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MAY 09 2007

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

SUSQUEHANNA STEAM ELECTRIC STATION
PROPOSED LICENSE AMENDMENT NO. 285
FOR UNIT 1 OPERATING LICENSE NO. NPF-14
AND PROPOSED LICENSE AMENDMENT NO. 253
FOR UNIT 2 OPERATING LICENSE NO. NPF-22
EXTENDED POWER UPRATE APPLICATION RE:
ELECTRICAL ENGINEERING TECHNICAL REVIEW
REQUEST FOR ADDITIONAL INFORMATION
RESPONSES **Docket Nos. 50-387**
PLA-6195 **and 50-388**

References: 1) *PPL Letter PLA-6076, B. T. McKinney (PPL) to USNRC, "Proposed License Amendment Numbers 285 for Unit 1 Operating License No. NPF-14 and 253 for Unit 2 Operating License No. NPF-22 Constant Pressure Power Uprate," dated October 11, 2006.*

2) *Letter, R. V. Guzman (NRC) to B. T. McKinney (PPL), "Request for Additional Information (RAI) – Susquehanna Steam Electric Station, Units 1 and 2 (SSES 1 and 2) - Extended Power Uprate Application Re: Electrical Engineering Review (TAC Nos. MD3309 and MD3310)," dated April 12, 2007.*

Pursuant to 10 CFR 50.90, PPL Susquehanna LLC (PPL) requested in Reference 1 approval of amendments to the Susquehanna Steam Electric Station (SSES) Unit 1 and Unit 2 Operating Licenses (OLs) and Technical Specifications (TSs) to increase the maximum power level authorized from 3489 Megawatts Thermal (MWt) to 3952 MWt, an approximate 13% increase in thermal power. The proposed Constant Pressure Power Uprate (CPPU) represents an increase of approximately 20% above the Original Licensed Thermal Power (OLTP).

The purpose of this letter is to provide responses to the Request for Additional Information transmitted to PPL in Reference 2.

The Enclosure contains the PPL responses.

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There are no new regulatory commitments associated with this submittal.

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

If you have any questions or require additional information, please contact Mr. Michael H. Crowthers at (610) 774-7766.

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

Executed on: May 9, 2007

for B. T. McKinney

Enclosure: Request for Additional Information Responses
Attachment: PPL Electric Utilities NEPA Memorandum

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

Enclosure to PLA-6195
PPL EPU
Request for Additional Information Responses

NRC Question 1:

In Attachment 6, Section 10.3.1 of the license amendment request (LAR), the licensee stated that the increased radiation levels, as result of Constant Pressure Power Uprate (CPPU), result in reduction of qualified life of some solenoid valves *inside* the primary containment. Certain additional equipment (i.e., power and instrument cable) may require radiation dose reduction analysis to demonstrate qualification for radiation level associated with the CPPU condition.

Confirm the worst case reduction in the life of affected solenoid valves due to CPPU condition *inside* the primary containment, and the management measure which will be taken for the early replacement of these solenoid valves. Confirm the results of radiation dose reduction analysis to demonstrate qualification of certain additional equipment (as stated above), corresponding to the CPPU condition.

PPL Response:

The radiation dose analysis for EQ equipment inside primary containment under CPPU conditions demonstrates that all equipment inside primary containment (including power and instrument cables) are qualified for CPPU conditions.

The worst-case reduction in the life of affected solenoid valves due to CPPU conditions *inside* the primary containment involves air-operated valve limit switch conduit seals. The conduit seals are qualified for the CPPU post-accident radiation levels with scheduled replacement every 13 years. This is reduced from a qualified life of 39.8 years.

The PPL Equipment Reliability and Station Health Program is the management control program that assures EQ components are replaced to maintain environmental qualification. The change to the conduit seals component qualified life will be reflected in the preventative maintenance program. This program includes controls that identify and schedule replacement to assure replacement prior to end of qualified life.

NRC Question 2:

In Attachment 6, Section 10.3.1 of the LAR, the licensee stated that the increased radiation levels, as result of CPPU, result in reduction of qualified life of some EQ equipment *outside* the primary containment. Certain additional equipment (i.e., relays, solenoid valves, flow switches, fire detection controls, pressure switches, hydrogen analyzer cell o-rings, heater control equipment, terminal blocks, and Residual Heat Removal (RHR) pump motor oil) initially do not meet qualification requirements based on CPPU conditions. However, the affected EQ equipment is expected to remain qualified with the application of radiation dose reduction analysis.

