NORTH ATLANTIC ENERGY SERVICES COMPANY

SEABROOK STATION

GENERIC LETTER 95-07

PRESSURE LOCKING AND THERMAL BINDING OF POWER-OPERATED GATE VALVES

Revision 0

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1.0 EXECUTIVE SUMMARY

This document describes the actions taken by Seabrook Station to address NRC Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves". All safety-related power-operated gate valves were evaluated for susceptibility to the pressure locking and thermal binding phenomena. In addition, power operated gate valves in selected non safety-related systems were also evaluated. The pressure locking and thermal binding evaluation was performed in stages. Initially, normally closed safety-related motor-operated gate valves that had a safety function to open were evaluated. Additionally, open valves that are subjected to high system fluid temperatures and are required to close or may be required to close and then reopen were also evaluated for the potential for thermal binding. Normally open safety-related gate valves were then reviewed for their susceptibility to both pressure locking and thermal binding. The initial two stages evaluated the gate valve population that met the scope of Generic Letter 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance". Pneumatic and solenoid operated power-operated gate valves were subsequently identified and evaluated to determine their susceptibility to pressure locking and/or thermal binding. Finally, non safety-related power-operated gate valves were evaluated. The evaluation identified gate valves that are required to open to perform a safety function and identifying system and environmental conditions to determine if the valve was susceptible to pressure locking and/or thermal binding. Engineering Evaluation 95-07 documents the results of the evaluations performed.

An operability determination was performed on safety-related gate valves that were determined to be potentially susceptible to pressure locking as part of Engineering Evaluation 95-07. The conclusions for each operability determination were included in Adverse Condition Report (ACR) 95-34. A total of twelve valves were identified as being potentially susceptible to thermal binding, pressure locking or both thermal binding and pressure locking. A procedure change was recommended for two of the valves that were determined to be potentially susceptible to thermal binding. Valve and system modifications were performed during the fourth refueling outage in accordance with Design Coordination Report (DCR) 95-023 and Minor Modification (MMOD) 95-509 to eliminate the potential for pressure locking for ten motor-operated gate valves.

2.0 PURPOSE

The purpose of this document is to summarize the actions taken to address the recommendations provided in NRC Generic Letter 95-07. MOV design changes that have been incorporated to address potential pressure locking and thermal binding concerns are also discussed.

3.0 BACKGROUND

The NRC issued NRC Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves" on August 17, 1995. This generic letter requested that licensees perform or confirm that they have previously performed, (1) evaluations of operational configurations of safety-related, power-operated (including motor-, air- and hydraulically operated) gate valves for susceptibility to pressure locking and thermal binding and (2) further analysis, and any needed corrective actions, to ensure that safety-related power-operated gate valves that are susceptible to pressure locking or thermal binding are capable of performing the safety functions within the current licensing basis of the facility.

The NRC had previously provided guidance on an acceptable approach for addressing pressure locking and thermal binding of motor-operated valves (MOVs) in Supplement 6 to Generic Letter 89-10. Generic Letter 95-07 confirms that licensees are expected, under existing regulations, to take actions as necessary to ensure that safety-related power-operated gate valves susceptible to pressure locking or thermal binding are capable of performing their required safety functions.

The NRC issued NUREG-1275, Volume 9 ,"Pressure Locking and Thermal Binding of Gate Valves" in March of 1993. This NUREG gave the history of pressure locking and thermal binding events, described the phenomena, discussed the consequences of pressure locking or thermal binding on valve functionality, summarized preventive measures, and assessed the safety significance of the phenomena. Pressure locking or thermal binding can cause a power operated gate valve to fail to open, resulting in an inability of the associated safety train or system to perform its safety function. Pressure locking and thermal binding represents a potential common cause failure mode that can render redundant trains of certain safety-related or multiple safety related systems incapable of performing their safety functions.

