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U. S. Nuclear Regulatory Commission
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SUQUEHANNA STEAM ELECTRIC STATION
SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING GENERIC LETTER 96-06 DATED JULY 26, 2001
PLA-5613

Docket Nos. 50-387 and 50-388

References: 1) *PLA-5093, R. G. Byram (PPL) to USNRC, "Generic Letter 96-06 Risk Assessment," dated August 3, 1999.*

2) *USNRC to R. G. Byram (PPL), "Request for Additional Information Regarding Supplemental Response to Generic Letter 96-06 (TAC Nos. M96875 and M96876)," dated July 26, 2001.*

3) *PLA-5352, R. G. Byram (PPL) to USNRC, "Response to Request for Additional Information Regarding Supplemental Response to Generic Letter 96-06 dated July 26, 2001," dated September 5, 2001.*

4) *PLA-5400, R. G. Byram (PPL) to USNRC, "Response to Request for Additional Information Regarding Supplemental Response to Generic Letter 96-06 dated July 26, 2001," dated December 3, 2001.*

On July 26, 2001, the NRC staff transmitted a request for additional information regarding the PPL Susquehanna, LLC (PPL) risk assessment generated in response to Generic Letter 96-06, "*Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions.*" PPL's response was provided in References 3 and 4.

Reference 4 provided an evaluation of the eleven containment piping penetrations (per unit) identified as being susceptible to thermally induced overpressurization. Two penetrations were quantitatively analyzed and nine were qualitatively analyzed.

In a teleconference held on February 10, 2003, NRC requested that PPL perform a quantitative analysis on the nine penetrations that PPL had qualitatively analyzed.

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The requested quantitative analysis has been completed. The attachment to this letter documents the results of the analysis. The analysis shows that overpressurization will not result in pressure boundary failure of the piping or valves in these penetrations. The results are provided in the form of an updated response to Question 8 of Reference 2. The revised portions are identified by revision bar in the right hand margin.

If you have any questions, please contact Mr. Michael H. Crowthers at (610) 774-7766.

Sincerely,

B. L. Shriver

Attachment 1 - Revised Response to NRC Question 8

copy: NRC Region I
Mr. R. V. Guzman, NRC Project Manager
Mr. S. Hansell, NRC Sr. Resident Inspector
Mr. R. Janati, DEP/BRP

Attachment 1 to PLA-5613

Revised Response to NRC Question 8

NRC Question 8:

Provide the results of piping and valve analysis based on the criteria contained in the American Society of Mechanical Engineers Code, Section III, Appendix F. For each component, provide a summary of the maximum faulted pressure, design load combination, calculated stress for design load combination including faulted pressure, and allowable stress based on the criteria contained in Appendix F. Also, you should include a reference to the specific provisions of Appendix F used as a basis in calculating the allowable stress (e.g., F-1331, F-1430, F-1420).

PPL Response:

The eleven containment piping penetrations (per unit) identified as being susceptible to thermally induced overpressurization have been evaluated for their pressure retention capability. The process piping located between the containment isolation valves associated with each penetration was evaluated using the criteria provided in the ASME Boiler & Pressure Vessel Code, Section III, Appendix F. Paragraph F-1430 has been used as a basis for calculating the allowable stresses. The results of the evaluation are provided here.

F-1430(a) states that the internal pressure shall not exceed 200% of the Design Pressure calculated in accordance with Eq.(2) of NB-3641.1. An allowable pressure for each piping penetration was determined using Eq.(2). The pressure limit is based on nominal wall thickness with a corrosion allowance. Table 1 below provides the allowable pressure for each penetration along with maximum post-LOCA temperatures and pressures.

The results demonstrate that the predicted maximum pressures for all of the lines are within the allowable pressure limits.

F-1430(b) states that Eq.(9) of NB-3652 shall be satisfied using a stress limit of the lesser of $3.0S_m$ or $2S_Y$. The hoop stress portion of Eq. (9) was determined using the maximum post-LOCA pressure associated with each line. The maximum Faulted stress for each line was extracted from the existing piping calculations and used for the mechanical stress portion of Eq.(9). These existing stresses are based on design basis Faulted load combinations that include pressure, deadweight, seismic and hydrodynamic loadings. Table 2 provides a tabulation of the Eq.(9) stresses and the allowables used.

The results demonstrate that all of the piping stresses are within allowable Appendix F limits.

Initially, a qualitative assessment of each penetration was performed in order to assess the susceptibility of the subject valves to an overpressurization failure. Based on a review of the isolation valves associated with the eleven penetrations, nine contain inboard and outboard isolation valves of a different type and design. It was initially concluded that because of the distinct design characteristics of these valves, the likelihood of simultaneous failure of the inboard and outboard isolation valves is negligible. Based on an NRC verbal request, a quantitative analysis, similar to that performed for the valves associated with Containment Penetrations X-23 and X-24[1], was performed for the valves associated with each of the affected Containment Penetrations. Table 3 provides a summary of the results of this evaluation.

