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 PARRISH, J.V. Washington Public Power Supply System
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SUBJECT: Submits supplemental response to GL 95-07, "Pressure Locking
 & Thermal Binding of Safety-Related Power Operated Gate
 Valves."

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

P.O. Box 968 • 3000 George Washington Way • Richland, Washington 99352

February 13, 1996
G02-96-027

Docket No. 50-397

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Subject: **WNP-2, OPERATING LICENSE NO. NPF-21
RESPONSE TO GENERIC LETTER 95-07, "PRESSURE LOCKING AND
THERMAL BINDING OF SAFETY-RELATED POWER OPERATED
GATE VALVES" - SUPPLEMENTAL INFORMATION (TAC NO. M93539)**

- References:
1. Letter, dated January 18, 1996, JW Clifford (NRC) to JV Parrish (SS), "Request for Additional Information (RAI) for Generic Letter 95-07, 'Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves,' for the Washington Public Power Supply System (WPPSS) Nuclear Project No. 2 (WNP-2) (TAC NO. M93539)"
 2. Letter GO2-95-221, dated October 13, 1995, JV Parrish (SS) to NRC, "Response to Generic Letter 95-07, 'Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves'"
 3. NRC Generic Letter 95-07, dated August 17, 1995, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves"

The purpose of this letter is to provide supplemental information to the Reference 2 response to Generic Letter (GL) 95-07 as requested in the Reference 1 RAI.

GL 95-07 (Reference 3) included 180-day requested actions for licensees to further analyze or identify, schedule, and take corrective action for valves susceptible to Pressure Locking and Thermal Binding (PLTB) to ensure they are capable of performing their intended safety functions under all modes of plant operation. In Reference 2, the Supply System committed to performing the actions requested in the GL, but amended the 180-day completion schedule consistent with evaluations already completed and the potential safety significance associated with the requested evaluations. The Supply System committed to complete the 180-day requested actions of GL 95-07 by July 15, 1996.

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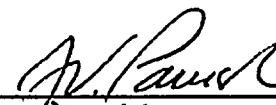
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STATE OF WASHINGTON)
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COUNTY OF BENTON)

Subject: Response to Generic Letter 95-07

I, J. V. PARRISH, being duly sworn, subscribe to and say that I am the Managing Director for the WASHINGTON PUBLIC POWER SUPPLY SYSTEM, the applicant herein; that I have the full authority to execute this oath; that I have reviewed the foregoing; and that to the best of my knowledge, information, and belief the statements made in it are true.

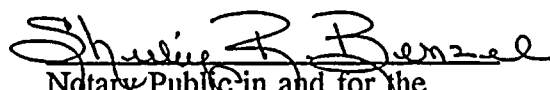
DATE 13 February, 1996



J. V. Parrish
Managing Director

On this date personally appeared before me J. V. PARRISH, to me known to be the individual who executed the foregoing instrument, and acknowledged that he signed the same as his free act and deed for the uses and purposes herein mentioned.

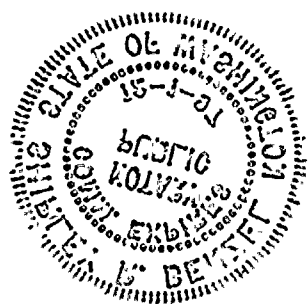
GIVEN under my hand and seal this 13 day of February 1996.



Notary Public in and for the
STATE OF WASHINGTON

Residing at Rochester, N.Y.

My Commission Expires 12/97



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RESPONSE TO GENERIC LETTER 95-07 - SUPPLEMENTAL INFORMATION

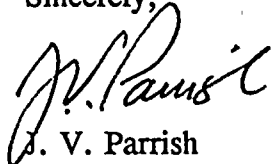
Attachment 1 contains (1) a discussion of the PLTB screening program evaluations and actions already completed; (2) a discussion of the additional evaluations to be completed by July 15, 1996; and (3) a summary of the justification for the 180-day completion schedule extension.

Attachment 2 is a logic diagram of the original PLTB valve screening process used for the WNP-2 safety-related power-operated gate valves.

