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SUBJECT: Provides supplemental response to ref RAI,dtd 940601,re basis for util use of RHR sys in FPC mode.

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U.S. Nuclear Regulatory Commission
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SUSQUEHANNA STEAM ELECTRIC STATION
LOSS OF SPENT FUEL POOL COOLING FROM
SEISMIC EVENT
USE OF RHR FUEL POOL COOLING MODE
PLA-4230 FILE R41-2

Docket Nos. 50-387/NPF-14
and 50-388/NPF-22

References: 1. *PLA-4145, R.G. Byram to C.L. Miller, "Response for Additional Information Concerning Loss of Spent Fuel Pool Cooling Initiated by the Design Basis Seismic Event," dated June 1, 1994.*
2. *Letter from Joseph W. Shea to R.G. Byram, "Susquehanna Steam Electric Station, Units 1 and 2, Draft Safety Evaluation Regarding Spent Fuel Pool Cooling Issues", dated November 3, 1994.*

Dear Sir:

The purpose of this letter is to provide a supplement to reference #1 and describe the basis for PP&L's use of the Residual Heat Removal (RHR) System in the fuel pool cooling mode to mitigate the effect of a seismic event. This letter also addresses the staff's request contained on page 35 of Reference #2 to provide a formal commitment to "fully qualify the spent fuel pool cooling assist mode of RHR such that this system may be credited in the licensing basis to prevent spent fuel pool boiling".

The current SSES FSAR does not take credit for use of the RHR Fuel Pool Cooling (RHRFPC) mode during a loss of normal fuel pool cooling following a seismic event (FSAR Appendix 9A). PP&L is proposing to change the FSAR to take credit for restoration of cooling via the RHRFPC mode. The analysis of the radiological impact of a boiling spent fuel pool (SFP) will be retained in Appendix 9A of the FSAR since it is required by regulations for a Non-Seismic Category I Fuel Pool Cooling system and bounds the radiological impact of a loss of fuel pool cooling. Note that the Appendix 9A analysis does not rely on operation of the Standby Gas Treatment system to meet offsite radiological requirements.

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For the proposed FSAR change, the RHRFPC mode will have the following missions:

a) The RHRFPC mode is designed and operated to provide cooling such that each fuel pool will be maintained at or below 125°F when the Emergency Heat Load (EHL) is resident in an isolated fuel pool. The EHL can be removed with a RHRSW inlet temperature of 91°F (Technical Specification maximum temperature is 88°F) with only one RHR pump and heat exchanger. Spent fuel pool temperature would be maintained at a temperature of less than or equal to 125°F. This function is currently described in FSAR sections 9.1.3.1.b, 9.1.3.2 and will not be discussed further herein as it will not change.

b) The RHRFPC mode will be designed and operated to prevent fuel pool boiling which could result from a seismic event that is assumed to cause the extended loss of both units' normal fuel pool cooling systems. This mission is not identified in the existing FSAR. It should be noted that, while not discussed in the FSAR, SSES procedures contain instructions to utilize the RHRFPC mode to cool the pools upon loss of the fuel pool cooling.

PP&L's review of the RHRFPC mode design indicates that it is capable of meeting applicable criteria of GDC 61, R.G. 1.13, 1.26, and 1.29 regarding backup fuel pool cooling systems used to mitigate the consequences of a seismic event postulated to cause the extended loss of the normal fuel pool cooling system. All piping and components of the RHRFPC are Seismic Category I, Quality Group B or C constructed to ASME Section III standards. The RHR system is Class 1E powered and both loops have separate power supplies. Thus the system will be functional following the seismic event.

The SSES RHRFPC system is hardpiped and requires operation of 6 manual valves accessible following a seismic event to establish the flowpath.[1] In addition, other manual valves must be operated in order to assure proper operation of the RHRFPC mode. Proper operation of all active components in the RHRFPC mode is confirmed on a periodic basis. These include ESW valves, RHR vent valves, and normal fuel pool cooling return isolation valves. The ESW valves are required to fill the SFP (and RHR in the event the normal makeup systems are unavailable), and there are 3 valves per fill connection. The ESW valves will be stroke tested as part of the IST program. The vent valves are used to ensure proper venting of the RHR system for use in the RHRFPC mode.

[1] Three valves are required to be opened on the discharge side. The suction side requires two valves to be opened and one to be closed.

Interconnecting piping and valving between the fuel pool and the RHR FPC mode is under evaluation. We have determined that closure of the normal fuel pool cooling return isolation valves (2 per unit) is necessary to ensure that the SFP can be filled to the proper level in the event the normal fuel pool cooling system is breached following a seismic event. These valves are located within a seismic Category I portion of normal SFP cooling piping, however, the valves were not seismically qualified. PP&L has determined that the seismic accelerations on the valves are sufficiently low that proper operation can be expected. We have determined that certain interconnecting piping and valving to the Skimmer surge tank requires seismic analysis and potentially a modification. An evaluation is being performed to formalize this determination and will be completed prior to issuance of PP&L's FSAR change on this issue.

