating at 3872 MWt to 3952 MWt (98% to 100% of the full CPPU power level) with feedwater and condensate flow rates stabilized. The test shall be performed within 90 days of operating at greater than 3733 MWt and within 336 hours of achieving a nominal power level of 3872 MWt with feedwater and condensate flow rates stabilized. PPL will demonstrate through performance of transient testing on either Susquehanna Unit 1 or Unit 2 (whichever is the first to achieve the specified conditions) that the loss of one condensate pump will not result in a complete loss of reactor feedwater. PPL shall confirm that the plant response to the transients is as expected in accordance with the acceptance criteria that are established. If a loss of all reactor feedwater occurs as a result of the test, the test failure shall be addressed in accordance with corrective action program requirements and the provisions of the power ascension test program prior to continued operation of the SSES unit above 3733 MWt.

Unit 2

(21) Transient Testing

(a) PPL will demonstrate through performance of transient testing on each SSES unit that the loss of one condensate pump will not result in a complete loss of reactor feedwater. The test shall be performed on each unit during the unit's CPPU power ascension test program within 336 hours of achieving and prior to exceeding a nominal power level of 3733 MWt with feedwater and condensate flow rates stabilized. PPL shall confirm that the plant response to the transient is as expected in accordance with the acceptance criteria that are established. If a loss of all reactor feedwater occurs as a result of the test, the test failure shall be addressed in accordance with corrective action program requirements and the provisions of the power ascension test program prior to continued operation of the SSES Unit above 3489 MWt.

(b) Unless the NRC issues a letter notifying the licensee that the tests specified by License Condition 2.C.(21)(a) adequately demonstrate that a single condensate pump trip will not result in a loss of all feedwater while operating at the full CPPU power level of 3952 MWt, PPL shall perform the transient test on either SSES unit (whichever unit is first to achieve the following specified operating conditions) specified by License Condition 2.C.(21)(a) during the power ascension test program while operating at 3872 MWt to 3952 (98% to 100% of the full CPPU power level) with feedwater and condensate flow rates stabilized. The test shall be performed within 90 days of operating at greater than 3733 MWt and within 336 hours of achieving a nominal power level of 3872 MWt with feedwater and condensate flow rates stabilized. PPL will demonstrate through performance of transient testing on either Susquehanna Unit 1 or Unit 2 (whichever unit is first to achieve the specified conditions) that the loss of one condensate pump will not result in a complete loss of reactor feedwater. PPL shall confirm that the plant response to the transient is as expected in accordance with the acceptance criteria that are established. If a loss of all feedwater occurs as a result of the test, the test failure shall be addressed in accordance with corrective action program requirements and the provisions of the power ascension test program prior to continued operation of either SSES Unit above 3733 MWt.

Attachment B to PLA-6451

Unit 1 Condensate Pump Trip Acceptance Criteria and Comparison of Test Results

Unit 1 Condensate Pump Trip Acceptance Criteria and Comparison of Results

Acceptance Criteria

Level 1 Criteria:

The trip of one condensate pump shall not cause the trip of all three feedwater pumps.

Level 2 Criteria:

(a) The trip of one condensate pump shall not cause the trip of more than one feedwater pump.
(b) A recirculation runback shall occur upon the trip of a condensate pump.
(c) For the 3733 MWt test only, the margin to the RFP suction pressure trip setpoint shall not be less than 10 psi.

Results

Condensate pump trip test from 3727 MWt results compared to acceptance criteria

Level 1 Criteria

No feedwater pumps tripped as predicted (criterion met)

Level 2 Criteria

(a) No feedwater pumps tripped as predicted (criterion met)
(b) A recirculation runback did occur(criterion met)
(c) Margin to RFP suction pressure trip = 329 psig - 285 psig = 44 psi, 34 psi above the Level 2 acceptance criteria(criterion met)

Attachment C 1 to PLA-6451

Tables

Table 1

Comparison of Plant, Simulator and Static Model RFP Suction Pressure for Unit 1 Condensate Pump Trip at 3727 MWt

Condition	Minimum RFP Suction Pressure (psig)			Comments
	Plant (Actual)	Simulator (Prediction)	Static model (Prediction)	
Minimum suction pressure with 3 condensate pumps	329	305	304	Higher simulator feed demand causes lower suction pressure
Condition	**Maximum RFP Speed (rpm)**			**Comments**
	Plant (Actual)	Simulator (Prediction)	Static Model (Prediction)	
Average RFP speed at minimum pressure	4997	5109	5150*	Plant power decrease is slightly faster than simulator causing higher feed demand

* Pumps at high speed stops

Table 2

Comparison of Plant Simulator and Static Model Predictions for 3952 MWt

	Minimum RFP Suction Pressure (psig)		
Condition	Simulator	Static model	Comments
3 condensate pumps and 3 RFPs at maximum speed	248	231	Simulator minimum pressure with 3 RFPs at 5382 RPM.
3 condensate pumps and 2 RFPs at maximum speed	367	383	Simulator pressure value 7 seconds after one RFP trip with 2 remaining RFP's at maximum speed.

Table 3

Simulator and Plant Condensate Pump Trip Time Line for 3727 MWt

Plant Time (sec)	Unit 1 Time Line	Simulator Time (sec)
0.0	Condensate pump trips and initiates recirculation runback	0.0
12.0	Plant Feedwater demand decreases due to effect of recirculation runback	
	Simulator Feedwater demand decreases due to effect of recirculation runback	14.0
	Simulator feedwater pump suction pressure reaches minimum of 305 psig	14.0
16.0	Plant feedwater pump suction pressure reaches minimum of 329 psig	
	Simulator feedwater pump suction pressure increases above initial pressure	36.5
37.0	Plant feedwater pump suction pressure increases above initial pressure	
180.0	Steady state conditions achieved in plant and simulator	180.0

Simulator Condensate Pump Trip Time Line for 3952 MWt

Time (sec)	Event
0.0	Condensate pump trips and initiates recirculation runback
5.0	Feedwater pump suction pressure < 285 psig (Start Trip Timers)
10.0	Feedwater Pump A tripped (5 Second Timer)
14.5	Feedwater pump suction pressure > 315 psig (Reset Trip Timers)
17.0	Feedwater pump suction pressure at 367 psig
50.0	Feedwater demand decreases due to effect of recirculation runback
180.0	Steady state conditions achieved