Confirm the worst case reduction in the life of some EQ equipment (as stated above) due to CPPU condition *outside* the primary containment. Also, confirm the management measure which will be taken for the early replacement of these EQ equipment. Confirm the results of radiation dose reduction analysis to demonstrate qualification of certain additional equipment (as stated above) corresponding to the CPPU condition.

PPL Response:

During the finalization of dose reduction analysis for CPPU cited in Attachment 6, Section 10.3.1 (Reference 1), non-conservative errors in the original EQ dose calculations for areas outside containment were discovered. These errors have been documented and managed by the PPL corrective action program. The CPPU analysis is correcting the deficiencies and addressing the CPPU impacts.

The radiation dose analysis for EQ equipment outside primary containment under CPPU conditions will be completed in June 2007. To date, no equipment has been identified that would be unqualified under CPPU conditions. Any equipment determined to be unqualified for the CPPU conditions will be replaced prior to CPPU implementation.

The PPL Equipment Reliability and Station Health Program is the management control program that assures EQ components are replaced to maintain environmental qualification. This program includes controls that identify and schedule replacement to assure replacement prior to end of qualified life.

NRC Question 3:

According to the LAR, the SSES main generators will be uprated from 1280 MVA to 1354 MVA after rewind.

Confirm the power factor rating of each generator after rewind.

PPL Response:

The SSES generators have had their stators rewound and have had new ratings applied to the generators. The new power factor rating of each generator after the rewind is 0.935 PF.

NRC Question 4:

In Attachment 11 of the LAR, it is stated that the studies performed for SSES 1 and 2, by Pennsylvania New Jersey/Maryland Interconnection LLC (PJM), tested the compliance of the system with the Mid-Atlantic Area Council (MAAC) Reliability Principles and Standards.

Provide specific normal voltage range and emergency/contingency voltage range criteria followed by PJM for power flow studies. Explain how these voltage range criteria were considered in the relay setting calculations for the plant degraded voltage protection.

PPL Response:

The specific voltage range for the 500 and 230 kV system for the SSES buses used in the PJM Interconnection LLC (PJM) power flow studies are as follows:

PJM 500 kV Transmission System Limits:
Normal Min/Max: 500/550kV
Emergency Min/Max: 485/550kV
Load Dump Min: 475kV
Voltage Drop Warning/Limit: 1.2/5.0%

PJM 230 kV Transmission System Limits:
Normal Min/Max: 219/242kV
Emergency Min/Max: 212/242kV
Load Dump Min: 207kV
Voltage Drop Warning/Limit: 5.0/8.0%

Note: The SSES normal voltage limits for the 230kV system are less restrictive (216.7/242kV) than the transmission limits listed above.

The voltage range criteria were considered in the relay setting calculations as described in PLA-6031 "RESPONSE TO GENERIC LETTER 2006-02 GRID RELIABILITY AND THE IMPACT ON PLANT RISK AND OPERABILITY OF OFFSITE POWER" dated March 28, 2006. This information is not provided herein since it was submitted in PLA-6031 pursuant to 10 CFR 2.390.

NRC Question 5:

According to Attachment 11 of the LAR, there are some cases when the system becomes unstable during certain line or transformer outages. An Operating Guide (PPL Electric Utilities NEPA memorandum) is in place to reduce power during these specific transmission outages. Further, the PJM impact studies and PPL Electric Utilities NEPA memorandum provide the information concerning the maximum gross mega-watts (MWs) and mega volt-amperes reactive (MVARs) output for each of the units, to maintain a stable grid operation under various maintenance and outage conditions.

Provide a copy of the Operating Guide (PPL Electric Utilities NEPA memorandum) which requires power reduction during certain line or transformer outages, and which puts limits on the maximum gross MWs and MVARs output for each of the units under

various maintenance and outage conditions. Provide a description as to how PPL follows this operating guide and procedurally coordinates with PJM.

PPL Response:

A copy of the PPL Electric Utilities NEPA memorandum is provided in the Attachment to this enclosure.