Seabrook Station had performed previous evaluations for pressure locking and thermal binding of gate valves. Independent Safety Engineering Group (ISEG) Memo 8801-004, "Pressure Locking and Thermal Binding of Gate Valves" was issued to address INPO SOER 84-7. Engineering Evaluation 93-33, "Thermal Binding and Pressure Locking of Safety Related Gate Valves" was prepared to address NRC Information Notice 92-26, "Pressure Locking of Motor Operated Flexible Wedge Gate Valves".

4.0 DISCUSSION

Seabrook Station performed a re-evaluation of the conclusions reached in Engineering Evaluation 93-33. This re-evaluation is documented in Engineering Evaluation 95-07, "Pressure Locking and Thermal Binding of Gate Valves". The re-evaluation was warranted based on questions regarding the potential for liquid entrapment pressure locking that was raised at other plants. Information Notice IN 95-14: "Susceptibility of Containment Sump Recirculation Gate Valves to Pressure Locking", identified the potential for liquid entrapment pressure locking of the containment sump suction valves. Engineering Evaluation 95-07 documents the screening evaluation and operability determination requirements for NRC Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves".

Motor operated gate valves are susceptible to thermal binding and pressure locking under certain operating conditions. This problem is a concern for those valves which must open in order to perform their safety function. When a valve is experiencing thermal binding or pressure locking, it is possible that the motor operator will not be able to provide sufficient force to open the valve. There are three mechanisms for thermal binding or pressure locking to occur. A description of these mechanisms follows:

Thermal Binding. When a wedge gate valve is closed while the system is hot, thermal binding of the valve can occur as the system cools. The valve body and disc could mechanically interfere because of the different thermal expansion and contraction characteristics of the valve body and the disc. The difference in thermal contraction, the valve body contracting a proportionally greater amount than the valve disc, can cause the seats to bind the disc so tightly that reopening the valve is either very difficult or impossible until the valve is reheated. It is important to note that double-disc, parallel-seat gate valves are not as susceptible to thermal binding as flexible-wedge gate valves. This is due to the fact that the wedging mechanism between the double discs collapses as the stem rises, thus, permitting the parallel discs to move inward and raise regardless of the change in system temperature. Excessive closing force can contribute to thermal binding because excessive closing force causes the disc to be driven into the seat more tightly and upon cooling, the

thermal binding effect is increased. Solid-wedge gate valves are most susceptible to thermal binding. However, flexible-wedge gate valves experiencing significant temperature changes or operating with significant upstream and downstream temperature differences may also be susceptible to thermally binding.

Liquid Entrapment Pressure Locking. When a gate valve is closed with a system full of cold liquid, the liquid becomes trapped in the bonnet cavity. A subsequent temperature increase of the fluid will cause an increase in bonnet cavity pressure due to thermal expansion of the fluid. A condition results where a high pressure in the valve bonnet and disc is produced if not relieved. The pressure buildup would be significant if there is no air trapped in the bonnet and the valve disc/seat and/or the packing did not leak. The valve does not have to be in a high temperature system but only in close proximity to a high temperature system where heat conduction through the pipe or the environment will heat the trapped fluid in the valve bonnet. The rate of pressure rise can be as high as 100 psi per °F temperature increase for a water solid bonnet for system temperatures above 450°F. For lower system temperatures (~ 100°F) the rate of pressure rise is approximately 33 psi per °F of temperature rise. High pressure forces the disc more tightly against the seat or, in extreme cases, permanently deforms the valve bonnet or disc. Valves that are closed in a cold liquid-filled system and then heated are susceptible to this condition.

Differential Pressure Locking. When a system is pressurized after a valve is closed, the pressurized side of the flexible disc may move slightly away from its seat, allowing high pressure liquid to enter the bonnet cavity. This would most likely occur when reactor coolant pressure forces one side of the disc of a normally closed valve away from the valve seat creating a leakage path and pressurizing the bonnet. If the pressure in the system is subsequently decreased, which would occur under a LOCA or other transient condition causing pipe line depressurization, the bonnet pressure would force the disc against one or both seats more tightly than normal if the bonnet pressure is not relieved. The valve actuator may not have been sized for the increased loads due to bonnet pressurization.

