The Light company

Houston Lighting & Power South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

February 13, 1996
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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

South Texas Project
Units 1 and 2
Docket Nos.: STN 50-498, STN 50-499
Response to NRC Generic Letter 95-07: "Pressure Locking
and Thermal Binding of Safety-Related Power-Operated Gate Valves"

Reference: NRC Generic Letter 95-07: "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves" dated August 17, 1995

Attached is South Texas Project's response to the information requested by the Nuclear Regulatory Commission in the referenced letter. If you have any questions regarding this response, please contact Mr. S. E. Thomas at (512) 972-7162 or me at (512) 972-8787.

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Vice President,
Nuclear Engineering

KJT/

Attachment: 180 Day Response to NRC Generic Letter 95-07

A056
1/1

c:

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
Houston Lighting & Power	)	Docket Nos. 50-498
Company, et al.,	)	50-499
	)	
South Texas Project	)	
Units 1 and 2	)	

AFFIDAVIT

I, T. H. Cloninger, being duly sworn, hereby depose and say that I am Vice President, Nuclear Engineering, of Houston Lighting & Power Company; that I am duly authorized to sign and file with the Nuclear Regulatory Commission the attached response to NRC Generic Letter 95-07; that I am familiar with the content thereof; and that the matters set forth therein are true and correct to the best of my knowledge and belief.

T.H. Cloninger
Vice President,
Nuclear Engineering

STATE OF TEXAS	)
	)
COUNTY OF MATAGORDA	)

Subscribed and sworn to before me, a Notary Public in and for the State of Texas, this 13th day of February, 1996.

LINDA RITTENBERRY
Notary Public, State of Texas
My Commission Expires 10/9/97

Linda Rittenberry
Notary Public in and for the
State of Texas

180 DAY RESPONSE TO NRC GENERIC LETTER 95-07

Reference: NRC Generic Letter 95-07: "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves" dated August 17, 1995

The referenced letter requested that licensees perform the following actions within 180 days of the issuance of the letter.

1. Evaluate the operational configurations of all safety-related power-operated (i.e., motor-operated, air-operated, and hydraulically operated) gate valves in its plant to identify valves that are susceptible to pressure locking or thermal binding.

   South Texas Project identified a population of 116 motor-operated gate valves screened into the NRC Generic Letter 89-10 program, 14 other motor-operated gate valves and 8 hydraulically operated gate valves to be applicable to the requirements of NRC Generic Letter 95-07. Of this population, 66 valves were evaluated to be potentially susceptible to pressure locking or thermal binding. A formal engineering calculation for evaluating the pressure locking and thermal binding phenomenon was reviewed and concluded that the 66 valves could perform their intended safety function and that no immediate operability concerns existed.

2. Perform further analyses as appropriate, and take needed corrective actions (or justify longer schedules), to ensure that the susceptible valves identified in Action 1 are capable of performing their intended safety function(s) under all modes of plant operation, including test configuration.

   The detailed analyses performed by the South Texas Project and needed corrective actions are summarized in Enclosure 3 to this attachment

Within 180 days from the date of NRC Generic Letter 95-07, licenses were requested to provide a summary description of the following information in a written response.

1. The susceptibility evaluation of operational configurations performed in response to (or consistent with) 180-day Requested Action 1, and the further analysis performed in response to (or consistent with) 180-day Requested Action 2, including the bases or criteria for determining that valves are or are not susceptible to pressure locking or thermal binding.

The criteria for determining valves susceptible to pressure locking or thermal binding is provided as Enclosure 1 to this attachment. Enclosure 3 to this attachment describes the detailed analysis performed to ensure susceptible valves are capable of performing their intended safety function.

2. The results of the susceptibility evaluation and the further analysis referred to in 1 above including a listing of the susceptible valves identified.

   The susceptibility evaluation results and a listing of the susceptible valves identified is provided as Enclosure 2 to this attachment.

3. The corrective actions, or other dispositioning, for the valves identified as susceptible to pressure locking or thermal binding, including: (a) equipment or procedural modifications completed and planned (including the completion schedule for such actions); and (b) justification for any determination that particular safety-related power-operated gate valves susceptible to pressure locking or thermal binding are acceptable as-is.

   The dispositioning for the valves identified as susceptible to pressure locking or thermal binding is provided as Enclosure 3 to this attachment.

Enclosure 1: Susceptibility evaluation criteria
Enclosure 2: Summary of susceptibility evaluation results
Enclosure 3: Summary of disposition of susceptible valves

SUSCEPTIBILITY EVALUATION CRITERIA

A screening evaluation of the operational configurations of all safety-related power (i.e. motor-operated, air-operated, and hydraulically operated) gate valves was completed to identify those valves that are potentially susceptible to pressure locking or thermal binding. South Texas Project Engineering Instruction EI-4.06, "MOV Design-Basis Review", was initially performed to verify compliance with NRC Generic Letter 89-10, Supplement 6. This review meets the requirements to perform the screening evaluation requested in NRC Generic Letter 95-07. Pages 22 through 26 of this Engineering Instruction provide the criteria used at the South Texas Project for determining valves susceptible to pressure locking or thermal binding and are included in this enclosure.

ATTACHMENT 1

MOV DESIGN-BASIS REVIEW CHECKLIST

(Sheet 5 of 10)

III. PRESSURE LOCKING & THERMAL BINDING ASSESSMENT

> **General Exclusion**
>
> Only gate valves will be considered susceptible to Pressure Locking and/or Thermal Binding. All other valve types are excluded from further evaluation.

A. Pressure Locking Evaluation Criteria

Pressure Locking can occur when a closed flexible-wedge or double-disc gate valve is required to open after a differential pressure condition has allowed higher pressure fluid into the bonnet cavity or when a bonnet cavity filled or partially filled with fluid is heated ("boiler effect"). The resulting pressure in the body-bonnet cavity (acting against the disk internal surfaces) could prevent the valve from being opened. This pressure locking phenomena is illustrated in Figures 1, 2, & 3 of Attachment 5 of this procedure. Plant procedures, system design criteria and system operating instructions for various operating modes must be reviewed to identify conditions that are susceptible to the Pressure Locking phenomena. Additionally, possible heat sources must be evaluated to determine the "boiler effect" potential.

Evaluation Criteria	YES	NO
1. Is the valve installed in a system with a process media containing compressible gases or fluid/gas mixtures other than steam (providing the system is not initially filled with water). If yes, valve may be excluded from further pressure locking evaluation. If no, GO TO step 2.		
NOTE If bonnet drain is provided, it must be connected to an open piping path (drain piping installed and any in-line valves are operable) to be exempted from further evaluation. The existence of an open bonnet drain path must be confirmed by use of the P&IDs, valve drawings, or discussions with knowledgeable plant personnel. Procedural use of valved drains to control pressure locking must be established.		
2. Does the valve have a valved bonnet drain, a bonnet relief valve, or a small hole through either the upstream side of the valve bridge or the valve disc ? If yes, valve may be excluded from further pressure locking evaluation. If no, GO TO step 3.		
3. Is valve always open during plant operation (Modes 1 - 4), closed during plant shutdown (Modes 5 & 6), and then re-opened to start the plant ? If yes, valve may be excluded from further pressure locking evaluation. If no, GO TO step 4.		