Attachment 3 is a logic diagram of the current (ongoing) PLTB valve screening process used for the WNP-2 safety-related power-operated gate valves.

Should you have any questions or desire additional information regarding this matter, please call me or D. A. Swank at (509) 377-4563.

Sincerely,



J. V. Parrish
Managing Director
(Mail Drop 1023)
CDM/ml

cc: LJ Callan - NRC RIV
KE Perkins, Jr. - NRC RIV, Walnut Creek Field Office
NS Reynolds - Winston & Strawn
JW Clifford - NRC
DL Williams - BPA/399
NRC Sr. Resident Inspector - 927N

PLTB SCREENING EVALUATIONS AND ACTIONS ALREADY COMPLETED

The original PLTB screening evaluations included only the WNP-2 GL 89-10 Program valves. This population consisted of approximately 100 safety-related motor-operated gate valves. Subsequent screening evaluations included an additional 12 safety-related air-operated gate valves. There are no safety-related hydraulically-operated or solenoid-operated gate valves at WNP-2. These evaluations were completed prior to the submittal of the Reference 2 response to GL 95-07. Attachment 2 is a logic diagram of the PLTB valve screening process that was used.

Valves with the potential for PLTB were determined from a review of relevant information, which included:

- WNP-2 Final Safety Analysis Report (FSAR)
- WNP-2 Technical Specifications
- WNP-2 Operating and Emergency Procedures
- WNP-2 GL 89-10 Program Requirements
- WNP-2 Motor Operated Valve Maintenance Records
- WNP-2 Surveillance Test Procedures
- WNP-2 Local Leak Rate Test (LLRT) Records
- WNP-2 Motor Operated Valve Design Basis Calculations
- WNP-2 System and Design Engineer Reviews
- Industry Events Reviews

The screening for Pressure Locking (PL) and Hydraulic Locking (henceforth termed thermally induced PL) included flexible-wedge disc and parallel sliding disc gate valves. The screening process was in accordance with NRC Special Study AEOD/S92-07, "Pressure Locking and Thermal Binding of Gate Valves," dated December 1992. Operating and testing modes were considered in the screening process.

PL occurs when pressure is trapped in the valve body-bonnet cavity of a flexible-wedge disc or parallel sliding disc gate valve such that the trapped pressure is at a higher pressure than the line pressure on either side of a closed disc. This typically results from a rapid depressurization of the upstream and/or downstream piping (e.g., due to a Loss of Coolant Accident (LOCA) or loss of feedwater). However, bonnet cavity pressurization can also be caused by the thermal expansion of trapped fluid in the bonnet cavity due to disc heating or an increase in the ambient air temperature. Both of these processes could potentially result in pressure being locked between the valve discs, causing the discs to be forced against the seats. The resultant drag force could increase the open (unseating or pullout) thrust requirements such that the valve would not open when actuated. Solid-wedge disc gate valves are not considered susceptible to PL because there is insufficient movement or flexibility for the upstream seat to seal (i.e., cannot seal on both seats simultaneously) and because there is no internal gate cavity to be pressurized or expanded. During the screening process, system operation was reviewed to determine if open operation of the valves was required after a potential PL condition existed. The screening



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process also included criteria to determine if a potential PL condition would be eliminated by repressurization of the upstream valve seat before valve operation.

Thermally induced PL is a subset of PL that occurs when trapped fluid (with no vapor or gas pockets) in a valve bonnet cavity is heated and expands due to the resulting pressure rise. Thermally induced PL could prevent the valve from opening when actuated due to the same increase in disc drag force as occurs in PL. The thermally induced PL effect is a rare industry occurrence and is difficult to reproduce even under ideal conditions. This effect is only a concern if the valve bonnet cavity is filled completely solid with fluid. It was assumed that if the valve bonnet orientation is above horizontal, the bonnet would trap vapor or gas at its high point and prevent the bonnet from becoming solid with fluid. If the bonnet is below horizontal, the bonnet area could be vented of all vapor or gas and be filled solid with fluid. Thus, the screening process included an evaluation of the valve orientation as well as evaluations of the potential temperature increases due to heat conduction through the piping or via the surrounding air. Valves with bonnets oriented above horizontal were determined not to be susceptible to thermally induced PL based on the screening criteria. Solid-wedge disc gate valves are not considered susceptible to thermally induced PL for the same reasons that they are not considered susceptible to PL (i.e., the valves cannot seal on both seats simultaneously and because there is no internal gate cavity to be pressurized or expanded). Therefore, solid-wedge disc gate valves were not screened for thermally induced PL.

