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U. S. Nuclear Regulatory Commission
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**SUSQUEHANNA STEAM ELECTRIC STATION
PROPOSED AMENDMENT NO. 269 TO UNIT 1
LICENSE NPF-14 AND AMENDMENT NO. 236 TO
UNIT 2 LICENSE NPF-22: DC ELECTRICAL POWER
SYSTEMS TECHNICAL SPECIFICATIONS REWRITE
SECOND RAI RESPONSE
PLA-6080**

**Docket Nos. 50-387
and 50-388**

References:

1) *PLA-5825, B. T. McKinney (PPL) to Document Control Desk (USNRC), Proposed Amendment No. 269 to Unit 1 License NPF-14 and Amendment No. 236 to Unit 2 License NPF-22: DC Electrical Power Systems Technical Specifications Rewrite," dated November 9, 2004.*

2) *Letter from USNRC (R. V. Guzman) to B. T. McKinney (PPL), "Request for Additional Information (RAI) – SSES Units 1 & 2 DC Electrical Power Systems TSTF-360 (TAC Nos. MC5153 and MC5154)," dated October 19, 2005.*

3) *PLA-5995, B. T. McKinney (PPL) to Document Control Desk (USNRC), Proposed Amendment No. 269 to Unit 1 License NPF-14 and Amendment No. 236 to Unit 2 License NPF-22: DC Electrical Power Systems Technical Specifications Rewrite-Response to Request for Additional Information (RAI)," dated December 15, 2005.*

4) *Letter from USNRC (R. V. Guzman) to B. T. McKinney (PPL), "Request for Additional Information (RAI) – SSES Units 1 & 2-Request for Additional Information regarding Amendment Application to Revise Technical Specifications on DC Electrical System Requirements (TAC Nos. MC5153 and MC5154)," dated May 31, 2006.*

5) *Letter from USNRC (T. H. Boyce) to Technical Specification Task Force (TSTF), "Request for Public Meeting to Discuss Enclosed Document Electrical Engineering Branch Concerns with Technical Specification Task Force (TSTF)-360, Revision 1 DC Electrical Rewrite," dated April 11, 2006.*

In accordance with the provisions of 10 CFR 50.90, PPL Susquehanna, LLC (SSES) submitted a request for amendment to the Technical Specifications (TS) for Susquehanna Units 1 & 2. (Reference 1). Reference 3 provided PPL's revised amendment request in response to the NRC Request for Additional Information (RAI) in Reference 2.

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The enclosure to this letter provides the PPL response to each of the four questions in Reference 4. PPL's responses are consistent with the Technical Specification Task Force (TSTF) draft responses to Reference 5, which are to be discussed with NRC at a public meeting scheduled for July 12, 2006.

Attachment 1 contains a draft of the Technical Requirements Manual (TRM) Section 3.8.7 for the new licensee controlled battery monitoring and maintenance program. Attachment 2 contains a revision to proposed TS Section 5.5.13 previously submitted by Reference 3. This proposed revision does not affect the No Significant Hazards Considerations included with Reference 3.

PPL plans to implement the proposed changes as soon as practical following NRC approval. Therefore, we request NRC complete its review by September 29, 2006 with changes to be implemented within 60 days of NRC approval.

Any questions regarding this request should be directed to Mr. Duane L. Filchner at (610) 774-7819.

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

Executed on: June 30, 2006

Richard D Pagodin

for B. T. McKinney

Enclosure: PPL Susquehanna Response to NRC Second Request for Additional Information

Attachment 1: PPL Battery Monitoring and Maintenance Program (Draft)
Attachment 2: Revised Markup to Proposed Units 1&2 Technical Specification Section 5.5.13

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

ENCLOSURE TO PLA-6080

PPL SUSQUEHANNA - RESPONSE TO NRC SECOND REQUEST FOR ADDITIONAL INFORMATION

Response to NRC Second Request for Additional Information

NRC QUESTION 1:

Specific gravity monitoring is used to measure the strength of a battery cell's electrolyte, which is an important component of the battery's chemical reaction, and provides an indication of the battery's state-of-charge. Whereas, float current monitoring may or may not provide an accurate indication of the battery's state-of-charge. Float current monitoring is based on a calculation that is dependent on several variables. The NRC staff has a concern with two variables of this calculation: the applied charging voltage and cell resistance. A change in either of these variables may provide a false indication of the battery's state-of-charge. Provide assurance that float current monitoring will provide an accurate indication of the battery's state-of-charge.