5.0 METHODOLOGY

The review of the power-operated gate valves to determine their susceptibility to pressure locking and thermal binding consisted of the following:

5.1 Approach

The review of the Seabrook Station's power-operated gate valves for potential susceptibility to pressure locking and thermal binding was performed in three stages. The following provides a brief description of the three stages used to evaluate the power-operated gate valves at Seabrook.

During the initial stage, normally closed safety related motor-operated valves along with selected normally open motor-operated gate valves which are included in Seabrook's Generic Letter 89-10 Program were reviewed for susceptibility to the phenomena. There were 26 valves evaluated during this stage of the evaluation.

In the second stage, the remaining normally open safety-related motor-operated gate valves that are included in the Generic Letter 89-10 MOV Program were then reviewed. There were 29 valves evaluated during the second stage of the evaluation.

In the last stage, most of the non-safety-related motor-operated gate valves as well as air-operated and solenoid operated gate valves were reviewed for susceptibility to pressure locking and thermal binding. There were 36 motor-operated gate valves reviewed during this stage of the evaluation. The power-operated containment isolation gate valves that were not motor-operated valves were identified by using UFSAR Table 6.2.83, "Containment Isolation System Design Information". There were 15 non-MOV power operated gate valves that met this criteria. Air-operated gate valves were identified using the Air-Operated Valve (AOV) List. This list was used in conjunction with a Probabilistic Risk Assessment (PRA) to prioritize the valves in the list. Another group of gate valves was identified by using the Automated Valve List, the Engineering data base, the Commonality database , applicable component specifications and vendor prints. There were an additional 10 air-operated gate valves identified in this review. Several systems were not considered for evaluation, based on the lack of plant operational consequences due to pressure locking, thermal binding or because they are gaseous or air systems which are not susceptible to the phenomena. However, systems in contact with the containment atmosphere were evaluated because of their potential exposure to high temperature and condensate. The nongaseous systems that were excluded from evaluation were Boron Recovery, Chilled Water, Chlorination, Hot Water Heating, Solid Waste Processing and Water Treatment. Solenoid power-operated gate valves were identified during the review of vendor manuals for the suppliers, Valcor and ASCO. A subsequent review of P&IDs identified additional ASCO valves, that were included on skid-mounted equipment supplied by other vendors. There were no additional solenoid power-operated gate valves identified as a result of this review. Electro-hydraulic and hydraulic-pneumatic power-operated gate valves were identified by P&ID, engineering database and/or vendor print review as applicable. There were no additional power-operated gate valves identified as a result of this review.

All of the identified power-operated gate valves were then reviewed for their susceptibility to liquid entrapment and differential pressure locking and thermal binding. For normally closed power-operated gate valves, each individual valve was evaluated to determine if it must open to perform a safety function. For normally open power-operated gate valves, each valve was evaluated to determine if it must close and must re-open after closure to perform a safety function. Additionally, the valve was evaluated for pressure locking and thermal binding under normal operating conditions. The evaluation consisted of the following:

5.2 Thermal Binding

Valves were determined to be potentially susceptible to thermal binding if they are open while the system temperatures are relatively high and are closed and the system is subsequently cooled. If the open stroke did not have any safety significance, no further actions were required. If the valve susceptible to thermal binding is required to open to perform a safety function then additional evaluation/corrective action was required to assure valve operability.

5.3 Liquid Entrapment Pressure Locking

Each valve was evaluated by determining if the valve is closed or could be closed and subsequently could be heated by the system process temperature or the environment. Changes in environmental temperature were identified if they were step changes due to a high energy line break or an accident. Normal ambient temperature swings based on seasonal weather changes were not considered. Valves meeting this criteria were identified as being potentially susceptible to liquid entrapment pressure locking. If the valve did not have to open to perform its safety function no further actions were taken. If the valve is required to open to perform its safety function both short term actions and long term corrective actions were performed.

