Susquehanna Steam Electric Station
Units 1 and 2

Docket Numbers 50- 387/388
Demonstration of Containment Purge and Vent Valve Operability

1.0 Requirements

Demonstration of operability of the containment purge and vent valves, particularly the ability of these valves to close during a design basis accident, is necessary to assure containment isolation. This demonstration of operability is required by BTP CSB 6-4 and SRP 3.10 for containment purge and vent valves which are not sealed closed during operational conditions 1, 2, 3, and 4.

2.0 Description of Purge and Vent Valves

The valves identified as the containment isolation valves in the purge and vent system in which operability has not previously been demonstrated are as follows:

Valve P&ID Number	Valve Size (Inches)	Type	Location
HV-1,2 25703	18	Butterfly	Outside containment
HV-1,2 25704	18	Butterfly	Outside containment
HV-1,2 25724	18	Butterfly	Outside containment
HV-1,2 25725	18	Butterfly	Outside containment
HV-1,2 25713	24	Butterfly	Outside containment
HV-1,2 25714	24	Butterfly	Outside containment
HV-1,2 25722	24	Butterfly	Outside containment
HV-1,2 25723	24	Butterfly	Outside containment

The 18 and 24-inch valves are Pratt valves Model 1200 150 lbs with an offset asymmetric disc. The 18-inch valves are equipped with Bettis Operators, Model T312-SR3, air open-spring close. The 24-inch valves are equipped with Bettis Operators, Model T416-SR3. Pennsylvania Power and Light's (PP&L) assessment is that the valves are capable of closing from the full open (90°) position under the accident case postulated. PP&L has previously demonstrated operability for the 6-inch valves installed in the purge and vent system.

3.0 Demonstration of Operability

Pennsylvania Power and Light has provided information demonstrating operability for the purge and vent system isolation valves for Susquehanna Steam Electric Station Units in the following submittals:

A. Pratt Qualification Analysis Report for the 18-inch valves HBB-BF-AO-5703, 5704, 5724, 5725 dated 1/11/83.

B. Pratt Qualification Analysis Report for the 24-inch valves HBB-BF-AO-5713, 5714, 5722, 5723 dated 1/28/83.

PP&Ls approach to operability demonstration is based on the following considerations:

a. The maximum dynamic torque occurs when initial sonic flow occurs. This corresponds with an open angle of 68° for an asymmetric disc.

b. Closure plus delay time equalled 11 seconds.

c. Closure time under LOCA conditions is less than no-load stroke times.

d. Flow direction through the valve is toward the hub side (asymmetric disc), which is the worst case dynamic torque developed.

e. Single valve closure is assumed.

f. All valves are air operated and are located outside containment. Containment back pressure effect is not applicable.

g. Accumulators are not part of any valve assembly.

h. The analysis of the structural integrity and operational adequacy of the valve assembly is based principally upon containment pressure vs time data, system response (delay) time, piping geometry upstream of the valve, back pressure due to ventilation components downstream of the valve, valve orientation, and direction of valve closure.

4.0 Evaluation

4.1 Revised pressure response and temperature response curves for a recirculation line break are presented. A peak Wetwell pressure of 41 psia and a peak dry well pressure of 58.2 psia were used in the analysis. The FSAR (Section 6.2.1.1,3.1) states that the calculated accident parameter is 43.8 psig and 29 psig for the dry well and suppression chamber, respectively. The staff bases their review on the latest submittal or the 41 psia and 58.2 psia values.

4.2 The analysis presented states that the maximum dynamic torque occurs when intial sonic flow occurs. This corresponds with an open angle of 68° for an asymmetric disc. Downstream pressure was selected by considering the valve

closure time and pressure time curves such that the downstream pressure at 68° would yield the critical ratio for the air stream mixture. This was considered, by Pratt and the staff, based on the information submitted, to be the worst case approach in determining valve loading.

4.3 Pratt's approach to determining dyamic torque--T_D for the subject valves is based in part on the fact that they have determined from the model valve tests that the maximum value of T_D occurs when initial sonic flow occurs coincident with a disc angle of 68° for the asymmetric disc (90° = full open). Based on this, the T_D equation for sonic flow (given in the submittal) is used with appropriate dynamic torque coefficient, media difference (steam/air mixture) and size difference factors to determine the maximum value of T_D possible in the subject valves.

Coefficient of friction used for the bronze bearings is 0.25.

Seating Torques (T_S) are calculated by an equation in AWWA C504-80. Seating factor or coefficient of seating (C_S) is said to be determined by Pratt lab tests.

T_8 defined as "maximum operating torque for valve" is used in the applicable areas of the stress analysis as the torque load. T_8 is shown to be the higher value of the algebraically combined T_D and T_B or T_B plus T_S. For the 18.0-inch valves, T_8 is 20551 inche -lbs or basically equal to T_D, which is more conservative then T_D -T_B. For the 24.0-inch valves, T_8 is 69617 inche -lbs or basically equal to T_D, which again is more conservative than T_D -T_B, to which the staff agrees.

4.4 In their analysis reports, H. Pratt has indicated that the stress analysis is structured to comply wth paragraph NB-3550 of Section III of the ASME BPVC and that design rules for Class I valves are used (exceeds rules for Class 2 and 3).

Pratt states that valve components are analyzed under the assumption that the valve is either at maximum fluid dynamic torque or seating against the maximum design pressure. An analysis temperature of 300°F is used along with 5g seismic accelerations statically applied simultaneously in each of three mutually perpendicular directions.

Stress summary tables were provided for both the 18 and 24-inch isolation valves. As requested by the NRC, Pratt has revised the shear stress allowable to 0.4Sy. Utilizing the revised peak post-LOCA Wetwell pressure in combination with the shear stress allowable of 0.4Sy and with the addition of new materials in the top disc pin and redesign of the bonnet for the 24-inch valve the stress levels for the 18 and 24-inch valves were found to be below the code allowables and acceptable.

4.5 Closing time, including delay time, is said to be 11 seconds. However, this is not an issue since the analysis has considered a constent peak containment pressure throughout the analysis.

5.0 Summary

We have completed our review of the information submitted to date concerning operability of 18 and 24-inch containment purge and vent valves for the Susquehanna Steam Electric Station. We find the information submitted demonstrates the ability of the 18 and 24-inch purge and vent valves to close against the buildup of containment pressure in the event of a LOCA.