ATTACHMENT 1

MOV DESIGN-BASIS REVIEW CHECKLIST
(Sheet 6 of 10)

Evaluation Criteria	YES	NO
4. Is the Safety Function of the valve to go from the open position to the closed position ? If yes, GO TO step 5. If no, GO TO Step 7.		
5. Do Emergency Operating Procedures, Off-Normal Procedures, etc., require valve to be reopened from the closed position ? If yes, GO TO Step 7. If no, go to step 6.		
6. Do maintenance, operational, surveillance, or testing activities require closure of the valve during modes 1, 2, 3, or 4 ? If yes, GO TO Step 7. If no, valve may be eliminated from further pressure locking evaluation.		
7. Is valve in closed position when and if - normal ambient temperatures could cause "boiler effect" binding or - accident ambient temperatures could elevate the area temperature even a small amount above normal for a significant period (several hours) - heat might be conducted through the fluid and/or piping (within 20 ft of upstream and downstream isolation valves) including adjacent piping ? If yes, GO TO Step 11. If no, GO TO Step 8.		
8. Have symptoms or indications (Attachment 5) of Pressure Locking been identified on this valve during Hot Functional Testing or during subsequent operation since startup? (NOTE: Valve/Actuator maintenance history or summary should be reviewed to make this determination.) If yes, GO TO Step 11. If no, GO TO Step 9.		
9. Have symptoms or indications of Pressure Locking been identified on like valves in the same or other systems (of either unit) ? If yes, GO TO Step 11. If no, GO TO Step 10.		
10. Have OERs or the NUREG 1275 study (AEOD/S92-07, dated 12/92) identified this valve application as susceptible to the Pressure Locking phenomena ? If yes, GO TO Step 11. If no, the valve may be eliminated from further pressure locking consideration.		

NOTE

Corrective measures may include actions by personnel or physical plant modifications as identified in the AEOD study (AEOD/S92-07, dated 12/92). Actions to be taken by personnel should have been specifically incorporated into plant procedures and appropriate training accomplished.

ATTACHMENT 1

MOV DESIGN-BASIS REVIEW CHECKLIST
(Sheet 7 of 10)

Corrective Measures	YES	NO
11. Have specific corrective measures been implemented to prevent the occurrence of Pressure Locking or Bonnet Overpressurization phenomena. If yes, no further Pressure Locking evaluation is required; provide written clarification of exclusion justification. If no, valve is susceptible to Pressure Locking or Bonnet Overpressurization and must undergo further analysis and/or corrective action to assure the capability of the MOV to overcome the potential Pressure Locking or Bonnet Overpressurization phenomena. Provide written explanation of potential Pressure Locking or Bonnet Overpressurization phenomena. (See Section C "Conclusion")		

B. Thermal Binding Evaluation Criteria

Thermal Binding can occur when valves are closed hot and allowed to cool before being reopened. The Thermal Binding phenomena are illustrated in Figures 4 & 5 of Attachment 5. Plant procedures, system design criteria and system operating instructions must be reviewed to determine the valve functions and system operating conditions for the various operating modes.

Evaluation Criteria	YES	NO
1. Is valve located in a system with maximum operating temperatures above ambient ? If yes, GO TO step 2. If no, valve may be excluded from further Thermal Binding evaluation.		
2. Is valve always open during plant operation (Modes 1 - 4), closed during plant shutdown (Modes 5 & 6), and then re-opened to start the plant ? If yes, valve may be excluded from further thermal binding evaluation. If no, GO TO step 3.		
3. Is the Safety Function of the valve to go from the open position to the closed position ? If yes, GO TO step 4. If no, GO TO Step 7.		
4. Do Emergency Operating Procedures, Off Normal Procedures, etc., require valve to be reopened from the closed position ? If yes, GO TO Step 7. If no, GO TO step 5.		
5. Do maintenance, operational, surveillance, or testing activities require closure of the valve during modes 1, 2, 3, or 4 ? If yes, GO TO Step 6. If no, the valve may be eliminated from further thermal binding evaluation.		

ATTACHMENT 1

MOV DESIGN-BASIS REVIEW CHECKLIST
(Sheet 8 - 10)

Evaluation Criteria	YES	NO
6. Could maintenance, operational, surveillance, or testing activities leave the valve in a closed position during moderate decreases (>10°F) in process temperature ? (If the valve undergoes only stroke-time testing or similar surveillance activities which are of such short time duration as to preclude appreciable temperature changes, it may be eliminated from further Thermal Binding evaluation.) If yes, GO TO Step 10. If no, Go TO Step 7.		
7. Have symptoms or indications (see Attachment 5) of Thermal Binding been identified on this valve during Hot Functional Testing or during subsequent operation since startup? (NOTE: Valve/Actuator maintenance history or summary can be reviewed to make this determination.) If yes, GO TO Step 10. If no, GO TO step 8.		
8. Have symptoms or indications of Thermal Binding been identified on like valves in the same or other systems (either unit) ? If yes, GO TO Step 10. If no, GO TO Step 9.		
9. Have OERs or the AEOD study (AEOD/S92-07, dated 12/92) identified this valve application as susceptible to the Thermal Binding phenomena ? If yes, GO TO Step 10. If no, valve may be eliminated from further Thermal Binding evaluation .		
Corrective Measures	YES	NO
NOTE Corrective measures may include actions by personnel or physical plant modifications as identified in the AEOD study (AEOD/S92-07, dated 12/92). Actions to be taken by personnel should have been specifically incorporated into plant procedures and appropriate training accomplished.		
10. Have specific corrective measures been implemented to prevent the occurrence of Thermal Binding phenomena. If yes, valve may be eliminated from further analysis for Thermal Binding. If not, valve is susceptible to Thermal Binding and must undergo further analysis and/or corrective action to assure the capability of the MOV to overcome the potential Thermal Binding phenomena. (See Section C "Conclusion")		

ATTACHMENT 1

MOV DESIGN-BASIS REVIEW CHECKLIST
(Sheet 9 of 10)

C. Conclusion

Further Pressure Locking or Thermal Binding Analysis is required (circle one)	YES	NO
Note: If YES, See Attachment 6 for Appropriate Data Sheets. __________ ___/___/___ __________ Name Date Signature		

Pressure Locking and/or Thermal Binding Analysis is Included as Calculation __________
__________ ___/___/___ __________ Name Date Signature

NOTE: Obtain the appropriate calculation subnumber from Calc. MC-6441 log sheet & enter the calculation number in the block above. Attach a copy of the resolution/summary sheets to the Check List.

SUMMARY OF SUSCEPTIBILITY EVALUATION RESULTS

A screening criteria matrix was developed to summarize the results of each criteria used in South Texas Project's Engineering Instruction EI-4.06 for assessing gate valve susceptibility to pressure locking and thermal binding. The matrix of screening criteria and results for the safety-related power-operated gate valves identified within the scope of NRC Generic Letter 95-07 are included as pages 2 through 5 of this enclosure. The valves identified as susceptible to pressure locking or thermal binding are found on page 2 and 3 of this enclosure. It should be noted that only 8 additional valves were identified that were not originally identified by South Texas Project during the NRC Generic Letter 89-10, Supplement 6 compliance activities.

Legend for reviewing the screening criteria matrix:

Each valve is identified by its valve identification number used at the South Texas Project (VLV TPNS), normal position and whether the valve was originally screened as part of the NRC Generic Letter 89-10 program. A description of the purpose of each valve is discussed in Enclosure 3 to this attachment and is referenced by VLV TPNS.

The results of each evaluation criteria used in Engineering Instruction EI-4.06 and found in enclosure 1 to this attachment are listed in the screening criteria matrix. As an example, criteria "PL1" refers to evaluation criteria 1 under paragraph III.A, "Pressure Locking Evaluation Criteria", and criteria "TB1" refers to evaluation criteria 1 under paragraph III.B, "Thermal Binding Evaluation Criteria", in Engineering Instruction EI-4.06. The results of the remaining screening criteria follow a similar legend. The overall conclusion if the valve is susceptible to pressure locking or thermal binding is listed.