5.4 Differential Pressure Locking

Valves were evaluated to determine if the valve is closed or could be closed, the valve bonnet pressurized and the piping subsequently depressurized. Valves meeting this criteria were identified as being potentially susceptible to differential pressure locking. If the valve did not have to open to perform its safety function no further actions were taken. If the valve is required to open to perform its safety function both short term actions and long term corrective actions were performed if not bounded by the conditions determined for liquid entrapment pressure locking.

5.5 Corrective Actions

5.5.1 Short Term Actions

Valves that were determined to be potentially susceptible to either thermal binding or pressure locking were further evaluated to assure that each identified valve was capable of performing its safety function. The valve's operating history was reviewed to determine if any operational occurrences of pressure locking or thermal binding at Seabrook Station had been identified. For the pressure locking evaluation an additional analysis was performed. If the valve was located in a potentially hot environment or if the valve could be heated by the process fluid a Gothic valve model was developed to determine the extent of valve bonnet heat up. Valve bonnet pressure was calculated assuming an initial bonnet pressure based on the maximum process fluid pressure and accounting for any increased bonnet pressure due to heat up using a heatup factor of 33 psi per 1° F increase in bonnet temperature. Valve required thrusts using three different methods were determined using the maximum bonnet pressure. The required thrust values were compared to the derated motor operator thrust capability and the derated stall thrust capability. Using this approach it was concluded that all ten valves that were identified as being potentially susceptible to pressure locking were determined to be operable.

5.5.2 Long Term Corrective Actions

Safety related power-operated gate valves that are required to open to perform their safety function and were determined to be potentially susceptible to pressure locking were modified by incorporating a way to depressurize the valve bonnet. Valves potentially susceptible to thermal binding were addressed by either a qualitative evaluation or by recommending procedure changes as applicable.

6.0 PRESSURE LOCKING/THERMAL BINDING STAGE 1 EVALUATION

The following normally closed and selected normally open motor-operated gate valves were included in the first stage of the evaluation. Table 1 identifies the valve, valve function and provides a conclusion of the results of the pressure locking and thermal binding evaluation identifying valves that could be potentially susceptible to pressure locking (PL), thermal binding (TB) or both pressure locking and thermal binding (PL/TB). Corrective actions taken to address PL/TB for valves identified as being potentially susceptible to either or both phenomena are provided following Table 1.

TABLE 1: PL/TB EVALUATION STAGE 1 VALVES		
VALVE ID	**FUNCTION**	**POT. SUSCEPTIBLE TO PL/TB**
CBS-V-8	Isolation Valve for Containment Recirc Sump Tank 101A	PL
CBS-V-11	Containment Spray Header Train 'A' Isolation Valve	
CBS-V-14	Isolation Valve for Containment Recirc Sump Tank 101B	PL
CBS-V-17	Containment Spray Header Train 'B' Isolation Valve	
CBS-V-38	SAT Supply to RWST Isolation Train 'A'	
CBS-V-43	SAT Supply to RWST Isolation Train 'B'	
CS-LCV-112D	Charging Pump Suction from RWST - Train 'A'	
CS-LCV-112E	Charging Pump Suction from RWST - Train 'B'	
CS-V-460	SI And Charging Pump Suction X-Connect from RH Pump Disch	
CS-V-461	SI And Charging Pump Suction X-Connect from RH Pump Disch	
FW-V-156	EFW X-Connect Isolation from SUFP	
FW-V-163	SUFP X-Connect to EFW Header	
RC-V-22	RHR Pump 'A' Suction Isolation from Loop 1 Hot Leg	PL/TB
RC-V-23	RHR Pump 'A' Suction Isolation from Loop 1 Hot Leg	PL/TB
RC-V-87	RHR Pump 'B' Suction Isolation from Loop 4 Hot Leg	PL/TB
RC-V-88	RHR Pump 'B' Suction Isolation from Loop 4 Hot Leg	PL/TB
RC-V-122	PORV 456A Block	TB
RC-V-124	PORV 456B Block	TB
RH-V-32	RHR Train 'B' Common Supply to Hot Leg Recirc	PL
RH-V-35	RHR Pump 'A' Discharge Isolation to SI/Charging Pumps	
RH-V-36	RHR Pump 'B' Discharge Isolation to SI/Charging Pumps	
RH-V-70	RHR Train 'A' Common Supply to Hot Leg Recirc	PL
SI-V-77	SI Train 'B' Discharge Isolation to Hot Legs 1/4	PL
SI-V-102	SI Train 'A' Discharge Isolation to Hot Legs 1/4	PL
SI-V-138	Charging Pumps Supply to RCS Cold Legs	
SI-V-139	Charging Pumps Supply to RCS Cold Legs	