The RHR pump suction path for the Fuel Pool Cooling Mode is shared with the Shutdown Cooling Mode of RHR. Consequently, Shutdown Cooling and Fuel Pool Cooling cannot be performed concurrently on a given unit. However, Alternate Shutdown Cooling and Fuel Pool Cooling can be performed concurrently since different suction sources are used. Alternate Shutdown Cooling involves filling the reactor to the main steam lines such that water is discharged to the suppression pool via the main steam relief valves, and then using the RHR Suppression Pool cooling mode in conjunction with Core Spray to cool the water and return it to the Reactor Vessel.[2]

The RHRFPC system can be placed in operation within at most 12 hours (10 hours to fill and 2 hours to place in operation) after the pool filling operation is initiated to raise pool level to that required for system operation.[3] The minimum time available to place the system into operation is the minimum time to boil of 25 hours in the event the normal systems are lost for an extended time due to a seismic event. Since the time available is much greater than the time it will take to place RHRFPC into service, spent fuel pool boiling will not occur.[4]

The spent fuel pools are normally maintained in a crosstied configuration during dual unit operation and refueling outages. The crosstied configuration allows use of either unit's systems (normal SFP Cooling or RHRFPC) to cool the pools, thus providing fuel pool cooling redundancy. Crosstied spent fuel pools also provide redundancy for the level instrumentation. This instrumentation is designed to operate following an Operating Basis Earthquake and under boiling spent fuel pool conditions. While not classified as 1E equipment, the instruments receive power from independent 1E power supplies that are Diesel Generator backed.

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[2] Alternate Shutdown Cooling can also use a combination of the Suppression Pool Cooling and LPCI modes of RHR to cool the water and return it to the RPV. This would also permit RPV and SFP cooling to be performed concurrently.

[3] This assumes that only one loop of ESW (2 of 4 fill connections) to the crosstied Spent Fuel Pools is used for filling.

[4] Generally, the time to boil is much greater than the minimum 25 hours. The 25 hour time to boil minimum would only be approached shortly after a unit is shut down for refueling. After completion of a refueling outage, when both units are at power, the time to boil is typically on the order of 50 hours.

Should a seismic event occur during dual unit power operation with crosstied pools and single failure of an RHR loop occurs in one of the units, spent fuel pool boiling will be prevented[5]. Only one loop of RHR is necessary to provide long term decay heat removal per reactor vessel. Similarly, only one loop of RHR is necessary to provide long term decay heat removal to crosstied spent fuel pools. Since either unit's RHR system can provide cooling to both units spent fuel pools with the pools crosstied, the failure of one loop of RHR in one of the units still allows a sufficient number of loops to cool both reactors and the spent fuel pools. In this case, the unit providing spent fuel pool cooling would utilize alternate shutdown cooling for long-term decay heat removal from the reactor. The other unit would utilize normal Shutdown Cooling.

During specific plant evolutions, such as transfer of fuel into fuel casks, it is expected the pools will not be crosstied. This configuration is the original plant design. These evolutions will be procedurally controlled to ensure sufficient cooling systems are available and limited in duration. These evolutions are expected to occur during dual unit operation when the time to boil is presently on the order of 50 hours in the pool with the highest heat load. [6] Thus, adequate time would exist to place the RHRFPC mode into operation, restore normal SFP cooling, or remove the cask pit gates should the normal fuel pool cooling system be lost for an extended period of time.

If a seismic event resulting in a loss of normal fuel pool cooling occurs during the short time periods when the pools are not crosstied (i.e., an isolated pool configuration), then shutdown of the units will require each unit to use alternate shutdown cooling mode in conjunction with RHRFPC. PP&L's ongoing review of RHR indicates that the failure of an RHRSW pump is the only failure likely to prevent use of the RHRFPC mode in one of the units prior to SFP boiling. Should this occur, it would be possible to take actions, such as, alternating cooling on each SFP by utilizing the RHRSW crosstie to ensure boiling of both SFP's is prevented. PP&L will ensure that the appropriate procedures and analysis are in place prior to isolating the SFPs.

It should be noted that the proposed revision to the SSES FSAR for the RHRFPC mode discussed herein is undergoing internal review. While incorporation of this mode of operation into the licensing basis for a seismic event will occur, it is possible that the exact description provided above may change.

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5 A single failure is assumed in order to demonstrate the reliability of RHRFPC.

6 The time to boil in the other pool would typically be on the order of 90-100 hours..

Commitment:

PP&L will finalize our review of RHRFPC mode and provide a FSAR change by February 15, 1995. Completion of the evaluation of the acceptability of the normal SFP cooling interconnecting piping and valving will be completed to support this change. Procedures/analysis to support operation with the cask pit gates in will be performed to support these activities when they occur in the future. A copy of the FSAR change will be forwarded to the NRC for your review/records.

Should you have any questions on this letter, please contact Mr. James M. Kenny at (610) 774-7904.

Very truly yours,

R. G. Byram

cc: NRC Region I
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