MATRIX OF SCREENING CRITERIA AND RESULTS

VLV TPNS	Normal Position	GL 89-10	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8	PL9	PL10	PL11	**Susceptible to PL**	TB1	TB2	TB3	TB4	TB5	TB6	TB7	TB8	TB9	TB10	**Susceptible to TB**
1R141XRC0001A	NO	Y	N	N	N	Y	N	Y	Y	N	N	Y	N	**Y**	Y	N	Y	N	Y	Y	N	N	Y	N	Y
1R141XRC0001B	NO	Y	N	N	N	Y	N	Y	Y	N	N	Y	N	**Y**	Y	N	Y	N	Y	Y	N	N	Y	N	Y
1R142XRC0001A	NO	Y	N	N	N	Y	N	Y	Y	N	N	Y	N	**Y**	Y	N	Y	N	Y	Y	N	N	Y	N	Y
1R142XRC0001B	NO	Y	N	N	N	Y	N	Y	Y	N	N	Y	N	**Y**	Y	N	Y	N	Y	Y	N	N	Y	N	Y
2N121XSI0016A	NC	Y	N	N	N	Y	Y	N/A	Y	N/A	N/A	N/A	N	**Y**	Y	N	N	N/A	N/A	N/A	Y	N/A	N/A	N	Y
2N121XSI0016B	NC	Y	N	N	N	Y	Y	N/A	Y	N/A	N/A	N/A	N	**Y**	Y	N	N	N/A	N/A	N/A	Y	N/A	N/A	N	Y
2N121XSI0016C	NC	Y	N	N	N	Y	Y	N/A	Y	N/A	N/A	N/A	N	**Y**	Y	N	N	N/A	N/A	N/A	Y	N/A	N/A	N	Y
2N122XSI0016A	NC	Y	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	N	N	N/A	N/A	N/A	Y	N/A	N/A	N	Y
2N122XSI0016B	NC	Y	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	N	N	N/A	N/A	N/A	Y	N/A	N/A	N	Y
2N122XSI0016C	NC	Y	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	N	N	N/A	N/A	N/A	Y	N/A	N/A	N	Y
1R161XRH0060A	NC	Y	N	N	N	Y	Y	Y	Y	N	N	Y	N	**Y**	Y	N	Y	Y	Y	Y	N	N	Y	N	Y
1R161XRH0060B	NC	Y	N	N	N	Y	Y	Y	Y	N	N	Y	N	**Y**	Y	N	Y	Y	Y	Y	N	N	Y	N	Y
1R161XRH0060C	NC	Y	N	N	N	Y	Y	Y	Y	N	N	Y	N	**Y**	Y	N	Y	Y	Y	Y	N	N	Y	N	Y
1R162XRH0060A	NC	Y	N	N	N	Y	Y	Y	Y	N	N	Y	N	**Y**	Y	N	Y	Y	Y	Y	N	N	Y	N	Y
1R162XRH0060B	NC	Y	N	N	N	Y	Y	Y	Y	N	N	Y	N	**Y**	Y	N	Y	Y	Y	Y	N	N	Y	N	Y
1R162XRH0060C	NC	Y	N	N	N	Y	Y	Y	Y	N	N	Y	N	**Y**	Y	N	Y	Y	Y	Y	N	N	Y	N	Y
1R161XRH0061A	NC	Y	N	N	N	N	Y	N/A	Y	Y	Y	N/A	N	**Y**	N	N	N	N/A	N/A	N/A	Y	N/A	N/A	N	Y
1R161XRH0061B	NC	Y	N	N	N	N	Y	N/A	Y	Y	Y	N/A	N	**Y**	N	N	N	N/A	N/A	N/A	Y	N/A	N/A	N	Y
1R161XRH0061C	NC	Y	N	N	N	N	Y	N/A	Y	Y	Y	N/A	N	**Y**	N	N	N	N/A	N/A	N/A	Y	N/A	N/A	N	Y
1R162XRH0061A	NC	Y	N	N	N	N	Y	N/A	Y	Y	Y	N/A	N	**Y**	N	N	N	N/A	N/A	N/A	Y	N/A	N/A	N	Y
1R162XRH0061B	NC	Y	N	N	N	N	Y	N/A	Y	Y	Y	N/A	N	**Y**	N	N	N	N/A	N/A	N/A	Y	N/A	N/A	N	Y
1R162XRH0061C	NC	Y	N	N	N	N	Y	N/A	Y	Y	Y	N/A	N	**Y**	N	N	N	N/A	N/A	N/A	Y	N/A	N/A	N	Y
2R161XRH0066A	NC	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	N	Y	Y	N/A	N/A	Y	N	Y
2R161XRH0066B	NC	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	N	Y	Y	N/A	N/A	Y	N	Y
2R162XRH0066A	NC	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	N	Y	Y	N/A	N/A	Y	N	Y
2R162XRH0066B	NC	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	N	Y	Y	N/A	N/A	Y	N	Y
2R161XRH0067A	NC	Y	N	N	N	N	Y	N/A	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	Y	Y	N	N	N	N	N/A	**N**
2R161XRH0067B	NC	Y	N	N	N	N	Y	N/A	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	Y	Y	N	N	N	N	N/A	**N**
2R161XRH0067C	NC	Y	N	N	N	N	Y	N/A	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	Y	Y	N	N	N	N	N/A	**N**
2R162XRH0067A	NC	Y	N	N	N	N	Y	N/A	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	Y	Y	N	N	N	N	N/A	**N**
2R162XRH0067B	NC	Y	N	N	N	N	Y	N/A	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	Y	Y	N	N	N	N	N/A	**N**
2R162XRH0067C	NC	Y	N	N	N	N	Y	N/A	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	Y	Y	N	N	N	N	N/A	**N**
2N121XSI0008A	NC	Y	N	N	N	N	N/A	N/A	Y	N/A	N/A	N/A	N	**Y**	N	N	N	Y	N/A	N/A	N	N/A	N/A	N	Y
2N121XSI0008B	NC	Y	N	N	N	N	N/A	N/A	Y	N/A	N/A	N/A	N	**Y**	N	N	N	Y	N/A	N/A	N	N/A	N/A	N	Y
2N121XSI0008C	NC	Y	N	N	N	N	N/A	N/A	Y	N/A	N/A	N/A	N	**Y**	N	N	N	Y	N/A	N/A	N	N/A	N/A	N	Y
2N122XSI0008A	NC	Y	N	N	N	N	N/A	N/A	Y	N/A	N/A	N/A	N	**Y**	N	N	N	Y	N/A	N/A	N	N/A	N/A	N	Y
2N122XSI0008B	NC	Y	N	N	N	N	N/A	N/A	Y	N/A	N/A	N/A	N	**Y**	N	N	N	Y	N/A	N/A	N	N/A	N/A	N	Y
2N122XSI0008C	NC	Y	N	N	N	N	N/A	N/A	Y	N/A	N/A	N/A	N	**Y**	N	N	N	Y	N/A	N/A	N	N/A	N/A	N	Y