PPL RESPONSE:

Float current monitoring provides an accurate indication and is an acceptable method to determine battery state of charge. Following a discharge, battery state of charge involves charge-discharge reactions related to electric current flow. Therefore, float current monitoring is a more meaningful indicator of state of charge because current is the primary means of discharging and charging the battery. Also, specific gravity readings have an inherent time lag on both charge and discharge. Therefore, after a discharge, float current monitoring is an accurate method to determine battery state of charge.

Float current monitoring is also an accurate method to monitor battery state of charge during steady-state operations. Since the charging voltage (E) is fixed by the battery charger and the battery internal cell resistance (R) is a very small value, the dominant factor for determining current flow in a battery cell is the internal cell voltage (E_b), where $I = (E-E_b)/R$. The value of E_b is dependent upon the presence of lead sulfate ions within the cell since the quantity of lead sulfate ions is associated with the state of charge (more lead sulfate is present when a battery is in a discharged state). A small amount of lead sulfate reduces the internal cell voltage, which has the effect of increasing the driving voltage ($E- E_b$). This results in the current flow through a discharged battery being higher than current flow under steady state fully charged conditions.

The process of charging the battery reduces the presence of lead sulfate in a fully charged battery, as such, E is approximately equal to E_b and the resulting float current is small. Therefore, the level of float current measured with the proper float voltage applied provides an indication of the battery state of charge at any time. Measured current that is higher than the established float current value indicates a recent discharge has occurred. Current that is at or below the established float current value provides assurance that the battery is charged.

Current SSES Technical Specification (TS) Table 3.8.6-1 footnote (c) and the TS Bases identify that it is acceptable to use float current to meet specific gravity limits.

NRC QUESTION 2:

The battery pilot cell is representative of the average battery cell in the battery. Provide assurance that a battery with a battery pilot cell with a voltage of 2.07 volts or slightly greater will remain capable of performing its minimum designed function.

PPL RESPONSE:

The pilot cell is representative of all cells in the battery and it is presently determined by selecting a cell, while connected to the battery charger, with a float voltage greater than 2.2 volts, and with a specific gravity reading equal to the average of all the cells. The 2.13 cell voltage limit specified in the battery monitoring and maintenance program is the limit for taking corrective action (per proposed TS 5.5.13 and draft TRM 3.8.7, Attachment 1). The 2.07 cell voltage limit in proposed TS 3.8.6 Condition A represents the voltage allowed in current technical specifications. This voltage is consistent with a fully charged battery and provides assurance that sufficient capacity exists to perform the intended function and maintain a margin of safety.

Discharge tests are performed with the battery charger disconnected from the battery. When the charger is disconnected, the average cell voltage will be below 2.07 for the entire duration of the discharge. This is consistent with the information provided by the battery manufacturer on the discharge curve for any battery. As a discharge starts, the internal resistance of the battery creates a voltage drop due to the discharge current. (Voltage Drop = Discharge Rate X Battery Internal Resistance). Since the nominal open circuit voltage of a fully charged, 1.215 specific gravity cell is approximately 2.06 VDC; the cell voltage during the discharge will be less than this value.

Pilot cell voltage alone cannot predict the ability of the battery to perform its design function. The entire surveillance and maintenance program consists of periodic tests and inspections necessary to provide assurance the battery is capable of performing its design function.

Therefore, it can be concluded that 2.07 volts is consistent with a battery which will remain capable of performing its minimum designed function.

NRC QUESTION 3:

As mentioned in Question No. 2, the battery pilot cell is representative of the average battery cell in the battery. Provide assurance that a battery with a battery pilot cell electrolyte temperature slightly greater than or equal to the minimum established design limit will remain capable of performing its minimum designed function.

PPL RESPONSE:

Per the response to Question 2 above, the pilot cell is representative of all cells in the battery and it is presently determined by selecting a cell, while connected to the battery charger, with a float voltage greater than 2.2 volts, and with a specific gravity reading equal to the average of all the cells. The design temperature for the SSES battery cells is 60 degrees F. This parameter is monitored by the licensee controlled battery monitoring and maintenance program (draft TRM Section 3.8.7, Attachment 1). The impact of a single cell temperature being slightly above or below the average does not in itself affect the battery's ability to perform its design function. In addition, each battery is sized with correction factors that include temperature and aging. The battery sizing correction factors for a 60 degree temperature are 1.11 and 1.25 for aging (20 year life). The overall battery sizing correction factor is 1.3875, which is the product of these two factors. This value is utilized in the SSES battery sizing calculations.