If a wedge disc type gate valve is closed while at an elevated temperature, Thermal Binding (TB) can occur as the associated system cools. The valve body and discs mechanically interfere because of the different thermal expansion and contraction characteristics of the valve body, stem, and discs. The differences in thermal contraction increase the seat forces against the disc. The increased seat load results in additional drag forces and a corresponding increase in the thrust requirement to open the valve. This TB effect could prevent the valve from opening when actuated. High closing forces tend to increase the TB effect. It was assumed that TB would not occur in flexible-wedge disc or parallel sliding disc gate valves because of their inherent disc flexibility. These valves were developed specifically to address the potential for TB in high temperature applications. Therefore, the screening for TB was restricted to solid-wedge disc gate valves that close at high temperatures.

The PLTB susceptibility screening evaluations of the GL 89-10 safety-related motor-operated gate valves were performed jointly by the Supply System and a contracted valve expert. The 12 safety-related air-operated gate valves were subsequently screened for PLTB susceptibility by Supply System personnel. The evaluations concluded that none of the air-operated valves screened were susceptible to PL, thermally induced PL, or TB and none of the motor-operated valves screened were susceptible to thermally induced PL or TB. However, seven motor-operated valves were identified that required a disc bypass modification to prevent PL. Three of the seven have been modified. The remaining four valves were subsequently shown to have sufficient open thrust capability to overcome the additional PL load and were determined to be acceptable without modification. Nine additional motor-operated valves were identified as being marginally susceptible to PL where the PL condition could potentially affect open operation. These valves were typically small valves subject to low differential pressure during design basis

conditions. All nine valves were subsequently shown to be acceptable based on sufficient actuator thrust capability to overcome the additional PL load. One additional motor-operated valve was identified as being susceptible to PL during test conditions. Testing procedures were changed to preclude the potential for PL. The results of the calculations demonstrating the capability to overcome PL have been compared with industry test data and show the analyzed operating margins to be conservative.

The motor-operated valves identified as being susceptible (or marginally susceptible) to PL are documented in WNP-2 Pressure Locking and Thermal Binding Report WPPSS-ENT-0136, issued December 29, 1993. Operability evaluations of the susceptible valves were performed and the bases for operability are documented in Problem Evaluation Report (PER) 294-0074, dated February 1, 1994. As stated above, the valves found to be susceptible to PL were either subsequently determined to be operable or were modified to prevent PL. A copy of the PLTB report and PER 294-0074 were presented to the NRC inspectors that conducted the preliminary GL 89-10 closeout inspection (NRC Inspection 50-397/95-24) in July, 1995.

ADDITIONAL PLTB SCREENING EVALUATIONS AND ACTIONS - TO BE COMPLETED BY JULY 15, 1996

Comparison of the PLTB screening evaluations and actions already completed with Attachment 1 of GL 95-07, "Guidance for Addressing Pressure Locking and Thermal Binding of Power-Operated Gate Valves," indicates that the Supply System has already completed the 90-day requested actions and the majority of the 180-day requested actions. However, it was recognized that the previous screening evaluation criteria should be updated to incorporate information recently obtained from PLTB workshops, vendors, and utility testing. As a result, the Supply System has contracted with an engineering group with PLTB expertise to update the current PLTB screening criteria process and perform the additional screening evaluations determined necessary for completion of the 180-day requested actions of GL 95-07. These tasks are currently in progress. A discussion of the additional screening evaluations being performed is presented below. Attachment 3 is a logic diagram of the PLTB valve screening process that is currently in use.