MATRIX OF SCREENING CRITERIA AND RESULTS

VLV TPNS	Normal Position	GL 89-10	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8	PL9	PL10	PL11	Susceptible to PL	TB1	TB2	TB3	TB4	TB5	TB6	TB7	TB8	TB9	TB10	Susceptible to TB
2R161XRH0019A	NC	Y	N	N	N	N	N/A	N/A	Y	N/A	N/A	N/A	N	**Y**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Y
2R161XRH0019B	NC	Y	N	N	N	N	N/A	N/A	Y	N/A	N/A	N/A	N	**Y**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Y
2R161XRH0019C	NC	Y	N	N	N	N	N/A	N/A	Y	N/A	N/A	N/A	N	**Y**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Y
2R162XRH0019A	NC	Y	N	N	N	N	N/A	N/A	Y	N/A	N/A	N/A	N	**Y**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Y
2R162XRH0019B	NC	Y	N	N	N	N	N/A	N/A	Y	N/A	N/A	N/A	N	**Y**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Y
2R162XRH0019C	NC	Y	N	N	N	N	N/A	N/A	Y	N/A	N/A	N/A	N	**Y**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Y
2R161XRH0031A	NO	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	N	N	Y	Y	Y	Y	Y	N/A	N/A	N	Y
2R161XRH0031B	NO	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	N	N	Y	Y	Y	Y	Y	N/A	N/A	N	Y
2R161XRH0031C	NO	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	N	N	Y	Y	Y	Y	Y	N/A	N/A	N	Y
2R162XRH0031A	NO	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	N	N	Y	Y	Y	Y	Y	N/A	N/A	N	Y
2R162XRH0031B	NO	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	N	N	Y	Y	Y	Y	Y	N/A	N/A	N	Y
2R162XRH0031C	NO	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	N	N	Y	Y	Y	Y	Y	N/A	N/A	N	Y
2R171XCV0003	NO/C	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	N	N	N	Y	N	Y	N/A	N/A	N/A	N	Y
2R171XCV0006	NO/C	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	N	N	N	Y	Y	N	Y	Y	Y	N	Y
2R172XCV0003	NO/C	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	N	N	N	Y	N	Y	N/A	N/A	N/A	N	Y
2R172XCV0006	NO/C	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	N	N	N	Y	Y	N	Y	Y	Y	N	Y
2R171XCV0112B	NO	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	N	Y	N	N	N	N	N/A	**N**
2R171XCV0112C	NC	Y	N	N	N	N	Y	Y	Y	N/A	N/A	N/A	N	**Y**	Y	N	N	Y	N/A	N/A	N	N	N	N/A	**N**
2R171XCV0113A	NO	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	N	Y	N	N	N	N	N/A	**N**
2R171XCV0113B	NC	Y	N	N	N	N	Y	Y	Y	N/A	N/A	N/A	N	**Y**	Y	N	N	Y	N/A	N/A	N	N	N	N/A	**N**
2R172XCV0112B	NO	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	N	Y	N	N	N	N	N/A	**N**
2R172XCV0112C	NC	Y	N	N	N	N	Y	Y	Y	N/A	N/A	N/A	N	**Y**	Y	N	N	Y	N/A	N/A	N	N	N	N/A	**N**
2R172XCV0113A	NO	Y	N	N	N	Y	N	Y	Y	N/A	N/A	N/A	N	**Y**	Y	N	Y	N	Y	N	N	N	N	N/A	**N**
2R172XCV0113B	NC	Y	N	N	N	N	Y	Y	Y	N/A	N/A	N/A	N	**Y**	Y	N	N	Y	N/A	N/A	N	N	N	N/A	**N**
1R171XCV0465	NO	Y	N	N	N	Y	Y	N	N/A	N/A	N/A	N/A	N	**Y**	Y	N	Y	N	N	Y	Y	Y	Y	N	Y
1R171XCV0468	NO	Y	N	N	N	Y	N	Y	N	N	Y	N/A	N	**Y**	Y	N	Y	N	Y	Y	N	Y	Y	N	Y
1R172XCV0465	NO	Y	N	N	N	Y	Y	N	N/A	N/A	N/A	N/A	N	**Y**	Y	N	Y	N	N	Y	Y	Y	Y	N	Y
1R172XCV0468	NO	Y	N	N	N	Y	N	Y	N	N	Y	N/A	N	**Y**	Y	N	Y	N	Y	Y	N	Y	Y	N	Y

MATRIX OF SCREENING CRITERIA AND RESULTS

VLV TPNS	Normal Position	GL 89-10	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8	PL9	PL10	PL11	Susceptible to PL	TB1	TB2	TB3	TB4	TB5	TB6	TB7	TB8	TB9	TB10	Susceptible to TB
A1FWFV7141	NO	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	Y	Y	N/A	N/A	N	N	N	Y	**N**
A1FWFV7142	NO	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	Y	Y	N/A	N/A	N	N	N	Y	**N**
A1FWFV7143	NO	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	Y	Y	N/A	N/A	N	N	N	Y	**N**
A1FWFV7144	NO	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	Y	Y	N/A	N/A	N	N	N	Y	**N**
A2FWFV7141	NO	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	Y	Y	N/A	N/A	N	N	N	Y	**N**
A2FWFV7142	NO	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	Y	Y	N/A	N/A	N	N	N	Y	**N**
A2FWFV7143	NO	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	Y	Y	N/A	N/A	N	N	N	Y	**N**
A2FWFV7144	NO	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	Y	Y	N/A	N/A	N	N	N	Y	**N**
3R201TCC0339	NO	*	N	N	N	N	Y	N	N	N/A	N/A	N/A	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
3R201TCC0356	NO	*	N	N	N	N	Y	N	N	N/A	N/A	N/A	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
3R201TCC0374	NO	*	N	N	N	N	Y	N	N	N/A	N/A	N/A	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
3R201TCC0390	NO	*	N	N	N	N	Y	N	N	N/A	N/A	N/A	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
3R201TCC0392	NO	*	N	N	N	N	N	N	N	N	N	N	N/A	**N**	Y	N	N	N	N/A	N/A	N	N	N	N/A	**N**
3R202TCC0339	NO	*	N	N	N	N	Y	N	N	N/A	N/A	N/A	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
3R202TCC0356	NO	*	N	N	N	N	Y	N	N	N/A	N/A	N/A	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
3R202TCC0374	NO	*	N	N	N	N	Y	N	N	N/A	N/A	N/A	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
3R202TCC0390	NO	*	N	N	N	N	Y	N	N	N/A	N/A	N/A	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
3R202TCC0392	NO	*	N	N	N	N	N	N	N	N	N	N	N/A	**N**	Y	N	N	N	N/A	N/A	N	N	N	N/A	**N**
2N101XCS0001A	NC	Y	N	N	N	N	N/A	N/A	N	N/A	N/A	N	N/A	**N**	Y	N	N	N/A	N/A	N/A	N	N	N	N/A	**N**
2N101XCS0001B	NC	Y	N	N	N	N	N/A	N/A	N	N/A	N/A	N	N/A	**N**	Y	N	N	N/A	N/A	N/A	N	N	N	N/A	**N**
2N101XCS0001C	NC	Y	N	N	N	N	N/A	N/A	N	N/A	N/A	N	N/A	**N**	Y	N	N	N/A	N/A	N/A	N	N	N	N/A	**N**
2N102XCS0001A	NC	Y	N	N	N	N	N/A	N/A	N	N/A	N/A	N	N/A	**N**	Y	N	N	N/A	N/A	N/A	N	N	N	N/A	**N**
2N102XCS0001B	NC	Y	N	N	N	N	N/A	N/A	N	N/A	N/A	N	N/A	**N**	Y	N	N	N/A	N/A	N/A	N	N	N	N/A	**N**
2N102XCS0001C	NC	Y	N	N	N	N	N/A	N/A	N	N/A	N/A	N	N/A	**N**	Y	N	N	N/A	N/A	N/A	N	N	N	N/A	**N**
2R171XCV0023	NO	Y	N	N	N	N	Y	Y	N	N	N	N	N/A	**N**	Y	N	Y	Y	N/A	N/A	N	N	N	N/A	**N**
2R171XCV0024	NO	Y	N	N	N	N	Y	Y	N	N	N	N	N/A	**N**	Y	N	Y	Y	N/A	N/A	N	N	N	N/A	**N**
2R171XCV0025	NO	Y	N	N	N	Y	N	N/A	N	N	N	N	N/A	**N**	Y	N	Y	Y	N/A	N/A	N	N	N	N/A	**N**
2R172XCV0023	NO	Y	N	N	N	N	Y	Y	N	N	N	N	N/A	**N**	Y	N	Y	Y	N/A	N/A	N	N	N	N/A	**N**
2R172XCV0024	NO	Y	N	N	N	N	Y	Y	N	N	N	N	N/A	**N**	Y	N	Y	Y	N/A	N/A	N	N	N	N/A	**N**
2R172XCV0025	NO	Y	N	N	N	Y	N	N/A	N	N	N	N	N/A	**N**	Y	N	Y	Y	N/A	N/A	N	N	N	N/A	**N**
2R171XCV0218	NC	Y	N	N	N	N	N/A	N/A	N	N	N	N	N/A	**N**	Y	N	N	Y	N/A	N/A	N	N	N	N/A	**N**
2R172XCV0218	NC	Y	N	N	N	N	N/A	N/A	N	N	N	N	N/A	**N**	Y	N	N	Y	N/A	N/A	N	N	N	N/A	**N**
2R171XCV8377A	NO	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2R172XCV8377A	NO	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2R171XCV8377B	NO	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2R172XCV8377B	NO	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2Q271TFP0756	NC	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2Q272TFP0756	NC	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**

* Was originally GL 89-10 then removed from scope. The EI 4.06 evaluation was performed as part of GL 89-10.