The SSES battery room temperatures are essentially the same as the ambient temperature of the adjacent control structure areas because there is no forced cooling to these rooms. Air is exhausted by design from redundant safety related HVAC systems which serve the rooms (to prevent hydrogen buildup), and makeup air is drawn into the rooms at the ambient temperature from the larger control structure volume. Since batteries have very large thermal inertia and the battery room temperature remains relatively constant at approximately 70 degrees F, it is concluded that the pilot cell temperature is an accurate representation of the temperature of the entire battery bank. The only heat load in a battery room (besides the batteries) is room lighting, which is normally off when the room is unoccupied. Since there is no significant heat load in the room and there is no localized impingement of ventilation air, there will be no localized hot or cold areas in the room and all battery cells are at essentially the same temperature. Further, the room does not have any internal air flow obstructions, which allows the transfer air to distribute evenly in the room. Each room is relatively small, which promotes air mixing within the room. Based on these physical characteristics, each battery remains at essentially the same uniform temperature and the pilot cell temperature is essentially the same temperature as the other battery cells located in the room.

The present Technical Specification Surveillance requirements ensure the average electrolyte temperature of a battery is checked and verified to be within design criteria on a quarterly basis. The proposed Technical Specification SR 3.8.6.4 verifies the pilot cell

temperature, which is representative of all the cells in the battery as stated above, is greater than or equal to the minimum established design limit every 31 days. Such monitoring of the pilot cell every 31 days is an improvement over quarterly average temperature monitoring.

Therefore, it can be concluded that a battery with a battery pilot cell electrolyte temperature slightly greater than or equal to the minimum established design limit will remain capable of performing its minimum designed function.

NRC QUESTION 4:

Consistency with the Institute of Electrical and Electronics Engineers (IEEE) Standard 450-1995, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," was used throughout your submittal as the justification for approval. The most recent version of IEEE Standard 450 that has been endorsed by the NRC through Regulatory Guides (RGs) is IEEE Standard 450-1975. The RGs of mention are: RG.1.28, "Installation, Design, and Installation of Large Lead Storage Batteries for Nuclear Power Plants," and RG 1.129, "Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Nuclear Power Plants."

a. Provide a plant specific technical justification for each proposed change in lieu of referencing consistency with the IEEE Standard 450-1995.

b. Provide a copy of the proposed battery monitoring and maintenance program identified in TS 5.5.13.

PPL RESPONSE:

a. Technical justifications in the SSES proposed TS changes were not based on IEEE-450. All references to IEEE-450 were either informational or were provided to identify the contents of the new battery maintenance and monitoring program required as a result of this change. The reference to IEEE-450 1995 in the proposed TS Section 5.5.13 has been removed and replaced with a reference to the licensee controlled program used to provide for battery restoration and maintenance. The revised TS Section 5.5.13 is contained in Attachment 2.

b. PPL formally committed to establish a battery monitoring and maintenance program in Reference 3, Attachment 1, Section 4. The new program to be contained in the SSES TRM will contain the elements from the affected Technical Specification LCO's whose parameter values will continue to be controlled at their current level.

A copy of the battery monitoring and maintenance program (Draft) is provided in Attachment 1. The SSES TRM is considered a part of the SSES FSAR and as such is subject to the provisions of 10 CFR 50.59.

ATTACHMENT 1 TO PLA-6080

PPL SUSQUEHANNA
BATTERY MONITORING AND
MAINTENANCE PROGRAM (DRAFT)

3.8.7 Battery Monitoring and Maintenance Program

TRO 3.8.7 Battery cell parameters for the Class 1E 250 V batteries and Class 1E 125 V batteries shall be within limits.

APPLICABILITY: When associated DC electrical power subsystems are required to be OPERABLE.