CBS-V-8/CBS-V-14

CBS-V-8 and CBS-V-14, the Containment Sump Isolation Valves, were determined to be potentially susceptible to liquid entrapment pressure locking. These normally closed Velan flexible wedge gate valves were modified in Refueling Outage 04 to eliminate the potential for pressure locking. A vent path was installed from the between seat drain to the upstream piping to eliminate the potential for pressurizing the valve bonnet. This work was performed in accordance with Engineering design document MMOD 95-509.

RC-V-22/RC-V-87

RC-V-22 and RC-V-87, the RCS to RHR Pump Suction Inboard Isolation Valves, were determined to be potentially susceptible to pressure locking. These normally closed Westinghouse flexible wedge gate valves were modified in Refueling Outage 04 to eliminate the potential for pressure locking. The valve packing was modified and a vent path was installed from the packing leakoff connection to the upstream piping (RCS side) to eliminate the potential for pressurizing the valve bonnet. This work was performed in accordance with Engineering design document DCR 95-023.

RC-V-22 and RC-V-87 were determined to be potentially susceptible to thermal binding. The valves are closed when the process temperature is in the 280°F to 340°F range and the valves are subsequently cooled to the ambient containment temperature of approximately 120°F. The closing action in the hot condition and subsequent cooldown to ambient conditions provides the potential for thermal binding. Based on successful operation of these valves for approximately 13 heatup and cooldown cycles there has been no evidence of thermal binding. Since this condition is related to the metal thermal expansion coefficient properties, the 13 successful cycles provides sufficient evidence that the valves are not subject to thermal binding.

RC-V-23/RC-V-88

RC-V-23 and RC-V-88, the RCS to RHR Pump Suction Outboard Isolation Valves, were determined to be potentially susceptible to pressure locking. These normally closed Westinghouse flexible wedge gate valves were modified in Refueling Outage 04 to eliminate the potential for pressure locking. The valve packing was modified and a vent path was installed from the packing leakoff connection to the upstream piping (RCS side) to eliminate the potential for pressurizing the valve bonnet. This work was performed in accordance with Engineering design document DCR 95-023.

RC-V-23 and RC-V-88 were determined to be potentially susceptible to thermal binding. The valves are closed when the process temperature is in the 280°F to 340°F range and the valves are subsequently cooled to the ambient containment temperature of approximately 120°F. The closing action in the hot condition and subsequent cooldown to ambient conditions provides the potential for thermal binding. Based on successful operation of these valves for approximately 13 heatup and cooldown cycles there has been no evidence of thermal binding. Since this condition is related to the metal thermal expansion coefficient properties, the 13 successful cycles provides sufficient evidence that the valves are not subject to thermal binding.

RC-V-122/RC-V-124

RC-V-122 and RC-V-124, the PORV Block Valves, were determined to be potentially susceptible to thermal binding. These valves are normally open Westinghouse flexible wedge gate valves that are exercised quarterly at power and may be closed to isolate a leaking PORV. Reopening these valves to prevent a challenge to the pressurizer safety valves or for a feed and bleed operation would be performed at similar

temperature and pressure conditions as existed when the valve was closed, precluding a thermal binding condition. For low temperature overpressure protection functions, the temperature at which the valve would be opened would be considerably lower than the temperature at which the valve was closed, creating the necessary conditions for thermal binding. However, LTOP protection can also be provided by the RHR suction relief valves or by providing an RCS vent path. Therefore, should thermal binding of these valves occur, no safety function would be impaired. Procedure changes have been made to the appropriate operating procedure to address the thermal binding concern.