MATRIX OF SCREENING CRITERIA AND RESULTS

VLV TPNS	Normal Position	GL 89-10	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8	PL9	PL10	PL11	**Susceptible to PL**	TB1	TB2	TB3	TB4	TB5	TB6	TB7	TB8	TB9	TB10	**Susceptible to TB**
2N121XSI0001A	NO	Y	N	N	N	N	N/A	N/A	N	N	N	N	N/A	**N**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N121XSI0001B	NO	Y	N	N	N	N	N/A	N/A	N	N	N	N	N/A	**N**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N121XSI0001C	NO	Y	N	N	N	N	N/A	N/A	N	N	N	N	N/A	**N**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N122XSI0001A	NO	Y	N	N	N	N	N/A	N/A	N	N	N	N	N/A	**N**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N122XSI0001B	NO	Y	N	N	N	N	N/A	N/A	N	N	N	N	N/A	**N**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N122XSI0001C	NO	Y	N	N	N	N	N/A	N/A	N	N	N	N	N/A	**N**	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N121XSI0004A	NO	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	Y	N	Y	N	Y	N	N	N	N	N/A	**N**
2N121XSI0004B	NO	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	Y	N	Y	N	Y	N	N	N	N	N/A	**N**
2N121XSI0004C	NO	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	Y	N	Y	N	Y	N	N	N	N	N/A	**N**
2N122XSI0004A	NO	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	Y	N	Y	N	Y	N	N	N	N	N/A	**N**
2N122XSI0004B	NO	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	Y	N	Y	N	Y	N	N	N	N	N/A	**N**
2N122XSI0004C	NO	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	Y	N	Y	N	Y	N	N	N	N	N/A	**N**
2N121XSI0006A	NO	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N121XSI0006B	NO	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N121XSI0006C	NO	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N122XSI0006A	NO	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N122XSI0006B	NO	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N122XSI0006C	NO	Y	N	N	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N121XSI0018A	NO	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N121XSI0018B	NO	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N121XSI0018C	NO	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N122XSI0018A	NO	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N122XSI0018B	NO	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N122XSI0018C	NO	Y	N	N	N	Y	N	Y	N	N	N	N	N/A	**N**	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N121XSI0039A	NO	*	N	N	N	N	N/A	N/A	N	N/A	N/A	N	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N121XSI0039B	NO	*	N	N	N	N	N/A	N/A	N	N/A	N/A	N	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N121XSI0039C	NO	*	N	N	N	N	N/A	N/A	N	N/A	N/A	N	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N122XSI0039A	NO	*	N	N	N	N	N/A	N/A	N	N/A	N/A	N	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N122XSI0039B	NO	*	N	N	N	N	N/A	N/A	N	N/A	N/A	N	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2N122XSI0039C	NO	*	N	N	N	N	N/A	N/A	N	N/A	N/A	N	N/A	**N**	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N**
2Q061TED0064	NO	Y	N	N	N	Y	Y	Y	N	N	N	N	N/A	**N**	Y	N	Y	Y	Y	N	N	N	N	N/A	**N**
2Q062TED0064	NO	Y	N	N	N	Y	Y	Y	N	N	N	N	N/A	**N**	Y	N	Y	Y	Y	N	N	N	N	N/A	**N**
2R302TWL0312	NO	Y	N	N	N	Y	Y	Y	N	N	N	N	N/A	**N**	Y	N	Y	Y	N/A	N/A	N	N	Y	Y	**N**
2R301TWL0312	NO	Y	N	N	N	Y	Y	Y	N	N	N	N	N/A	**N**	Y	N	Y	Y	N/A	N/A	N	N	Y	Y	**N**

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SUMMARY OF DISPOSITION OF SUSCEPTIBLE VALVES

A. Modifications or Procedure Changes

1. South Texas Project has modified or plans to modify the following valves to remove susceptibilily to pressure locking:

2R171XCV0003	Hole in disc
2R172XCV0003	Hole in disc
2R171XCV0006	Hole in disc
2R172XCV0006	Hole in disc
2N121XSI0016A	Hole in disc scheduled for October 1996
2N122XSI0016A	Hole in disc
2N121XSI0016B	Hole in disc scheduled for September 1996
2N122XSI0016B	Hole in disc
2N121XSI0016C	Hole in disc scheduled for August 1996
2N122XSI0016C	Hole in disc

2. South Texas Project has revised the following procedures to remove susceptibility of thermal binding:

0POP02-SI-0002:	"Safety Injection Initial Lineup", the change assures a column of water exists between the sump and valves. (2N121XSI0016A, 2N122XSI0016A, 2N121XSI0016B, 2N122XSI0016B, 2N121XSI0016C, 2N122XSI0016C)
0POP02-RH-0001:	"Residual Heat Removal System Operation", the change enhanced the cooldown by jogging the Residual Heat Removal system pump to assure thermal binding does not occur.(2R161XRH0031A, 2R162XRH0031A, 2R161XRH0031B, 2R162XRH0031B, 2R161XRH0031C, 2R162XRH0031C)

3. One of the Residual Heat Removal System suction isolation valves will be diagnostically tested during a plant shutdown to cold shutdown conditions utilizing the Residual Heat Removal System to measure the actual effects of thermal binding during these conditions. The test results will be evaluated to determine if any additional actions are necessary to prevent thermal binding of the following valves:

1R161XRH00060A	1R162XRH00060A	1R161XRH00060B
1R162XRH00060B	1R161XRH00060C	1R162XRH00060C
1R161XRH00061A	1R162XRH00061A	1R161XRH00061B
1R162XRH00061B	1R161XRH00061C	1R162XRH00061C

All other valves identified as being potentially susceptible to pressure locking or thermal binding effects have been dispositioned as USE-AS-IS based on the justifications outlined below in paragraph C.

B. Summary of Enclosure 3 Organization

Enclosure 3 was developed to provide a summary of the various valves determined to be susceptible to pressure locking or thermal binding. Valves are presented individually or with other valves with similar functions. The valve nomenclature starts each section followed by the safety/normal functions, Probabilistic Safety Analysis Ranking, and Environmental Temperatures.

The Summary of Calculation Results provides a brief overview of the design features of the selected valves.

Paragraphs a. and b. in each valve(s) summary briefly describe the pressure locking and thermal binding conditions considered during the analysis. The resultant additional loads calculated for each effect is also quantified.

Paragraph c. in each valve(s) summary provides a conclusion of completed or planned corrective actions, if applicable. This section also provides the basis and justification for actions taken.

C. Establishment of Justifications for Dispositions

All valves have been evaluated analytically and found to have sufficient margins to assure continued operation. In addition, performance criteria has been established for evaluating pressure locking or thermal binding margins during periodic diagnostic testing as outlined in procedure OPEP06-ZE-0001, "Diagnostic Testing Error Analysis and Acceptance Criteria". This procedure assures a 10% margin (including instrument errors) is maintained below degraded voltage actuator capability (DVAC). This assures that any degradations in critical design parameters (specifically stem factor degradation or valve factor/coefficient of friction) is enveloped by the analytical assumptions.

South Texas Project has participated and been in communication with other utilities and the Westinghouse User's group during the development of industry testing of various analytical methodologies and assumptions. As a result of this interface, South Texas Project has developed analytical tools for assessing the pressure locking and thermal binding phenomena.

The pressure locking analysis methodology used by the South Texas Project is based on specific flat plate models from Roark's Formulas for Stress & Strain. Specifically, this methodology determines the total force required to open the valve under a pressure locking scenario by solving the four components of this required force. The four components of the force are the pressure locking component, the static unseating component, the piston effect component, and the "reverse piston effect" component.

The thermal binding analysis methodology used by the South Texas Project quantifies the increase in seat contact force utilizing equations and guidance outlined in NUREG/CR-5807, "Improvements in Motor Operated Gate Valve Design and Prediction Models for Nuclear Power Plant Systems", dated Sept. 1990-April 1991 and Mark's Standard Handbook for Mechanical Engineers, eighth edition.