The previous PLTB screening evaluations for thermally induced PL assumed that if the valve bonnet orientation is above horizontal, the bonnet would trap vapor or gas at its high point and prevent the bonnet from becoming solid with fluid. Since the thermally induced PL effect is only a concern if the valve bonnet cavity is filled completely solid with fluid, valves with their bonnets oriented above horizontal were determined not to be susceptible to thermally induced PL based on the screening criteria. It was later learned that valve bonnet orientation may be considered in the evaluations for thermally induced PL, but should not be used as screenout decision criteria. This information has been incorporated into the current screening process and the horizontal valve bonnet orientation decision block has been deleted from the current screening criteria for thermally induced PL. Solid-wedge disc gate valves are not considered susceptible to thermally induced PL because the valves cannot seal on both seats simultaneously and there is no internal gate cavity to be pressurized or expanded. Due to the changes to the screening criteria for thermally induced PL, approximately 16 flexible-wedge disc and parallel

sliding disc gate valves are currently being screened for susceptibility to thermally induced PL as part of the evaluation for GL 95-07 and will be completed by July 15, 1996.

The previous PLTB screening evaluations only screened solid-wedge disc gate valves for TB. Flexible-wedge disc and parallel sliding disc gate valves were excluded from TB screening based on their inherent disc flexibility and because these valves were designed specifically to address TB in high temperature applications. Parallel sliding disc gate valves are still not considered susceptible to TB because their design allows the unwedging forces to be relaxed during opening. However, industry data indicates that TB events have occurred on flexible-wedge disc gate valves. Therefore, approximately 22 GL 89-10 Program flexible-wedge disc gate valves are currently being screened for susceptibility to TB as part of the evaluation for GL 95-07 and will be completed by July 15, 1996.

The previous PLTB screening evaluations included approximately 100 GL 89-10 Program motor-operated gate valves and an additional 12 safety-related air-operated gate valves. There are also approximately 32 safety-related motor-operated and air-operated gate valves (non-GL 89-10 Program valves) that were not included in the scope of the previous PLTB screening evaluations. These additional valves are currently being screened as part of the evaluation for GL 95-07 and will be completed by July 15, 1996.

JUSTIFICATION FOR THE 180-DAY COMPLETION SCHEDULE EXTENSION

It does not appear that the ongoing PLTB screening evaluations of the additional safety-related gate valves (discussed above) will result in a condition outside the plant design bases or significantly affect operability. All of the valves scoped under the evaluations for GL 95-07 have been preliminarily screened for the potential for PLTB using the revised screening criteria specified in Attachment 3. Even though these new criteria are more restrictive than the previous criteria (Attachment 2), no additional valves, other than those already identified under previous screening evaluations, have yet been identified as being susceptible to PLTB. Formal documentation of these preliminary evaluations is ongoing and required to complete the requested actions for GL 95-07.

The additional 16 flexible-wedge disc or sliding parallel disc valves were preliminarily screened for thermally induced PL and determined not to be susceptible to thermally induced PL for the following reasons:

- Thermally induced PL is rare in the industry and is difficult to duplicate even under ideal conditions. Recent testing by Commonwealth Edison demonstrated that the venting of all non-condensable gases from valve bonnets (a necessary condition for thermally induced PL) is very difficult.
- It has been determined that the valves currently being screened have valve bonnets oriented above horizontal, which is the most favorable orientation for a non-condensable gas pocket to exist. Industry testing has demonstrated that the potential for thermally induced PL is substantially reduced for valves with bonnet cavity gas pockets.