The operating guidelines contained in the PPL Electric Utilities (EU) NEPA memorandum is for the use of PJM and PPL EU. Should an abnormal system configuration require the use of this operating guide, PPL EU will direct the SSES operators to take the appropriate actions with regard to generator loading. The PPL EU NEPA memorandum is not a SSES procedure. Adherence to the PPL Electric Utilities NEPA memorandum is the responsibility of PJM and PPL EU. The Interconnection Service Agreement (ISA) obligates SSES to comply with operating directions from PPL EU. The ISA is a three party agreement between SSES, PPL EU and PJM.

NRC Question 6:

According to Attachment 11 of the LAR, to accommodate the loss in reactive capability due to increase in real power output, a 183 MVAR capacitor will be installed on the 230 kilo-volt (kV) substation bus and a 171 MVAR capacitor will be installed on the 500 kV substation at SSES 1 and 2.

Confirm whether these capacitor banks are controllable or switchable type. If controllable type, provide operational details of capacitor banks. Confirm whether these capacitors were taken into consideration for all cases of power flow and stability studies performed by PJM. Provide a licensing commitment that these capacitor banks will be installed and operated in accordance with the power flow and stabilities studies performed by PJM for SSES.

PPL Response:

The capacitor banks are switchable and can be put into service or removed from service by the transmission system operator. PPL EU owns and operates the supplemental capacitor banks. The SSES operators have no control over the operation of the capacitor banks. Therefore, PPL Susquehanna LLC can not provide a commitment that the capacitor banks will be installed and operated in accordance with the power flow and stabilities studies performed by PJM.

PJM identified the need for the supplemental capacitor banks during their Impact Studies for the SSES 1 and 2 EPU. The PJM impact studies detailed the results of their load flow and stability analyses. Attachment 11 to Reference 1 provides a summary of the results of the PJM impact studies. The Impact Studies are public documents, which can be

accessed via the PJM web site at https://www.pjm.com/planning/project-queues/queue-gen-active.jsp. The applicable queue requests are M11 and M12.

NRC Question 7:

According to Attachment 11 of the LAR, the Post-fault transient voltages at 500 kV buses shall not be below 0.7 per-unit (pu) voltage.

Confirm the effect of 0.7 pu post-fault transient voltage at 500 kV buses, was considered in the relay setting calculations for the plant undervoltage and degraded voltage protection.

PPL Response:

The criterion that post-fault voltages shall not be below 0.7 pu is a criterion used by the Transmission Operator (PJM) in the evaluation of grid stability, as identified in Attachment 11 of the LAR. The stability analysis performed by PJM uses a criteria/assumption that evaluates the post-fault transient voltage at the second swing to be $\geq$0.7 pu following the clearing of a transmission fault by protective relaying schemes. This is used by PJM as an internal flag and not as a requirement for all PJM generating plants.

The clearing times for transmission protection schemes is less than 1 second, which is shorter than the plant undervoltage and degraded voltage protective relay minimum time delay of 3 seconds. The voltage on the transmission system would recover to within the normal transmission voltage limits once cleared by the appropriate transmission protective relaying. Therefore, while considered for grid stability, this post-fault transient voltage criteria used by PJM is not a requirement of the SSES design basis for the plant undervoltage or degraded voltage protection. However, the plant undervoltage and degraded voltage protection time delay allows for the normal clearing of transmission type events and voltage recovery.

NRC Question 8:

In Section 6.1.2 of Attachment 6 of the LAR, the licensee stated that the Unit 2 main transformer rating is upgraded to meet the requirements for CPPU operation and the tap setting is changed.

Confirm the upgraded rating and revised tap setting of Unit 2 Main Transformer. Also, confirm whether the upgraded rating and revised tap setting of this transformer were considered in all the power flow and stability studies performed by PJM for SSES 1 and 2.

PPL Response:

The original equipment manufacturer for the Unit 2 Generator Step-Up (GSU) transformers has provided an analysis to document the maximum cooling rating increase from 420 MVA to 450 MVA. This re-rating did not require physical changes to the transformers. The Unit 2 configuration consists of three single phase transformers.

Transmission load flow analysis was done to review the transformer tap requirements along with plant load flow analysis to evaluate the optimal auxiliary transformer tap setting. SSES provides generator and Step-up transformer technical data to PJM on a periodic basis. This data is used as input for the PJM stability and load flow analyses. This most recent analysis determined that the existing tap positions are the optimal transformer settings with consideration to the plant downstream buses under all generator required MVAR considerations as defined in the SSES ISA. Therefore, no tap changes are required for the Unit 2 GSU Transformers resulting in no impact to the PJM load flow or stability studies.