Probabilistic Safety Analysis was also considered during the dispositioning of susceptible valves. This, in conjunction with the available margin, helped provide the various justifications of continued acceptability. South Texas Project used probablistic risk information in combination with operator degraded voltage capability (DVAC) to provide added assurance that the recommended corrective actions were commenserate with the valve's expected response and the confidence that there is sufficient capability to achieve

that response. Risk contributions of susceptible valves were determined by using the Fussel-Vesely (FV) Risk Achievement Worth (RAW) importance values for Core Damage Frequency (CDF). Risk importance threshold levels were defined as follows:

- High @ FV > 0.005 & RAW >2
- Medium @ FV > 0.005 & RAW < 2 or FV < 0.005 & RAW >2
- Low @ FV < 0.005 & RAW <2

Deterministic margin was determined using the latest as-left static diagnostic thrust values including instrument errors and adding a 5% degradation consideration for stem factor (SF) and 5% degradation consideration for valve factor/coefficient of friction as compared to the design degraded voltage actuator capability (DVAC). Deterministic margin levels were defined as:

- High >25%
- Medium 10% - 25%,
- Low <10%.

A matrix of the results of the risk and deterministic justifications is provided on the next 3 pages of this enclosure. Finally, the summary of the various valves determined to be susceptible to pressure locking or thermal binding follows the matrix.

Conclusion:

South Texas Project has established a high level of confidence in our selection of corrective actions, analyses, and established margins. The following pages of this enclosure summarizes the design basis assumptions, analysis results and recommended corrective actions for all 66 potentially susceptible valves.

VLV TPNS	RISK RANKING	DETERMINISTIC MARGIN	SF/TEMP CORRECTED DETERMINISTIC MARGIN	DISPOSITION	JUSTIFICATION OF RECOMMENDED ACTIONS
1R141XRC0001A	H	H	H	USE-AS-IS	NO PL , TB IF CLOSED ONLY. HIGH DESIGN MARGIN CAPABILITY
1R141XRC0001B	H	H	H	USE-AS-IS	NO PL , TB IF CLOSED ONLY. HIGH DESIGN MARGIN CAPABILITY
1R142XRC0001A	H	H	H	USE-AS-IS	NO PL , TB IF CLOSED ONLY. HIGH DESIGN MARGIN CAPABILITY
1R142XRC0001B	H	H	H	USE-AS-IS	NO PL , TB IF CLOSED ONLY. HIGH DESIGN MARGIN CAPABILITY
2N121XSI0016A	H	L	H	MODIFY	HOLE IN DISC SCHEDULED/ ENHANCED PROCEDURE FOR TB
2N121XSI0016B	H	L	H	MODIFY	HOLE IN DISC SCHEDULED/ ENHANCED PROCEDURE FOR TB
2N121XSI0016C	H	L	H	MODIFY	HOLE IN DISC SCHEDULED/ ENHANCED PROCEDURE FOR TB
2N122XSI0016A	H	H	H	MODIFIED HOLE IN DISC	NO PL OR TB/ ENHANCED PROCEDURE FOR TB. HIGH DESIGN MARGIN
2N122XSI0016B	H	H	H	MODIFIED HOLE IN DISC	NO PL OR TB/ ENHANCED PROCEDURE FOR TB. HIGH DESIGN MARGIN
2N122XSI0016C	H	H	H	MODIFIED HOLE IN DISC	NO PL OR TB/ ENHANCED PROCEDURE FOR TB. HIGH DESIGN MARGIN
1R161XRH0060A	M	L	H	US-AS-IS See note 1	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. TB TEST OF A VALVE WILL CONFIRM LONG TERM FUNCTIONALITY. HIGH CORRECTED MARGIN
1R161XRH0060B	M	L	H	US-AS-IS See note 1	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. TB TEST OF A VALVE WILL CONFIRM LONG TERM FUNCTIONALITY. HIGH CORRECTED MARGIN
1R161XRH0060C	M	L	H	US-AS-IS See note 1	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. TB TEST OF A VALVE WILL CONFIRM LONG TERM FUNCTIONALITY. HIGH CORRECTED MARGIN
1R162XRH0060A	M	L	M	US-AS-IS See note 1	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. TB TEST OF A VALVE WILL CONFIRM LONG TERM FUNCTIONALITY.
1R162XRH0060B	M	L	H	US-AS-IS See note 1	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. TB TEST OF A VALVE WILL CONFIRM LONG TERM FUNCTIONALITY. HIGH CORRECTED MARGIN
1R162XRH0060C	M	L	H	US-AS-IS See note 1	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. TB TEST OF A VALVE WILL CONFIRM LONG TERM FUNCTIONALITY. HIGH CORRECTED MARGIN
1R161XRH0061A	M	L	H	US-AS-IS See note 1	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. TB TEST OF A VALVE WILL CONFIRM LONG TERM FUNCTIONALITY. HIGH CORRECTED MARGIN

Note1: One valve within the group of (RH0060 and RH0061) will be tested during the next refueling outage scheduled for the Spring of 1997.

VLV TPNS	RISK RANKING	DETERMINISTIC MARGIN	SF/TEMP CORRECTED DETERMINISTIC MARGIN	DISPOSITION	JUSTIFICATION OF RECOMMENDED ACTIONS
1R161XRH0061B	M	M	H	US-AS-IS See note 1	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. TB TEST OF A VALVE WILL CONFIRM LONG TERM FUNCTIONALITY. HIGH CORRECTED MARGIN
1R161XRH0061C	M	H	H	US-AS-IS See note 1	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. TB TEST OF A VALVE WILL CONFIRM LONG TERM FUNCTIONALITY. HIGH CORRECTED MARGIN
1R162XRH0061A	M	L	M	US-AS-IS See note 1	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. TB TEST OF A VALVE WILL CONFIRM LONG TERM FUNCTIONALITY.
1R162XRH0061B	M	L	M	US-AS-IS See note 1	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. TB TEST OF A VALVE WILL CONFIRM LONG TERM FUNCTIONALITY.
1R162XRH0061C	M	L	H	US-AS-IS See note 1	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. TB TEST OF A VALVE WILL CONFIRM LONG TERM FUNCTIONALITY. HIGH CORRECTED MARGIN
2R161XRH0066A	NM	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB.
2R161XRH0066B	NM	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB.
2R162XRH0066A	NM	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB.
2R162XRH0066B	NM	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB.
2R161XRH0067A	L	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB. DOES NOT HAVE TO CHANGE POSITION TO PERFORM SAFETY FUNCTION.
2R161XRH0067B	L	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB. DOES NOT HAVE TO CHANGE POSITION TO PERFORM SAFETY FUNCTION.
2R161XRH0067C	L	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB. DOES NOT HAVE TO CHANGE POSITION TO PERFORM SAFETY FUNCTION.
2R162XRH0067A	L	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB. DOES NOT HAVE TO CHANGE POSITION TO PERFORM SAFETY FUNCTION.

Note1: One valve within the group of (RH0060 and RH0061) will be tested during the next refueling outage scheduled for the Spring of 1997.

