DRAFT REQUEST FOR ADDITIONAL INFORMATION

REGARDING PROPOSED LICENSE AMENDMENTS

CHANGE TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENTS

TO INCREASE DIESEL GENERATOR MINIMUM STEADY STATE FREQUENCY

SUSQUEHANNA STEAM ELECTRIC STATION, UNITS 1 AND 2

DOCKET NOS. 50-387 AND 50-388

By letter to the Nuclear Regulatory Commission (NRC) dated September 18, 2012,[1] as supplemented by letter dated, May 10, 2013,[2] PPL Susquehanna, LLC (PPL, the licensee) submitted a license amendment request (LAR) for Susquehanna Steam Electric Station (SSES), Units 1 and 2. The proposed amendments would change Surveillance Requirement (SR) 3.8.1.19 in Technical Specification (TS) 3.8.1, "AC Sources-Operating." Specifically, the proposed amendments would increase the minimum steady state frequency for Diesel Generator (DG) E during the loss of offsite power and Emergency Core Cooling System surveillance.

The NRC staff has reviewed the information that the licensee provided in support of its proposed license amendments. In order for the staff to complete its review, the licensee is requested to address the following requests for additional information.

Background:

TS operability considerations require that SSCs meet all surveillance requirements. In order to be considered operable, structures, systems and components (SSCs) must be capable of performing the safety functions specified by their design, within the required range of design physical conditions, initiation times, and mission times. The staff considers that specific parameters such as proper DG frequency in all SRs demonstrate the capability of the DGs to satisfy the specified safety function as credited in the design basis accident conditions for the limiting case delineated in the Final Safety Analyses Report (FSAR).

The "Proposed Change" section of the LAR states "SR 3.8.1.19 is being revised to verify that on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ECCS initiation signal, Emergency Diesel Generators A-E auto-start from a standby condition. Diesel Generators A-D is to achieve a steady state frequency of ≥58.8 Hz and ≤ 61.2 Hz. Diesel Generator E is to achieve a steady state frequency of ≥ 59.3 Hz and :≤ 61.2 Hz."

The "Background" section of the LAR states "The purpose of the Emergency Diesel Generators, per FSAR Section 8.1.1, is to supply a highly reliable, self-contained source of power in the event of a complete loss of off-site power. The Diesel Generators are designed to provide sufficient power for the electrical loads required for a simultaneous shutdown of both reactors. This includes the loads required to mitigate the effects of a design basis loss-of-coolant accident

[11] Agencywide Documents Access and Management System (ADAMS) Accession No. ML12262A321.
[2] ADAMS Accession No. ML13130A127

[LOCA] on one unit with a complete loss of off-site power plus a single failure in the on-site power system, concurrent with a safe shutdown on the other unit." The section concludes "SSES has verified in a calculation that the minimum and maximum steady state frequency values will not impact the operability of the loads powered by the Diesel Generators."

RAIs:

RAI 5: The SSES response to NRC question 1 stated that the steady state frequency requirements in SRs 3.8.1.7, 3.8.1.11, 3.8.1.12, 3.8.1.15 and 3.8.1.20 are not applicable to demonstrate that the DG's will perform their safety function described in SR 3.8.1.19. Specifically the response states that SR 3.8.1.7 is a monthly operability surveillance performed with the DG in test mode to ensure its capability of starting from standby conditions and achieves *proper voltage and frequency* (emphasis added) within the allowable timeframe. The staff agrees that the intent of this SR is to verify that the DG starts and achieves *the proper voltage and frequency* (speed) within the allowable time and can operate at steady state conditions within the allowable band. The staff considers the satisfactory completion of this SR validates the capability of the DG to perform its required functions as specified in the current licensing basis and briefly discussed in the "Background" section of the LAR. The LAR proposes a steady state operating range for frequency to be ≥ 59.3 Hz and ≤61.2 Hz to satisfy accident mitigation capabilities. Explain how the DG is considered operable for mitigating the consequences of worst case accident if the acceptance criterion for SR 3.8.1.7 allows a minimum frequency below the evaluated value. The staff notes that this SR does not require the DG to be connected to the offsite source to demonstrate the *proper* voltage and frequency requirements.

