Mr. Robert G. Byram Senior Vice President-Generation and Chief Nuclear Officer Pennsylvania Power and Light Company 2 North Ninth Street Allentown, PA 18101

SUBJECT: OFFGAS SYSTEM MODIFICATIONS, SUSQUEHANNA STEAM ELECTRIC STATION (SSES), UNITS 1 AND 2 (TAC NOS. MA1014 AND MA1015)

Dear Mr. Byram:

By letter dated February 9, 1998, Pennsylvania Power and Light Company (PP&L) submitted calculations to justify that the SSES Units' offgas systems are detonation-resistant. Based on the submittal, PP&L intends to remove the current automatic isolation of offgas and to change the technical specifications accordingly. Enclosed is our request for additional information (RAI) concerning the subject submittal.

If you have any questions, please contact me on (301) 415-1484.

Sincerely, /S/

Victor Nerses, Senior Project Manager Project Directorate I-2 Division of Reactor Projects - I/II Office of Nuclear Reactor Regulation

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Docket Nos. 50-387/50-388

Enclosure: RAI

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By letter dated February 9, 1998, Pennsylvania Power and Light Company (PP&L, the licensee) provided calculations to justify that the SSES Units' offgas systems are detonation-resistant. The licensee intends to remove the current automatic isolation of offgas upon detection of high hydrogen. In reviewing Calculation No. EC-072-1007, Revision 1, "Evaluation of Susquehanna Offgas System Pressure Integrity for Hydrogen Detonation," the staff requests the following additional information:

 The method of calculation in EC-072-1007 was based on GE report, NEDE-11146 with some modifications in determination of detonation peak pressure. In NEDE-11146, the detonation peak pressure is a function of the length to diameter ratio (L/D). For L/D <7, the peak pressures are 17 times the initial pressure. For L/D >7, the peak pressures are 170 times the initial pressure.

EC-072-1007 uses <u>80</u> times the initial pressure as the peak pressure for an 8-inch diameter piping with L/D>7 in the SSES offgas system. This factor of 80 is not supported by NEDE-11146 method.

The licensee indicated that the factor of 170 was developed based on the measurements in small diameter piping of 5 inches or less and that for piping diameters of 8-inches and larger, both theory and measurements support a factor of two conservatism in the small bore piping data. The licensee further referred to the actual measurement of a long 24-inch diameter piping to support its argument.

The staff has reviewed the licensee's justifications and has the following questions:

- (a) Explain why the measurement data from 24-inch diameter piping are more applicable than the data from 5-inch for the application of 8-inch piping.
- (b)' Furthermore, the peak pressure is a function of (L/D), not just a function of piping diameter (D). Explain why the licensee adjusted the factor from 170 to 80 based on the piping diameter alone?
- (c) The licensee is required to provide applicable supporting documents in the measurements and theory regarding the factor of two conservatism for the staff to review their applicability. Otherwise, the licensee should use the method in NEDE-11146 without modifications.
- 2. The initial pressures (P_a), used in Table 1, "Summary of Susquehanna Piping Analysis," appears to be the pressures corresponding to the normal plant operation. In Final Safety Analysis Report Table 11.3-8, it shows that the pressures corresponding to startup mode are higher. Explain why the analysis used the lower pressures.

- 3. Section 2.0 of Calculation EC-072-1009 indicates that ANSI/ANS 55.4-1979 Appendix C provides an acceptable method for analyzing a hydrogen detonation in the offgas system. The summary discussion in Calculation EC-072-1007 further implies that the criteria were accepted in Regulatory Guide 1.143. However, the discussion in Regulatory Guide 1.143 indicates that the standard would be endorsed separately. Please provide the following information.
 - a. A specific reference that indicates the procedure specified in Appendix C of ANSI/ANS 55.4-1979 has been previously reviewed and approved by the staff.
 - b. Table 1 of Regulatory Guide 1.143 lists the applicable equipment design codes. Describe how the criteria for determining wall thickness specified in Equation 2 of Appendix C of ANSI/ANS 55.4-1979 meet the design code requirements specified in Regulatory Guide 1.143.
- 4. Section 2.0 of Calculation EC-072-1009 indicates that the design guidance documents do not require design for a hydrogen detonation simultaneous with a seismic event. However, ANSI/ANS 55.4-1979 Appendix C contains the following statement: "The method assumes the absence of simultaneous secondary events such as earthquakes." The statement does not indicate that additional load combinations are not required. Describe the design load combinations for mechanical equipment and piping that are applicable to the design of the offgas system. Reference the Susquehanna FSAR section that contains the load combination criteria.
- 5. Calculation EC-072-1007 provides a summary of the evaluation of the offgas piping and equipment using the criteria in ANSI/ANS 55.4-1979 Appendix C. The summary indicates that the analysis demonstrates that material yield stresses would not be exceeded following a detonation within the Susquehanna offgas system. Provide the following information.
 - a. Table 1 of Calculation EC-072-1007 lists the yield stress values used in the evaluation. Provide the technical justification that the reported yield stress values are applicable to the piping at Susquehanna.
 - b. Table 1 of Calculation EC-072-1007 lists the strain hardening exponents used in the evaluation. Provide the technical justification that the reported strain hardening exponents are applicable to the piping at Susquehanna.
 - c. The procedure specified in ANSI/ANS 55.4-1979 Appendix C only applies to the hoop stress due to pressure. Discuss the potential for additional dynamic loads resulting from the transient pressure wave propagation through the system as a result of the detonation. Describe the component and component support criteria that are applicable to this scenario.
- 6. Following a postulated explosion of the offgas system, discuss the following concerns:
 - a. the equipment (such as hydrogen analyzers, radiation monitors...etc.) survivability,
 - b. monitoring and controlling of the release of radioactivity, and

c. operator actions.