VLV TPNS	RISK RANKING	DETERMINISTIC MARGIN	SF/TEMP CORRECTED DETERMINISTIC MARGIN	DISPOSITION	JUSTIFICATION OF RECOMMENDED ACTIONS
2R162XRH0067B	L	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB. DOES NOT HAVE TO CHANGE POSITION TO PERFORM SAFETY FUNCTION.
2R162XRH0067C	L	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB. DOES NOT HAVE TO CHANGE POSITION TO PERFORM SAFETY FUNCTION.
2N121XSI0008A	NM	L	H	USE-AS-IS	HIGH CORRECTED MARGIN AND RISK NOT MODELED.
2N121XSI0008B	NM	L	H	USE-AS-IS	HIGH CORRECTED MARGIN AND RISK NOT MODELED.
2N121XSI0008C	NM	L	H	USE-AS-IS	HIGH CORRECTED MARGIN AND RISK NOT MODELED.
2N122XSI0008A	NM	L	H	USE-AS-IS	HIGH CORRECTED MARGIN AND RISK NOT MODELED.
2N122XSI0008B	NM	L	M	USE-AS-IS	MEDIUM CORRECTED MARGIN AND RISK NOT MODELED.
2N122XSI0008C	NM	L	H	USE-AS-IS	HIGH CORRECTED MARGIN AND RISK NOT MODELED.
2R161XRH0019A	NM	M	H	USE-AS-IS	HIGH CORRECTED MARGIN AND RISK NOT MODELED.
2R161XRH0019B	NM	L	M	USE-AS-IS	MEDIUM CORRECTED MARGIN AND RISK NOT MODELED.
2R161XRH0019C	NM	L	M	USE-AS-IS	MEDIUM CORRECTED MARGIN AND RISK NOT MODELED.
2R162XRH0019A	NM	L	H	USE-AS-IS	HIGH CORRECTED MARGIN AND RISK NOT MODELED.
2R162XRH0019B	NM	L	H	USE-AS-IS	HIGH CORRECTED MARGIN AND RISK NOT MODELED.
2R162XRH0019C	NM	L	H	USE-AS-IS	HIGH CORRECTED MARGIN AND RISK NOT MODELED.
2R161XRH0031A	M	H	H	Procedure changed	LOW RISK AND HIGH DESIGN MARGIN. ENHANCED PROCEDURE FOR TB
2R161XRH0031B	M	H	H	Procedure changed	LOW RISK AND HIGH DESIGN MARGIN. ENHANCED PROCEDURE FOR TB
2R161XRH0031C	M	H	H	Procedure changed	LOW RISK AND HIGH DESIGN MARGIN. ENHANCED PROCEDURE FOR TB
2R162XRH0031A	M	H	H	Procedure changed	LOW RISK AND HIGH DESIGN MARGIN. ENHANCED PROCEDURE FOR TB
2R162XRH0031B	M	H	H	Procedure changed	LOW RISK AND HIGH DESIGN MARGIN. ENHANCED PROCEDURE FOR TB
2R162XRH0031C	M	H	H	Procedure changed	LOW RISK AND HIGH DESIGN MARGIN. ENHANCED PROCEDURE FOR TB
2R171XCV0003	M	H	H	HOLE IN DISC US-AS-IS	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. HIGH MARGIN.
2R171XCV0006	NM	H	H	HOLE IN DISC US-AS-IS	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. HIGH MARGIN AND NOT MODELED..

VLV TPNS	RISK RANKING	DETERMINISTIC MARGIN	SF/TEMP CORRECTED DETERMINISTIC MARGIN	DISPOSITION	JUSTIFICATION OF RECOMMENDED ACTIONS
2R172XCV0003	M	H	H	HOLE IN DISC US-AS-IS	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. HIGH MARGIN.
2R172XCV0006	NM	H	H	HOLE IN DISC US-AS-IS	TB SCENARIO DURING NORMAL PLANT EVOLUTIONS WITH NO HISTORY OF FAILURE DUE TO TB. HIGH MARGIN AND NOT MODELED.
2R171XCV0112B	M	M	H	USE-AS-IS	MEDIUM RISK MEDIUM TO HIGH MARGINS
2R171XCV0112C	M	M	H	USE-AS-IS	MEDIUM RISK MEDIUM TO HIGH MARGINS
2R171XCV0113A	M	H	H	USE-AS-IS	MEDIUM RISK AND HIGH DESIGN MARGIN
2R171XCV0113B	M	H	H	USE-AS-IS	MEDIUM RISK AND HIGH DESIGN MARGIN
2R172XCV0112B	M	H	H	USE-AS-IS	MEDIUM RISK AND HIGH DESIGN MARGIN
2R172XCV0112C	M	M	H	USE-AS-IS	MEDIUM RISK MEDIUM TO HIGH MARGINS
2R172XCV0113A	M	H	H	USE-AS-IS	MEDIUM RISK AND HIGH DESIGN MARGIN
2R172XCV0113B	M	H	H	USE-AS-IS	MEDIUM RISK AND HIGH DESIGN MARGIN
1R171XCV0465	M	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB.
1R171XCV0468	M	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB.
1R172XCV0465	M	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB.
1R172XCV0468	M	N/R	N/R	USE-AS-IS	FURTHER ANALYSIS DETERMINED VALVES ARE NOT SUSCEPTIBLE TO PL OR TB.

1R141XRC0001A, 1R141XRC0001B
1R142XRC0001A, 1R142XRC0001B

VALVE DESCRIPTION:	RC Pressurizer PORV Block Valves
SAFETY FUNCTIONS:	These valves provide positive shutoff capability in the event a PORV becomes inoperative (stuck open) or experiences excessive leakage, to preserve RCS pressure boundary and facilitates safe shutdown.
NORMAL FUNCTIONS:	Same as Safety Function.
SURVEILLANCE REQUIREMENTS:	The subject valve's are required to be exercised (full stroke) for operability at least once every three months.
PSA RANKING:	FV based on CDF = 1.52E-01 (High) FV with Common Cause = 7.19E-01 (High)
ENVIRONMENTAL TEMPERATURES:	The subject valves are located in harsh environments in the Reactor Containment Building. During normal plant operation, the maximum environmental temperature at the valves' location is equal to 120°F. During the performance of the safety function, the containment environmental temperature may be equal to 328°F.

SUMMARY OF CALCULATION RESULTS

These valves are located between the pressurizer and the pressurizer power-operated relief valves (PORV). The subject valve's provide positive closure capability for the line to the pressurizer relief tank if the associated PORV fails to close. Each PORV/block valve pair is redundant to the other. For conservatism, a design temperature of 650°F will be used in this calculation.

The subject valves are 3" Westinghouse EMD gate valves, limit controlled, with a Limitorque SB-00-15 actuator, and are located in the Reactor Containment Building on top of the Pressurizers.

The valves are susceptible to thermal binding, however the subject valves have sufficient pullout capacity to handle this potential scenario. The valve is not susceptible to pressure locking, as the pressurizing medium is steam.

a. **PRESSURE LOCKING**

The RC0001's valves are not susceptible to pressure locking. The pressurizing medium is steam, which, if entrapped in the bonnet cavity, is compressible when at temperature and condenses to relieve the pressure when it cools.

b. **THERMAL BINDING (Large ΔT)**

The analysis assumes that when a valve is closed at a high temperature and allowed to cool to a much lower temperature, differences in contraction between the disc and body seat stellite facings and stainless steel body and seat parent material can result in binding forces beyond the normal seating forces to pull these surfaces apart.

Two cases of "large ΔT" scenarios are considered by this analysis, both assume the valve is closed to shut off steam at 650°F, but that it cools to two different environmental temperatures such as the normal temperature of 120°F and the accident temperature of 328°F. The reason for these two cases is to compare against the actuator's DVAC pullout thrust capability at the different temperatures. The resultant increase in stem loads required to unseat the valves was calculated to be **4083 lbs @ 120°F and 2519 lbs @ 328°F**.

c. **CONCLUSION**

The valves are not susceptible to pressure locking, as the pressurizing medium is steam.

Existing actuator capability margins assure the effects from Thermal Binding can be overcome. Utilizing the stem factors and pullout forces measured during the latest diagnostic test, these valves demonstrated greater than a 44% margin after applying instrument errors, 5% SF degradation, and 5% valve factor/coefficient of friction degradation above design DVAC. Utilizing the actual measured SF the margins are greater than 70%.

These valves are designated as USE-AS-IS and meet STP's GL 89-10 MOV performance acceptance criteria, including errors and uncertainties. In addition, during periodic diagnostic testing, STP's Diagnostic Testing Error Analysis and Acceptance Criteria procedure, 0PEP06-ZE-0001, performs an evaluation of PL/TB loads, combined with the latest measured pullout forces to assure DVAC design margin is maintained.

2N141XSI0016A, 2N141XSI0016B, 2N141XSI0016C
2N142XSI0016A, 2N142XSI0016B, 2N142XSI0016C

VALVE DESCRIPTION:	(OCIV) Emergency Sump Isolation Valves
SAFETY FUNCTIONS:	These valves are normally closed. The valves prevent draining the RWST water into the containment sump. Each of these valves is automatically opened upon initiation of the switchover signal to provide sump water to the pump suction header during sump recirculation. The valves also serve as containment isolation valves.
NORMAL FUNCTIONS:	None.
SURVEILLANCE REQUIREMENTS:	The subject valve's are required to be exercised (full stroke) for operability once every three months.

