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APR 1 3 2007

U. S. Nuclear Regulatory Commission
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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
CONSTANT PRESSURE POWER UPRATE –
SUPPLEMENT **Docket Nos. 50-387**
PLA-6174 **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 Regarding Turbine Generator Review (TAC Nos. MD3309 and MD3310)," dated March 15, 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 (TS) 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.

There are no new regulatory commitments associated with this submittal.

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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: 4-13-07

B. T. McKinney

Enclosure: Request for Additional Information Responses

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

PPL EPU
Request for Additional Information Responses

NRC Question 1:

On page 7-2 of the SSES 1 and 2 Power Uprate Safety Analysis Report (PUSAR), the licensee stated that in 2003 for Unit 2, and 2004 for Unit 1, the low pressure rotors were changed from a monoblock design to a shrunk-on wheel design. The keyway of the shrunk-on wheel has been known to be susceptible to stress-corrosion cracking. The monoblock rotor has no keyway and is considered to be less susceptible to stress-corrosion cracking than the shrunk-on wheel. Discuss why the low-pressure rotors were changed to a shrunk-on wheel design and how the shrunk-on wheel design addresses the keyway cracking that has been experienced in the past.

PPL Response:

The low-pressure (LP) rotor replacement was part of a turbine upgrade project implemented to increase electric generation output and improve turbine reliability. In 2003 and 2004, the Unit 2 and Unit 1 LP and High Pressure (HP) turbine sections were replaced. A competitive bid process determined the best turbine design. The process evaluated three designs. The bids submitted contained three different LP rotor designs:

- Monoblock rotors
- Welded barrel rotors
- Advanced Disk-type Shrunk-on wheel rotors

The bid evaluation included an extensive technical evaluation of the different LP rotor designs. The bid evaluation resulted in the selection of the Siemens design that utilizes their Advanced Disk-type shrunk-on wheel LP rotors.

The technical portion of the bid evaluation investigated the susceptibility of the Siemens design to keyway cracking. The Siemens LP rotor design is an acceptable design for the prevention of keyway cracking since their LP design has incorporated features to prevent Stress Corrosion Cracking (SCC) in the keyway. The Siemens Advanced Disk-type design includes the following features to prevent SCC:

1. No keyway on two of the three disks,
2. Locating the key on the 3rd disk in a low temperature zone,
3. Higher compressive stresses induced in the disk hub bore during heat treatment
4. Shot peening of two of the three disks to provide a compressive stress on the disk surface.

An extensive operating experience review of the Siemens Advanced Disk design performed during the bid evaluation identified no SSC reports. Based on the design features and operating history, PPL concluded that the Siemens shrunk-on wheel design acceptably addressed the keyway SCC concern.

NRC Question 2:

On page 7-2 of the SSES 1 and 2 PUSAR, the licensee stated that prior to constant pressure power uprate (CPPU), the high pressure turbines in SSES 1 and 2 were replaced in 2004 and 2003, respectively. The licensee stated further that "...For CPPU, the existing 12-stage high pressure monoblock rotor is being replaced by an 11-stage high pressure monoblock rotor while the existing low pressure turbine rotors are being retained..."

NRC Question 2a:

Discuss why the high pressure turbines in both units will be replaced again after only 3 to 4 years of operation and why the low pressure turbines in both units do not need to be replaced or modified for the power uprate.

PPL Response:

During the specification and procurement of the HP and LP turbines installed in 2003 and 2004, evaluations were performed to determine the possibility of building additional flow passing capability into the turbine design for a possible future power uprate.

The evaluation concluded that that the LP turbine sections could be designed to pass steam flows in excess of 120% of Original Licensed Thermal Power (OLTP) with no generation performance degradation, but that the HP turbine would experience a generation performance impact. Specifically, a higher flow HP design would result in a generation decrease of approximately 37 megawatts electric when operating at Current Licensed Thermal Power (CLTPC) steam flows. An economic evaluation determined that the HP turbine should be designed for CLTP steam flows and then replaced should an additional power uprate be implemented in the future.

The Constant Pressure Power Uprate (CPPU) evaluation of the HP turbine indicated that the flow area of the HP turbine would have to be increased in order to pass the additional CPPU steam flow. This increase in flow area will be accommodated in the new HP turbine by:

1. Removing a stage.
2. Opening up the flow area of the remaining 11 stages.

Thus, the LP turbines were originally designed for the higher steam flows and higher stresses than what they will see at full CPPU conditions and thus do not need to be replaced. The current HP turbine design was optimized for CLTP steam flows. The HP Turbine was evaluated and it was well understood that HP turbine replacement would be necessary for CPPU implementation.

NRC Question 2b:

Confirm that Siemens is the turbine vendor for the 11-stage high pressure turbine rotor.

PPL Response:

Siemens is the turbine vendor for the existing HP section, the new 11-stage turbine rotor, and the existing LP sections.