RH-V-32/RH-V-70

RH-V-32 and RH-V-70, the Low Head Hot Leg Recirculation Valves, were determined to be potentially susceptible to pressure locking. These normally closed Westinghouse flexible wedge gate valves were modified in Refueling Outage 04 to eliminate the potential for pressure locking. The valve packing was modified and a vent path was installed from the packing leakoff connection to the downstream SI piping (RCS side) to eliminate the potential for pressurizing the valve bonnet. This work was performed in accordance with Engineering design document DCR 95-023.

SI-V-77/SI-V-102

SI-V-77 and SI-V-102, the Intermediate Head Hot Leg Recirculation Valves, were determined to be potentially susceptible to pressure locking. These normally closed Westinghouse flexible wedge gate valves were modified in Refueling Outage 04 to eliminate the potential for pressure locking. The valve packing was modified and a vent path was installed from the packing leakoff connection to the downstream piping (RCS side) to eliminate the potential for pressurizing the valve bonnet. This work was performed in accordance with Engineering design document DCR 95-023.

7.0 PRESSURE LOCKING/THERMAL BINDING STAGE 2 EVALUATION

The following normally open motor-operated gate valves were included in the second stage of the evaluation. Table 2 identifies the valve, valve function and provides a conclusion of the results of the pressure locking and thermal binding evaluation. Although it could be postulated under certain conditions that some of the evaluated valves may be potentially susceptible to either pressure locking, thermal binding or both, there were no valves identified that have a safety function to re-open following valve closure. Accordingly, no valves in Table 2 were identified as meeting the pressure locking and thermal binding criteria and no corrective actions were required to address PL/TB concerns for valves evaluated in Stage 2.

TABLE 2: PL/TB EVALUATION STAGE 2 VALVES

VALVE ID	FUNCTION	POT. SUSCEPTIBLE TO PL/TB
AS-V-175	Train 'A' HELB Isolation - AUX Steam Supply to PAB And WPB	
AS-V-176	Train 'B' HELB Isolation - AUX Steam Supply to PAB And WPB	

TABLE 2: PL/TB EVALUATION STAGE 2 VALVES		
VALVE ID	**FUNCTION**	**POT. SUSCEPTIBLE TO PL/TB**
CBS-V-2	RWST to RHR/CBS Pump Suction Isolation (Train 'A')	
CBS-V-5	RWST to RHR/CBS Pump Suction Isolation (Train 'B')	
CBS-V-47	RWST to SI Pump 'A' Suction Isolation	
CBS-V-49	RWST to SI Pump 'A' Suction Isolation	
CBS-V-51	RWST to SI Pump 'B' Suction Isolation	
CBS-V-53	RWST to SI Pump 'B' Suction Isolation	
CC-V-395	PCCW Isolation from RCP 'B' Thermal Barrier	
CC-V-428	PCCW Isolation from RCP 'A' Thermal Barrier	
CC-V-438	PCCW Isolation from RCP 'C' Thermal Barrier	
CC-V-439	PCCW Isolation from RCP 'D' Thermal Barrier	
CS-LCV-112B	Charging Pump Suction from VCT - Train 'A'	
CS-LCV-112C	Charging Pump Suction from VCT - Train 'B'	
CS-V-142	Train 'A' Charging System to Regen HX Isolation	
CS-V-143	Train 'B' Charging System to Regen HX Isolation	
CS-V-149	Regen HX Outlet to Letdown HX	
CS-V-475	SI And Charging Pump Suction X-Connect from RH Pump Disch	
RH-V-14	RHR Train 'A' to Cold Legs 1 And 2	
RH-V-21	RHR Train 'B' Discharge X-Connect	
RH-V-22	RHR Train 'A' Discharge X-Connect	
RH-V-26	RHR Train 'B' to Cold Legs 3 And 4	
SI-V-3	Accumulator 'A' Discharge Isolation	
SI-V-17	Accumulator 'B' Discharge Isolation	
SI-V-32	Accumulator 'C' Discharge Isolation	
SI-V-47	Accumulator 'D' Discharge Isolation	
SI-V-111	SI Train 'B' Discharge X-Connect	
SI-V-112	SI Train 'A' Discharge X-Connect	
SI-V-114	SI Pumps Common Isolation to Cold Legs	