As can be seen from the results in Table 3, for all penetrations, pressure relief will occur through leakage at a pressure value lower than the pressure retaining capability of the associated piping. As a result, the calculated maximum pressure, P_{max}, listed in Table 1 will not be reached and the pressure boundary for the valves and piping in these penetrations will not be ruptured. Therefore, for all of the penetrations, pressure relief will occur via a leakage path rather than through a catastrophic pressure boundary failure.

The remaining two penetrations (X-23 and X-24) contain isolation valves that are of the same design (flex-wedge gate valves). A quantitative analysis has been performed by the valve vendor in order to determine if the subject valves are capable of accommodating the predicted post-LOCA pressures. This analysis employed allowable stress criterion based on ASME Section III, Appendix I. The analysis concludes that the body-bonnet flange would leak prior to reaching 1232[2] psi. This leakage would serve to release any build-up of pressure and thus would preclude overpressurization failure. It is therefore, concluded that gross failure of the valves is not expected.

In addition, the limiting pressure associated with the structural capability of the subject valves is 3566 psi which bounds the maximum post-LOCA pressure of 2280 psi (X-23 penetration) and 2420 psi (X-24 penetration).

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[1] The allowable stresses were based on ASME Section III Appendix I using either the Service Level D allowable stress level or the material yield stress.

[2] The value of 900 psi previously reported in PLA-5400 dated December 3, 2001 was based on bolt tension due to internal pressure exceeding 1.5 times the allowable bolt stress. This reported value is based on bolt tension due to internal pressure exceeding the bolt pre-load stress resulting from the bolt tightening operation.

Table 1. Pressure Limits In Accordance With F-1430(a)					
Penetration	**D_{pipe}**	**P_{max} (psi)**	**T_{max} (F)**	**$P_{allowable}$ (psi)**	**Comments**
X-85A	3"	3010	118	5143	$P_{max} < P_{allowable}$
X-85B	3"	2810	120	5143	$P_{max} < P_{allowable}$
X-86A	3"	4570	139	5143	$P_{max} < P_{allowable}$
X-86B	3"	4400	142	5143	$P_{max} < P_{allowable}$
X-23	4"	2280	133	4360	$P_{max} < P_{allowable}$
X-24	4"	2420	135	4360	$P_{max} < P_{allowable}$
X-17	6"	4600	160	5473	$P_{max} < P_{allowable}$
X-54	8"	2570	114	3059	$P_{max} < P_{allowable}$
X-53	8"	2970	117	3059	$P_{max} < P_{allowable}$
X-56	8"	2570	114	3059	$P_{max} < P_{allowable}$
X-55	8"	3030	114	3059	$P_{max} < P_{allowable}$

Table 2. Stress Limits In Accordance With F-1430(b)					
Penetration	**D_{pipe}**	**Hoop Stress (psi)**	**Mech Stress (psi)**	**Total Stress (psi)**	**3.0 S_m or 2.0 S_Y (psi)**
X-85A	3"	12193	16399	28592	60000
X-85B	3"	11383	16038	27421	60000
X-86A	3"	18513	10324	28837	60000
X-86B	3"	17824	9122	26946	60000
X-23	4"	10823	20451	31274	60000
X-24	4"	11487	10166	21653	60000
X-17	6"	17636	21853	39489	50200
X-54	8"	17210	13668	30878	60000
X-53	8"	19888	13576	33464	60000
X-56	8"	17210	10255	27465	60000
X-55	8"	20290	10118	30408	60000

Table 3
Component Level Weak-Link Matrix for Containment Penetration Valves

Pene. No.	Inboard Valve – Critical Pressures (psi)			Outboard Valve - Critical Pressures (psi)		
	Valve Body	Disc Leakage	Piping Flange / Bonnet Leakage	Valve Body	Disc Leakage	Bonnet leakage
X-85A	4233	2078	1875[3]	6748	2812	5069
X-85B	4233	2078	1875[3]	6748	2812	5069
X-86A	4233	2078	1875	6748	2812	5069
X-86B	4233	2078	1875	6748	2812	5069
X-17	8349	7432	3502	8548	3794	4744
X-54	4334	381	1450	3391	1338	1147
			1450	4291	571	3353
X-53	4334	381	1450	3391	1338	1147
			1450	4291	571	3353
X-56	4334	381	1450	4288	571	3353
X-55	4334	381	1450	4288	571	3353

[3] The value of 1,850 psi reported in PLA-5352 dated September 5, 2001 in response to NRC Question No. 3 was based on a spiral-wound stainless steel asbestos filled gasket. The value of 1,875 psi presented here is based on a spiral-wound stainless steel flexible-graphite filled gasket.