NRC Question 2c:

Discuss whether the structural integrity of the last stages of the low turbine blades and discs will be affected due to increased steam flow as a result of CPPU in terms of (1) corrosion on the blade surfaces, (2) stress-corrosion cracking at the root of blades, and (3) vibration of the blades and discs.

PPL Response:

The last stages of the LP turbines were designed for flows higher than the full CPPU conditions as discussed in the response to 2a above. This includes the corresponding slightly higher operating temperatures and pressures. Therefore, the increased CPPU steam flow will have no effects on the structural integrity of the low-pressure turbine blades for the following reasons:

1. For CLTP all nine stages of LP blades, including the airfoil and the roots, were manufactured from 12 Cr materials. 12 Cr materials are resistant to corrosion in this application, including the blade surfaces.

2. Included in the PPL contract with Siemens for both CLTP and CPPU steam conditions was the requirement that the design for both the rotating and the stationary parts account for SCC. Hence, the Siemens design includes features to account for SCC. These design features are discussed in the answer to questions 1 and 2a.

3. Since there is no change in LP blade or rotor mass, there is no change in LP blade or rotor natural frequency. Both the new and the existing Siemens turbine designs exclude natural frequencies that are coincident with operating resonance frequencies.

NRC Question 2d:

Discuss whether a vibration analysis has been performed, and provide details of the analysis to demonstrate that the power uprate will not cause excessive vibration on the low- and high-pressure turbines and the generator.

PPL Response:

Both lateral and torsional vibration analysis were performed by Siemens at CPPU conditions. For the LP turbine, there is no mass change and therefore no change in natural frequencies. For the HP turbine, there is a minor mass reduction due to the 11 stage versus a 12 stage design. Both the CLTP and CPPU lateral and the torsional analyses identified natural frequencies within the operating range, but outside of the operating speed. Operating restrictions were furnished by Siemens that will be implemented by PPL to assure operation at speeds other than at speeds within the natural frequency ranges.

NRC Question 3:

On page 7-2 of the SSES 1 and 2 PUSAR, the licensee states, "...the missile analysis for the turbine replacement is supported by the Siemens Technical Report CT-27332, Revision 2 which was approved by the Nuclear Regulatory Commission (NRC) (Reference 28)." Reference 28 is listed on page 11-2 of the PUSAR as TP-04124-NP-A, dated June 7, 2000. The licensee states that Reference 28 refers to a prior NRC safety evaluation (Reference 54); however, Reference 54 was issued after the above referenced date. Clarify the statement on page 7-2 in terms of these two references.

PPL Response:

The PUSAR reference 28 date is wrong and needs to be corrected. The correct date for TP-04124-NP-A is June 7, 2004 (ADAMS: ML 042100095). Hence, reference 28 is dated later than the March 30, 2004 date for reference 54.

NRC Question 4:

On page 7-3 of the SSES 1 and 2 PUSAR, the licensee stated that the results of revised turbine missile analysis showed that the turbine missile probability remains below the NRC-specified limit of 1E-05 per year.

NRC Question 4a:

Provide the exact missile probability value (i.e., the P1 value) after CPPU.

PPL Response:

The P1 probability for CPPU for SSES 1 and 2 is 3.00 x 10e-6 per year per unit.

NRC Question 4b:

Discuss whether under CPPU, the high- and low-pressure turbine rotors in SSES 1 and 2 will satisfy the guidance in Standard Review Plan Section 10.2.3, "Turbine Rotor Integrity."

PPL Response:

The Unit 1 and Unit 2 HP and LP turbine rotors will satisfy SRP 10.2.3 Rev. 1 "Turbine Rotor Integrity." The SRP contains requirements for materials selection, fracture toughness, preservice inspection, turbine disk design and inservice inspection. Each SRP topic is addressed as follows:

- Materials Selection - Materials used for both the HP and LP rotors is based upon both a Finite Element analysis and successful operating experience with the rotor materials. The CPPU HP rotors and the CLTP HP rotors use the same material.

- Fracture Toughness - This is determined using Siemens specifications. For both the HP monoblock rotors and the LP shrunk-on disk rotors, PPL reviewed all disk and rotor properties and confirmed that they were within Siemens specification limits.

- Preservice Inspection - The Siemens Quality Steam Turbine (QST) plan details all of the preservice inspection requirements. PPL reviewed and approved the Siemens QST. Contained in the CLTP QST are the actual material properties for all rotors and LP disks. Overspeed testing of the two CLTP HP rotors and all six CLTP LP rotors was performed at 125% of running speed. The 125% represents testing 5% above the 120% speed used in the turbine missile analysis as the highest expected speed. PPL witnessed overspeed testing of all six CLTP LP rotors. The CPPU QST plan contains the 125% overspeed test requirement for the HP rotors.

- Turbine Disk Design - The design complies with Siemens design procedures. For both the CLTP HP monoblock rotors and the CPPU HP monoblock rotor design does not have separate disks.

- Inservice Inspection - The requirements for CPPU will be the same as those for CLTP. Hence, the CLTP inservice inspection requirements currently described in SSES FSAR section 10.2.3.6.a will not change for CPPU.