NRC Question 9:

In Section 6.1.2 of Attachment 6 of the LAR, the licensee stated that the 230 kV synchronizing breaker was replaced to meet CPPU continuous current and short circuit requirements after replacement of 230 kV synchronizing breaker.

Confirm the revised ratings of the 230 kV synchronizing breaker.

PPL Response:

The continuous current and short circuit requirements for CPPU are:

Continuous current (max.): 3342 amperes
Short Circuit Amperes: 31.25 kAmps

The new 230 kV synchronizing circuit breakers are three single pole Mitsubishi Electric Power Products Inc. Type 200-SFMT-63HF circuit breakers. The ratings of the replacement 230 kV synchronizing circuit breakers are:

Continuous current: 4000 amperes
Short Circuit Amperes: 63 kAmps
Rated Maximum voltage: 245 kV
BIL: 900 kV
Rated Interrupting Time: 2 cycles

NRC Question 10:

In Section 6.1.2 of Attachment 6 of the LAR, the licensee stated that the Unit 2 overall differential protection relay required a setpoint change for the CPPU generator output.

Confirm the existing and revised relay set points of Unit 2 overall differential protection. Explain why this setting change is not listed in the Attachment 7 of the LAR - List of Planned Modifications.

PPL Response:

At the time Section 6.1.2 was written, it was determined that the Unit 2 overall differential protection relay setting was marginal and that a setpoint change may be warranted. Because of this uncertainty, it was not listed in Attachment 7. A third party review of the generator relay settings was conducted that confirmed the adequacy of the current relay setpoints for the CPPU conditions. The Unit 2 overall differential protection relay setting was also reviewed and determined to be acceptable for the new main generator rating and generator step-up transformer rating. Therefore, no changes are required to the protective relay settings.

NRC Question 11:

In Section 6.1.1 of Attachment 6 of the LAR, it is stated that the existing protective relay/settings are adequate to accommodate the increased load on the 13.8 kV system.

Confirm the calculated worst case maximum load demands at 13.8 kV buses, before and after the EPU conditions.

PPL Response:

Load flow analysis was performed for the 13.8 kV buses with the new expected CPPU loading profile. The increase in loading to the 13.8 kV buses is a result of the increased loading to the condensate pump motors, which resulted from the installation of new higher head condensate pumps. Analysis was conducted to demonstrate the 13.8 kV buses and transformers have acceptable margin for the increase in bus loading due to the condensate pump motor loading increase. The increase to the Unit 1 and Unit 2 auxiliary transformer is approximately a 1% increase. This results in a total transformer load of about 48 MVA for Unit 1 and 47 MVA for Unit 2, which is below the 55 MVA rating of the auxiliary transformers. This increase in loading does not impact the plant design base accident loading since the condensate pumps are tripped as part of a plant auxiliary bus transfer scheme during a Design Basis Accident (DBA) condition. Therefore, the increase in condensate pump loading does not affect the DBA analysis.

NRC Question 12:

In Section 6.1.1 of Attachment 6 of the LAR, it is stated that the current emergency diesel generator (EDG) fuel oil storage volume, as required by the plant technical specification, is based on the continuous full load diesel rating, and not the Design Basis Accident (DBA) loads.

Confirm any increase in DBA electrical loads due to CPPU which may have any impact on the EDG rating.

PPL Response:

The SSES CPPU license amendment safety analyses did not identify the need to install modifications to SSES DBA mitigation equipment. Flows, pressures, and pump loads for DBA mitigation equipment have not changed because of the CPPU. The loads on the 4 kV safety buses, as documented in the SSES load tracking calculation, will not change because of CPPU. Since there are no changes to safety bus loadings, the ratings of the Emergency Diesel Generators are not impacted.