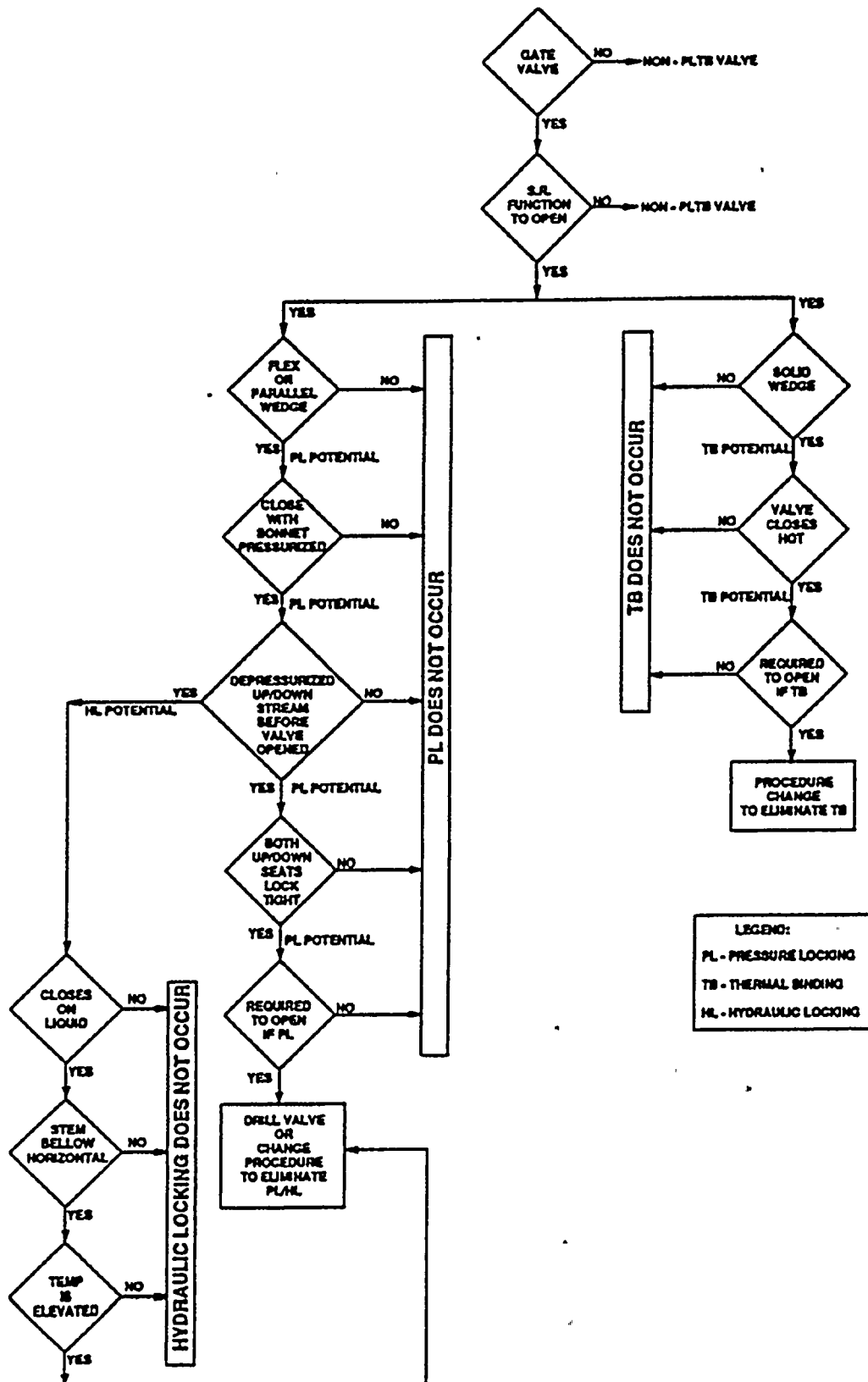
- Both internal system temperatures and external environmental temperatures were evaluated and were found to be below the level of thermally induced PL susceptibility concern.

The additional 22 flexible-wedge disc gate valves were preliminarily screened for TB and determined not to be susceptible to TB. Both internal system temperatures and external environmental temperatures were evaluated for maximum differential temperature conditions and the worst-case conditions were found to be below the level of TB susceptibility concern.