8.0 PRESSURE LOCKING/THERMAL BINDING STAGE 3 EVALUATION

The following power--operated gate valves were included in the third stage of the evaluation. Table 3 identifies the valve, identifies whether the valve is safety related (SR) or non nuclear safety-related (NNS), valve function and provides a conclusion of the results of the pressure locking and thermal binding evaluation. Although it could be postulated under certain conditions that some of the evaluated valves may be potentially susceptible to either pressure locking, thermal binding or both, there were no valves identified that have a safety function to re-open following valve closure. Accordingly, no valves in Table 3 were identified as meeting the pressure locking and thermal binding criteria and no corrective actions were required to address PL/TB concerns for valves evaluated in Stage 3. All valves in Table 3 should be considered as having motor-operators unless noted otherwise.

TABLE 3: PL/TB EVALUATION STAGE 3 VALVES

VALVE ID	SR/NNS	FUNCTION	POT. SUSCEPTIBLE TO PL/TB
AB-V-36	NNS	Aux Boiler Deaerator Tank High Level Dump (AOV)	
ASC-V-359	NNS	Aux Steam Condensate Discharge Return to Deaerator (AOV)	
ASC-V-967	NNS	Recirc Supply to Sparger on Aux Steam Condensate Tank (AOV)	
CAH-FV-6572	SR	Containment Radiation Monitoring Isolation (Solenoid-operated)	
CAH-FV-6573	SR	Containment Radiation Monitoring Isolation (Solenoid-operated)	
CAH-FV-6574	SR	Containment Radiation Monitoring Isolation (Solenoid-operated)	
CO-V-59	NNS	FW Heaters 21C and 22C Inlet	
CO-V-71	NNS	FW Heaters 21A and 22A Inlet	
CO-V-73	NNS	FW Heaters 21B and 22B Inlet	
CO-V-75	NNS	FW Heaters 21 and 22 'A', 'B', and 'C' Bypass	
CO-V-82	NNS	FW Heaters 21A and 22A Outlet	
CO-V-84	NNS	FW Heaters 21B and 22B Outlet	
CO-V-86	NNS	FW Heaters 21C and 22C Outlet	
CS-V-625	SR	L/D System to PDT Iso from LCV-112A	
CS-V-633	SR	Letdown Degasifier Supply	
EX-V-1	NNS	FW-E-26A Hi/Hi Heater Isolation	
EX-V-4	NNS	FW-E-26B Hi/Hi Heater Isolation	

TABLE 3: PL/TB EVALUATION STAGE 3 VALVES			
VALVE ID	**SR/NNS**	**FUNCTION**	**POT. SUSCEPTIBLE TO PL/TB**
EX-V-13	NNS	24C Hi/Hi Heater Isolation	
EX-V-16	NNS	23C Hi/Hi Heater Isolation	
EX-V-19	NNS	24B Hi/Hi Heater Level Isolation	
EX-V-22	NNS	23B Hi/Hi Heater Isolation	
EX-V-25	NNS	24A Hi/Hi Heater Isolation	
EX-V-28	NNS	23A Hi/Hi Heater Isolation	
EX-V-34	NNS	Extraction Steam Drain Isolation	
EX-V-35	NNS	Extraction Steam Drain Isolation	
FW-V-2	NNS	Feed Pump 'A' Discharge Isolation	
FW-V-13	NNS	Feed Pump 'B' Discharge Isolation	
FW-V-23	NNS	26A Heater Outlet Isolation	
FW-V-25	NNS	26B Heater Outlet Isolation	
FW-V-28	NNS	Feedwater Regulating Block Valve 'A'	
FW-V-30	SR	Main Feedwater Isolation (Hydraulic Pneumatic operated)	
FW-V-37	NNS	Feedwater Regulating Block Valve 'B'	
FW-V-39	SR	Main Feedwater Isolation (Hydraulic Pneumatic operated)	
FW-V-46	NNS	Feedwater Regulating Block Valve 'C'	
FW-V-48	SR	Main Feedwater Isolation (Hydraulic Pneumatic operated)	
FW-V-55	NNS	Feedwater Regulating Block Valve 'D'	
FW-V-57	SR	Main Feedwater Isolation (Hydraulic Pneumatic operated)	
HD-V-240	NNS	Heater Drain Tank Vent	
MS-V-86	SR	Main Steam Isolation (Hydraulic-Pneumatic operated)	
MS-V-88	SR	Main Steam Isolation (Hydraulic-Pneumatic operated)	
MS-V-90	SR	Main Steam Isolation (Hydraulic-Pneumatic operated)	