Attachment to PLA-6195
PPL Electric Utilities NEPA Memorandum

TABLE SUMMARY

"BASE" STABILITY NEPA TRANSFER LIMIT	=	**3900MWs**
Generation Status Change		*NEPA Transfer Change*
Susquehanna Unit#2 OFF		-1079
Susquehanna Unit#1 OFF		-633
Montour Unit#1 OFF		-198
Montour Unit#2 OFF		-198
Gilberton OFF		-54
Schuylkill Energy OFF		-29
Sunbury Unit#4 OFF		-27
NEPCO OFF		-27
Hunlock Unit #3 OFF (steam unit)		-27
Hunlock Unit#4 OFF (combustion turbine)		-25
Frackville Wheelabrator OFF		-24
Foster Wheeler OFF		-22
Williams Unit#1 OFF		-40
Williams Unit#2 OFF		-20
Williams Unit#3 OFF		-20
Williams Unit#4 OFF		-20

BASE STABILITY TRANSFER LIMIT = 3900MWs

Transmission Status Change	*MW Limit Change*	Next *Worst Contingency*
1. 500 kV Line Out of Service		
➢ Juniata- Sunbury including Sunbury 500/230 kV Transformer#24 out.	-1618 (with Susquehanna Unit#2 max 850MW)	Single Phase to ground fault on Wescosville line @ Susquehanna and Susq#2 loss of outlet outage scheme fails to trip unit
	-813 (if Susquehanna #2 off-line)[2]	Three Phase fault on the 230kv side of Susq. 500/230kv Transformer #21 with normal relay operation.
➢ Sunbury-Susquehanna #2	-980 (with Susquehanna Unit#2 max 1050MW)	Single Phase to ground fault on Wescosville line @ Susquehanna and Susq#2 loss of outlet outage scheme fails to trip unit. Unit#2 MVA output isolated on Susq 500/230kv T21.
	No additional reduction for line outage if Susq Unit#2 is off-line. [2]	
➢ Susquehanna-Wescosville and Wescosville-Alburtis	-1573 (with Susquehanna Unit#2 max 900 MW)	Single Phase to ground fault on Juniata line @ Sunbury and Susq#2 loss of outlet outage scheme fails to trip unit.
	-656 (if Susquehanna #2 off-line)[2]	Three Phase fault on the Juniata – Sunbury 500kv line at Sunbury, which trips Sunbury 500/230kv Transformer #24, and de-energizes Susq. 500/230kv Transformer #21.

[1] In addition to the -633 limit change due to Susquehanna #1 outage
[2] In addition to the -1079 limit change due to Susquehanna #2 outage

Transmission Status Change	*MW Limit Change*	*Next Worst Contingency*
2. 500 kV CB outages		
➢ Susquehanna #2 500kV CB @ Sunbury. (Bypass switch open)	-980 (with Susq Unit #2 max 1050MW) No additional reduction for line outage if Susquehanna #2 is off-line. [2]	Single Phase to ground fault on Wescosville line @ Susquehanna and Susq#2 loss of outlet outage scheme fails to trip unit. Unit#2 MVA output isolated on Susq 500/230kv T21.
➢ Susquehanna #2 500kV CB @ Sunbury. (Bypass switch closed)	-360	Single phase to ground fault on Sunbury#2 500 kV line @ Susq and Sunbury 500kV South CB @ Susq fails.Trip both Sunbury 500/230 kV and Susquehanna 500/230 kV Transformers isolating the 230kv system from Susq 500kv Switchyard.
3. 500/230 kV Transformer out of service		
➢ Sunbury 500/230 kV Transformer #24	If Susq #1&#2 @ 1204 = -563 If Susq #2 @ 700 = -1145 If Susq #2 off-line = -813[2] If Susq #1 off-line = -227[1]	Three Phase fault on the 230 side of T21 with normal relay operation.
➢ Susquehanna 500/230 kV	If Susq #1&#2 @ 1204 = -409 If Susq #2 @ 700 = -1085 If Susq #2 off-line = -656[2] If Susq #1 off-line = -344[1]	Three Phase fault on the 230 side of T24 with Transformer #21 normal relay operation.

[1] In addition to the -633 limit change due to Susquehanna #1 outage
[2] In addition to the -1079 limit change due to Susquehanna #2 outage

Transmission Status Change	*MW Limit Change*	*Next Worst Contingency*
4. 230 kV Bus Outage		
➢ Frackville 230 kV Bus	-269	Three Phase fault on 500 kV Juniata-Sunbury line at Sunbury.
5. *230 kV Line Outage*		
➢ Montour-Susquehanna	-110	Three Phase fault on 500 kV Juniata-Sunbury line at Sunbury.
➢ Susquehanna-E. Palmerton	-110	Three phase fault on 500 kV Juniata line at Sunbury.

[1] In addition to the -633 limit change due to Susquehanna #1 outage
[2] In addition to the -1079 limit change due to Susquehanna #2 outage