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each battery.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more batteries on one 125 VDC electrical power subsystem or on one 250 VDC electrical power subsystem for electrolyte level or float voltage not within Category A or B limits.	A.1 Verify pilot cell electrolyte level and float voltage meet Table 3.8.7-1 Category C limits.	1 hour
	AND	
	A.2 Verify battery cell parameters meet Table 3.8.7-1 Category C limits for electrolyte level, cell temperature, and float voltage.	8 hours **AND** Once per 7 days thereafter
	AND	
	A.3 Restore battery cell parameters for electrolyte level, float voltage and Pilot Cell Specific Gravity to Category A and B limits of Table 3.8.7-1.	31 Days
B. Required Action and associated Completion Time for Condition A.1 or A.2 not met.	B.1 Enter TS 3.8.6 Condition A, C and/or D.	Immediately
C. Required Action and associated Completion Time for Condition A.3 not met.	C.1 Declare associated battery inoperable.	Immediately

D. One or more batteries on one 125 VDC electrical power subsystem or on one 250 VDC electrical power subsystem with one or more cells electrolyte level less than minimum established design limits.	D.1 Restore in accordance with T.S 3.8.6 C.3, apply equalizing charge to battery/or affected cell, and verify cell meets Table 3.8.7-1 Category C Limits for float voltage and temperature.	31 Days
E. One or more batteries on one 125 VDC electrical power subsystem or on one 250 VDC electrical power subsystem with average electrolyte temperature less the Table 3.8.7-1 Category B Limits.	E.1 Restore battery average electrolyte temperature to greater than or equal to Table 3.8.7-1 Category B Limits.	24 Hours

TECHNICAL REQUIREMENT SURVEILLANCE

SURVEILLANCE		FREQUENCY
TRS 3.8.7.1	Verify for each terminal and connector: No visible corrosion <u>OR</u> a. ≤ 50.0E-6 ohms; or b. ≤ 100.0E-6 ohms with the calculated average resistance for the battery < 50.0E-6 ohms.	92 Days
TRS 3.8.7.2	Verify average electrolyte temperature (minimum of 10% of cells) is within Table 3.8.7-1 Category B limits.	92 Days
TRS 3.8.7.3	Verify battery cell parameters meet Table 3.8.7-1 Category B Limits for Specific Gravity.	2 Years
TRS 3.8.7.4	Verify Battery cells, cell plates, and racks show no visual indication of physical damage or abnormal deterioration that could potentially degrade battery performance.	2 Years
TRS 3.8.7.5	Verify the battery connection resistance is: a. < 100.0 E-6 ohms for any single connection; and b. The calculated average resistance for the battery is < 50.0 E-6 ohms.	2 Years

Table 3.8.7-1 (page 1 of 1)
Battery/Battery Cell Parameter Requirements

Minimum Established Battery Terminal Float Voltage:	≥ 129 VDC for the 125 V Batteries	≥ 258 for the 250 V Batteries

CELL PARAMETER	CATEGORY A: LIMITS FOR EACH DESIGNATED PILOT CELL	CATEGORY B: LIMITS FOR EACH CONNECTED CELL	CATEGORY C: ALLOWABLE LIMITS FOR EACH CONNECTED CELL
Electrolyte Level	≥ Minimum level indication mark, and ≤ ¼ inch above maximum level indication mark[(a)]	≥ Minimum level indication mark, and ≤ ¼ inch above maximum level indication mark[(a)]	Above top of plates, and not overflowing
Float Voltage	≥ 2.13 V	≥ 2.13 V	> 2.07 V
Specific Gravity[(b)(c)]	N/A	Not more than 0.020 below average of all connected cells AND Average of all connected cells ≥ 1.195	N/A
Cell Temperature	60 Degrees F	60 Degrees F	60 Degrees F

(a) It is acceptable for the electrolyte level to temporarily increase above the specified maximum level during and immediately following equalizing charges provided it is not overflowing.

(b) Corrected for cell temperature. Level correction is not required.

(c) A battery charging current of < 0.25 amp for Class 1E 250 V batteries and < 0.1 amp Class 1E 125 V batteries when on float charge is acceptable for meeting specific gravity limits.

ATTACHMENT 2 TO PLA-6080

PPL SUSQUEHANNA
Revised Markup to Proposed
Units 1&2 Technical Specification
Section 5.5.13

5.5 Programs and Manuals (continued)

5.5.13 Battery Monitoring and Maintenance Program

This program provides for battery restoration and maintenance, is licensee controlled, and includes the following:

a. Actions to restore battery cells with float voltage < 2.13 V, and
b. Actions to equalize and test battery cells that had been discovered with electrolyte level below the minimum established design limit.

5.5 Programs and Manuals (continued)

5.5.13 Battery Monitoring and Maintenance Program

This program provides for battery restoration and maintenance, is licensee controlled, and includes the following:

a. Actions to restore battery cells with float voltage < 2.13 V, and
b. Actions to equalize and test battery cells that had been discovered with electrolyte level below the minimum established design limit.