TABLE 3: PL/TB EVALUATION STAGE 3 VALVES			
VALVE ID	**SR/NNS**	**FUNCTION**	**POT. SUSCEPTIBLE TO PL/TB**
MS-V-92	SR	Main Steam Isolation (Hydraulic-Pneumatic operated)	
MS-V-100	NNS	Reheater Steam Supply for MSR 'A'	
MS-V-101	NNS	Reheater Steam Supply for MSR 'A'	
MS-V-150	NNS	Reheater Steam Supply for MSR 'D'	
MS-V-158	NNS	Reheater Steam Supply for MSR 'C'	
MS-V-185	NNS	Main Steam Supply to Aux Steam Isolation (AOV)	
RC-V-81	SR	Regenerative Heat Exchanger Letdown Isolation from Loop 3	
SB-V-1	SR	Steam Generator Blowdown to Flash Tank Isolation (AOV)	
SB-V-3	SR	Steam Generator Blowdown to Flash Tank Isolation (AOV)	
SB-V-5	SR	Steam Generator Blowdown to Flash Tank Isolation (AOV)	
SB-V-7	SR	Steam Generator Blowdown to Flash Tank Isolation (AOV)	
SB-V-9	SR	Steam Generator Blowdown Isolation (AOV)	
SB-V-10	SR	Steam Generator Blowdown Isolation (AOV)	
SB-V-11	SR	Steam Generator Blowdown Isolation (AOV)	
SB-V-12	SR	Steam Generator Blowdown Isolation (AOV)	
SSS-V-18	NNS	Steam Seal Header Bypass to Condenser	
SSS-V-20	NNS	Steam Seal Feed Valve Isolation	
SSS-V-22	NNS	Steam Seal Auxiliary Steam Isolation	
WL-V-166	NNS	Waste Test Tank Isolation (AOV)	
WL-V-168	NNS	Waste Test Tank Isolation (AOV)	

9.0 CONCLUSION

This report documents Seabrook's actions that were taken to implement the recommendations provided in NRC Generic Letter 95-07. Twelve valves were identified as being potentially susceptible to thermal binding, pressure locking or both thermal binding and pressure locking. A procedure change was implemented for two of the valves that were determined to be potentially susceptible to thermal binding. Valve and system modifications were performed during the fourth refueling outage in accordance with Design Coordination Report (DCR) 95-023 and Minor Modification (MMOD) 95-509 to eliminate the potential for pressure locking for ten motor-operated gate valves. No additional actions regarding pressure locking and thermal binding are planned.

10. REFERENCES

1. Engineering Evaluation 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves".
2. NUREG-1275, Volume 9 ,"Pressure Locking and Thermal Binding of Gate Valves".
3. AEOD Special Study AEOD/S92-07 , "Pressure Locking and Thermal Binding of Gate Valves".
4. DCR 95-023
5. MMOD 95-509
6. I. E. Notice 92-26, "Pressure Locking of Motor-Operated Flexible Wedge Gate Valves"
7. Engineering Evaluation 93-33, "Thermal Binding and Pressure Locking of Safety Related Gate Valves".
8. INPO SOER 84-7, "Pressure Locking and Thermal Binding of Gate Valves".
9. NAESCO Letter NYN-95080, "Response to Generic Letter 95-07" dated October 13,1995