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SUBJECT: Forwards 90-day response to GL 97-04, "Assurance of Sufficient Net Positive Suction Head for ECC & Containment Heat Removal Pumps."

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**SUSQUEHANNA STEAM ELECTRIC STATION**
**GENERIC LETTER 97-04 90-DAY RESPONSE** **Docket Nos. 50-387**
**PLA-4823 FILE R41-2** **and 50-388**

*Reference: Generic Letter 97-04, "Assurance of Sufficient Net Positive Suction Head For Emergency Core Cooling and Containment Heat Removal Pumps," dated October 7, 1997.*

On October 7, 1997, the Nuclear Regulatory Commission issued the referenced generic letter regarding an issue which may have generic implications for Emergency Core Cooling System and containment heat removal system pumps. The generic letter required, within 90 days, that licensees provide the information outlined below for each of their facilities:

1. Specify the general methodology used to calculate the head loss associated with the ECCS suction strainers. The same methodology identified in this response will be utilized with the enhanced ECCS suction strainers.
2. Identify the required NPSH and the available NPSH.
3. Specify whether the current design-basis NPSH analysis differs from the most recent analysis reviewed and approved by the NRC for which a safety evaluation was issued.
4. Specify whether containment overpressure (i.e., containment pressure above the vapor pressure of the sump or suppression pool fluid) was credited in the calculation of available NPSH. Specify the amount of overpressure needed and the minimum overpressure available.
5. When containment overpressure is credited in the calculation of available NPSH, confirm that an appropriate containment pressure analysis was done to establish the minimum containment pressure.

By this letter, PP&L, Inc. is providing the required 90-day response.

A076 1

Sincerely,

R. G. Byram

Attachment

copy: NRC Region I
Mr. K. Jenison, NRC Sr. Resident Inspector
Mr. V. Nerses, Project Manager

# *AFFIDAVIT*

COMMONWEALTH OF PENNSYLVANIA )
: SS
COUNTY OF LEHIGH )

I, ROBERT G. BYRAM, being duly sworn according to law, state that I am Senior Vice President - Generation and Chief Nuclear Officer of PP&L, Inc. and that the facts set forth on the attached response to Generic Letter 97-04 (90 day response) are true and correct to the best of my knowledge, information and belief.

Robert G. Byram
Senior Vice President
Generation and Chief Nuclear Officer

Sworn to and subscribed
before me this 5th day
of January , 1998.

Janice M. Reese
Notary Public

NOTARIAL SEAL
JANICE M. REESE, Notary Public
City of Allentown, Lehigh County, PA
My Commission Expires June 11, 2001

## RESPONSE TO GENERIC LETTER 97-04

Upon issuance of Generic Letter 97-04 "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pump" the BWR Owners Group (BWROG) initiated activities to assist BWR licensees in responding to the Generic Letter. The development of a response format was one of the activities performed. PP&L's response to the Generic Letter utilizes the BWROG format.

1. Specify the general methodology used to calculate the head loss associated with the ECCS Suction strainers.

The following is PP&L's response to each element of the NPSH equation.

NPSH equation:

$NPSH_A = h_a + h_{st} - h_{vpa} - h_{fs}$
where:

$h_{st}$ = static height (in feet) that the liquid supply level is above or below the pump datum.

Response:

The fluid elevation used is the calculated minimum fluid level post-LOCA. This level is lower than the Technical Specification minimum level. This minimum level is based upon Suppression Pool draw down to account for the volume of water on the drywell floor up to the elevation of the downcomers. The minimum level used is 2.7' below the minimum Technical Specification level. The pump reference datum is the centerline inlet of the pump.

$h_{fs}$ = suction line losses (in feet) including entrance losses and frictional losses.

Response:

The strainer head loss was determined by calculation at maximum system flows assuming that one of the two strainers is 100% plugged and the other strainer is clean (this is more conservative than assuming each strainer is 50% plugged). Vendor supplied strainer data was used in this calculation. The friction factors used in line loss calculations are for clean pipe. Additionally, entrance, fitting and line losses are derived from the Crane Technical Paper No. 410.

$h_a$ = atmospheric pressure (in feet) at the elevation of the minimum required Suppression pool level.