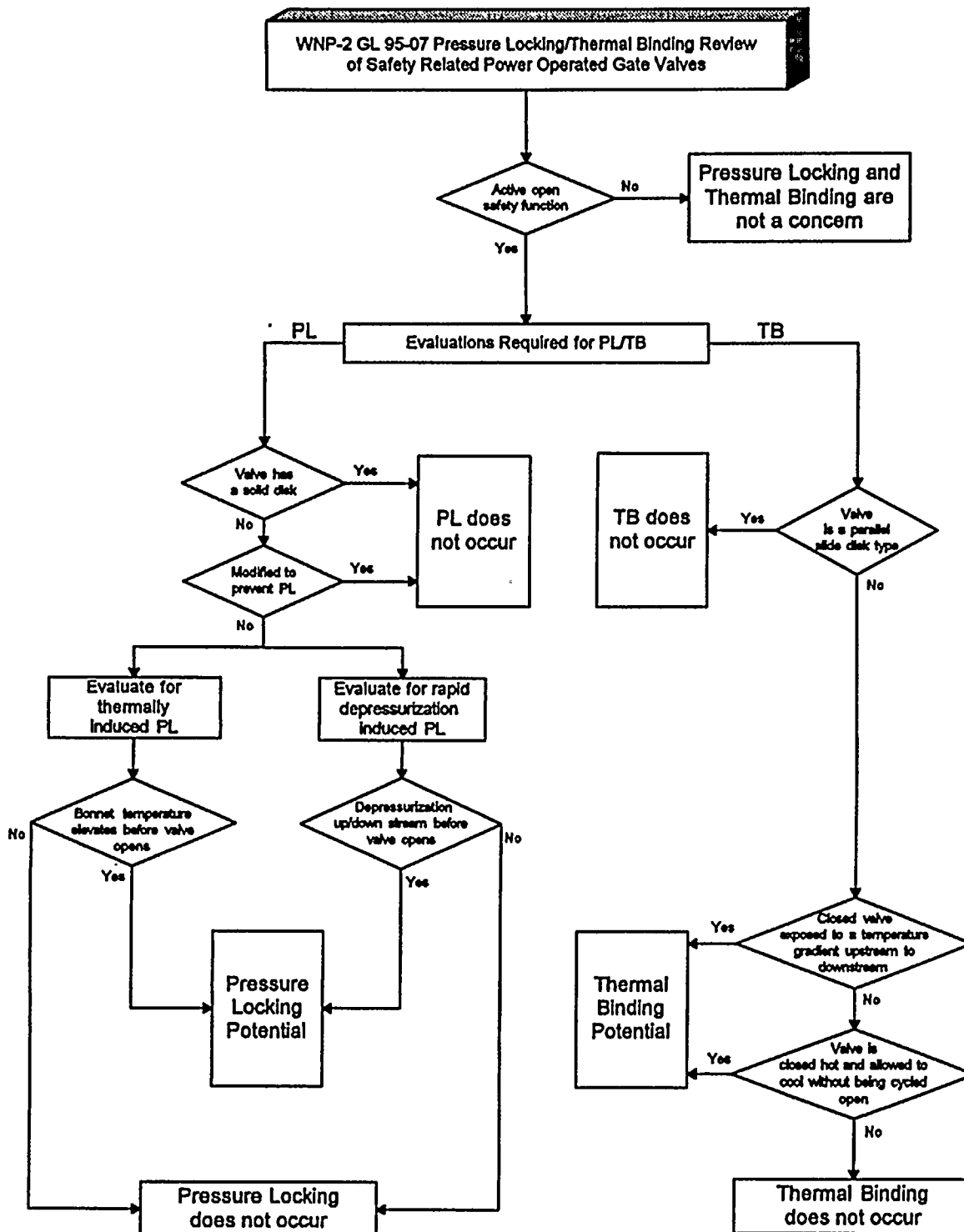
The 32 safety-related motor-operated and air-operated gate valves not included in the scope of previous evaluations were preliminarily screened for PLTB and determined not to be susceptible to PLTB. None of these valves were found to have an active open safety function and were screened out in accordance with the criteria specified in Attachment 3.

Therefore, based on the above justification, the Supply System believes that the 5 month extension to the 180-day schedule of GL 95-07 is reasonable considering the low potential safety significance. Corrective actions will be taken commensurate with safety significance for any valves determined to be susceptible to PLTB during the ongoing screening evaluation process. Operability evaluations and corrective actions will be properly documented and available for staff review.

PLTB VALVE SCREENING PROCESS



RESPONSE TO GENERIC LETTER 95-07 - SUPPLEMENTAL INFORMATION



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