RAI 6: The SSES response to NRC question 1 states "SR 3.8.1.11 is a bi-annual surveillance, which demonstrates the as designed operation of the standby power sources during loss of offsite power (LOOP). This test verifies all actions encountered from the LOOP, including the shedding of nonessential loads and energization of the ESS buses and respective 4.16 kV loads from the DG. The DG auto-starts in the emergency (isochronous) mode with its output frequency fixed by the electronic governor to a preset value of 60 Hz." The staff notes the following:

- The LAR states that a properly tuned and adjusted governor is capable of maintaining a steady state frequency above 59.3Hz.
- Calculation EC-024-1014, attached to the letter dated May 10, 2013, states that the actual DG speed could be 0.5 percent less than the indicated reading.
- TS SRs 3.8.1.7, 3.8.1.9, 3.8.1.11, 3.8.1.12, 3.8.1.15 and 3.8.1.20 demonstrate the capability of the DGs to start from a standby condition and maintain a steady state frequency in the range ≥58.8Hz and ≥ 61.2Hz

Based on the staff observations noted above, provide justification as to how the electronic governor will maintain the DG frequency at an absolute value of 60Hz during a design basis LOOP event requiring DG operation with emergency safety features (ESF) loads automatically actuated for safe shutdown of both Susquehanna units. Explain the differences between performance capabilities of the DG and ESF loads during this event and the LOOP/LOCA event performance verified by SR 3.8.1.19.

RAI 8: The response to NRC Question 2 states "Attachment 1 also shows that a 2% variation in power supply frequency combined with errors in pressure and flow instrumentation result in total ECCS pump flow uncertainties between 5.2 percent and 7.4 percent for the various LOCA scenarios; however, this is acceptable due to the inherent conservatism of the Appendix K LOCA analysis in terms of calculating peak cladding temperatures." Provide an overview of the margin available in Appendix K analysis and any other evaluations that also credit the same margin.

RAI 9: The response to NRC Question 2 states "'The need to account for the impacts of uncertainties in ECCS flowrates, which are induced by a 2% reduction in diesel speed, in the SSES LOCA analysis is addressed in an engineering position paper which has been prepared by the Nuclear Fuels Group. It has been concluded that NRC regulations do not explicitly require an analytical allowance for diesel generator frequency uncertainties in Appendix "K" methods. In addition, these methodologies, which are used for the SSES LOCA analysis, are conservative and consistent with the NRC's current expectations. Hence, the inclusion of such allowance is not needed to assure the health and safety of the public.'" Provide references of the NRC regulations that imply that variations in DG frequency need not be considered for Appendix K analyses.

RAI 10: The SSES response to NRC Question 3 indicates that reduction of DG frequency will decrease the motor operated valve (MOV) synchronous speed by 2 percent. The response indicates that the in service testing (IST) observations indicate there is some margin between the valve performance and the required stroke times considered in the FSAR and TSs. The staff notes that the IST is usually performed at nominal voltage and frequency and is not a clear indication of valve performance at reduced voltage and low frequency. Provide a summary of the detailed evaluation performed to evaluate the stroke time of the critical valves associated with the emergency core cooling systems when the DGs A-E are operating at the <u>minimum allowable voltage and frequency</u>. Explain how the valve stroke time is not affected given that the maximum speed of the motor operator is reduced by at least 2 percent and the starting torque may be reduced by 5-10 percent.

RAI 11: The SSES response to NRC Question 4 states "'…a 2 percent increase in frequency results in approximately a 6 percent increase in the horsepower load on the motors.'" Provide a summary of the total load (real and reactive) on DGs A-E when they are operating at the upper end of the allowable frequency and lower end of allowable voltage as validated by SRs in TS section 3.8.1.