Response:

Post-accident containment pressurization is not credited in the NPSH analysis. However, PP&L calculates NPSH utilizing containment atmospheric pressure. Therefore, NPSH requirements for the ECCS pumps are based upon a containment pressure of 0 psig.

$h_{vpa}$ = vapor pressure (in feet) of the liquid at the temperature being pumped

Response:

The temperature used in the determination of liquid NPSH vapor pressure is taken from the GE Process Diagrams. These Diagrams are part of the Licensing basis of the plant located in the FSAR. The bulk pool temperature is utilized in calculating the values found in the Diagrams.

2. Identify the required NPSH (ft) and the available NPSH (ft).

Response

The required NPSH is specific to each pump type and is dependent upon the flow rate at the time the NPSH is being evaluated. The available NPSH ($NPSH_A$) is dependent upon the number of pumps operating, piping configuration and the Suppression Pool temperature at the most limiting condition. The required NPSH ($NPSH_R$) values shown are taken from the appropriate GE Process Diagram and/or the vendor supplied pump curves.

$NPSH_A$ and $NPSH_R$ information is provided below for all accident modes given in the GE Process Diagram. The limiting case is shown in bold lettering.

**Core Spray System NPSH Data**

| Accident Mode | $NPSH_A$ (ft) | $NPSH_R$ (ft) |
|---|---|---|
| D<br>Accident Injection Rated | 25.07 | 2 |
| E<br>**Accident Injection Rated - Long Term** | **11.57** | **11** |
| F<br>Accident Injection Rated - Core Flood | 23.56 | 2.5 |
| G<br>Accident Injection Runout | 19.15 | 16 |

**High Pressure Coolant Injection System NPSH Data**

| Accident Mode | $NPSH_A$ (ft) | $NPSH_R$ (ft) |
|---|---|---|
| **C**<br>**Reactor High Pressure**<br>**Suppression Pool Low Pressure** | **31.4** | **21** |

**Residual Heat Removal System NPSH Data**

| Accident Mode | $NPSH_A$ (ft) | $NPSH_R$ (ft) |
|---|---|---|
| A<br>Recirc Line Break<br>One Pump Operation | 37.11 | 6 |
| B<br>Recirc Line Break<br>Two Pump Operation | 38.88 | 3 |
| $C_1$<br>Post Accident Containment Spray One Pump Operation Normal Suppression Pool Temperature | 33.69 | 2 |
| $C_2$<br>**Post Accident Containment Spray One Pump Operation Peak Suppression Pool Temperature** | **16.74** | **7** |
| G<br>Recirc Line Break<br>One Pump Operation<br>Runout | 36.19 | 9 |

3. Specify whether the current design basis NPSH analysis differs from the most recent analysis reviewed and approved by the NRC for which a safety evaluation was issued.

   Response

   The most recent NPSH design basis calculations reviewed by the NRC are documented in NUREG 0776 and NUREG 0776 Supplement 1. These calculations are equivalent to the current NPSH design basis analysis. The safety evaluation report associated with PP&L power uprate titled Safety Evaluation by the Office of Nuclear Reactor Regulation Regarding "Licensing Topical Report NE-092-001, Revision 0, Power Uprate with Increased Core Flow" documents the review of the impact of increased Suppression Pool temperature on ECCS pump NPSH. The increased of Suppression Pool temperature due to power uprate (200 degrees F to 203 degrees F) on NPSH was determined to be negligible.

4a. Specify whether containment overpressure (i.e., containment pressure above the vapor pressure of the sump or suppression pool fluid) was credited in the calculation of available NPSH.

Response

Post-accident containment pressurization is not credited in the NPSH analysis. However, PP&L calculates NPSH utilizing containment atmospheric pressure. Therefore, NPSH requirements for the ECCS pumps are based upon a containment pressure of 0 psig.

4b. Specify the amount of overpressure needed and the minimum overpressure available.

Response

Not applicable, since the NPSH requirements did not credit containment pressure above atmospheric.

5. When containment overpressure is credited in the calculation of available NPSH, confirm that an appropriate containment pressure analysis was done to establish the minimum containment pressure.

Response

Not applicable, since the NPSH requirements did not credit containment pressure above atmospheric.