PSA RANKING:	FV based on CDF	(vlvs A & B)	= 1.12E-02 - 1.28E-02 (High)
		(vlvs C)	= 4.30E-03 (Medium)
	FV with Common Cause	(vlvs A & B)	= 1.10E-02 - 1.28E-02 (High)
		(vlvs C)	= 4.63E-03 (Medium)

ENVIRONMENTAL TEMPERATURES:	The subject valve's are located in harsh environments in the Fuel Handling Building. The accident environmental temperature at the location where these valves are located is equal to 120°F. The maximum environmental temperature during normal plant functions of these valves is equal to 104°F.

SUMMARY OF CALCULATION RESULTS

These valves are located in the Fuel Handling Building, serve as outside Containment Isolation Valves, and are normally closed to prevent draining the RWST water into the containment sump. These valves' safety function is to open automatically upon initiation of an auto recirculation signal to provide sump water to the SI pump suction header after the RWST supply is exhausted. These valves will not open unless the corresponding HHSI and LHSI pump mini-flow valves have closed. During the subject cold leg recirculation accident condition, the containment sump maximum water temperature is 265°F. The subject MOV's are 16" Westinghouse EMD Gate with Limitorque SMB-1-40 (unit 1) and SB-1-40 (unit) actuators.

These valves have been evaluated as part of IN 95-14 and found to have sufficient margins to assure operability. A revision to Safety Injection Operating procedure 0POP02-SI-0002 was made to verify a column of water exists between the sump and subject valves prior to system operation. This was performed under CR action# 95-2444-19 and completed 4/7/95. In addition, conversion to SB actuators and drilling holes in the disc have been completed on unit 2 and scheduled for completion on unit 1 in 1996.

a. **PRESSURE LOCKING (by Thermal, Pressurization or Depress.)**

This section is only applicable to 1SI0016A, B and C since the corresponding unit 2 valves nad their disk drilled per DCP #95-6907-1 and implemented in refueling outage 2RE04. Unit 1 valves are scheduled to have the same work performed and is being tracked through Condition Report Engineering Evaluation (CREE) #'s 95011357, 95011358, and 95011359.

THERMAL EFFECT

The analysis assumes the flexible wedge or double-disc gate valve is closed and entraps line-pressurized fluid in the bonnet cavity and area between the discs. An increase in temperature of the entrapped fluid will cause an increase in pressure due to thermal expansion of the fluid (thermal effect). This increase can occur as fluid on either side of the disc heats up or as ambient air temperature increases. This increase in pressure forces the discs against the valve seats, causing seating forces to increase beyond normal.

CASE 1: <u>Thermal effect due to environmental temperature</u>

Pressure Locking analysis due to the environmental temperature is enveloped by case 2 below.

CASE 2: <u>Thermal effect due to high temp. accident water filling sump</u>

A thermal decay analysis was performed using a nine feet of column of water as the insulator between the valve and the hot sump water (265°F) just before the opening stroke of the subject valves. The temperature increase in the valve bonnet was calculated to not exceed 6°F. The pressurization rate is considered to be equal to 23 psi/°F. This temperature increase is addressed in the pressure locking pressurization/thermal effect computation.

PRESSURIZATION

High-pressure fluid enters the bonnet area if the valve has a high Δp across the disc that causes the disc to move slightly away from the seat and the fluid to seep in. This will cause the increase in double-disc drag forces that could result in binding (pressure locking) of the valve

The initial pressure in the bonnet, previous to the accident, is postulated to be most likely due to the downstream static head. This maximum static pressure is due to the difference in elevation between the maximum elevation of the RWST and the subject valve elevations. The normal level of the RWST of 30.4' (based on injection volume of 350000 gallons) and the subject valves lowest elevation is (-)25'-6". The bonnet fluid pressure is then calculated equal to 24.2 psig, where the water density is considered to be equal to 62.4 lb/ft^3. For practical purposes, the upstream and downstream pressure is considered equal to zero. This pressurization case is then combined with the previous thermal effect pressure locking case for worst case pressure locking scenario consideration. The resultant increase in stem loads required to unseat the valves was calculated to be **14419 lbs.**

DEPRESSURIZATION

This case has been enveloped by the pressurization and thermal effect combination.

b. **<u>THERMAL BINDING (Large ΔT)</u>**

Thermal Binding analysis is not required for these valves because these valves are normally closed and during their safety function these are required to be in the open position and remain open.
Westinghouse's position is that these type of flex wedge valves do not require any thermal analysis during normal temperature swings and up to the threshold temperature of 200°F. The maximum normal operating temperature of 104°F for these valves during surveillance testing is within Westinghouse's threshold temperature of 200°F.

Presently, the unit 2 SI0016 valves had SB operators installed in refueling outage 2RE04. The unit 1 SI0016 operators are scheduled to be replaced with SB operators through Condition Report Engineering Evaluation (CREE) #'s 95011357, 95011358, and 95011359. This action reduces the inertial loads in the valve and therefore one of the potential effects related to thermal binding which affects the capacity of the operator during the pullout stroke.

c. **CONCLUSION**

Unit 2:

Unit 2 SI0016A, B, & C are not considered to be susceptible to thermal binding as a result of the procedural enhancement. The procedure assures that there is an adequate column of water to prevent any thermal effects prior to valve being required to open.

These valves have been modified by drilling an hole in the disc and changing the actuator to an SB type controlled on limit. Therefore removing the pressure locking susceptibility.

These valves are designated as USE-AS-IS and meet STP's GL 89-10 MOV performance acceptance criteria, including errors and uncertainties. In addition, during periodic diagnostic testing, STP's Diagnostic Testing Error Analysis and Acceptance Criteria procedure, 0PEP06-ZE-0001, performs an evaluation of PL/TB loads, combined with the latest measured pullout forces to assure DVAC design margin is maintained.

Unit 1:

Unit 1 SI0016A, B, & C are not considered to be susceptible to thermal binding as a result of the procedural enhancement. The procedure assures that there is an adequate column of water to prevent any thermal effects prior to valve being required to open.

These valves are scheduled to be modified by drilling an hole in the disc and changing the actuator to an SB type controlled on limit. These modifications are tracked and scheduled as follows:

1-SIMOV0016C	**CR# 95-6907-4**	**August 1996**
1-SIMOV0016B	**CR# 95-6907-2**	**September 1996**
1-SIMOV0016A	**CR# 95-6907-3**	**October 1996**

Existing MOV capability margins assure the effects from Pressure Locking can be overcome. Utilizing the stem factors and pullout forces measured during the latest diagnostic test these valves demonstrated greater than a 25% margin after applying instrument errors, 5% SF degradation, and 5% valve factor/coefficient of friction degradation. This margin is the basis for the justification of the current modification schedule.

1R161XRH0060A, 1R161XRH0060B, 1R161XRH0060C
1R162XRH0060A, 1R162XRH0060B, 1R162XRH0060C

1R161XRH0061A, 1R161XRH0061B, 1R161XRH0061C
1R162XRH0061A, 1R162XRH0061B, 1R162XRH0061C

VALVE DESCRIPTION: RHR Suction Isolation Valves

SAFETY FUNCTIONS: These valves maintain the RCPB integrity during RCS modes of operation with pressures and temperatures that exceed the RHRS design considerations. Valve opening is required during safety grade cold shutdown, Appendix R recovery, and recovery from various postulated accidents.

NORMAL FUNCTIONS: These valves are normally closed except during RHRS operation.

SURVEILLANCE REQUIREMENTS: The subject MOV's are required to be exercised (full stroke) for operability only during each cold shutdown and at each refueling outage.

PSA RANKING:

FV based on CDF	(vlvs A & B)	= 4.74E-04	(Medium)
	(vlvs C)	= 3.71E-04	(Medium)
FV with Common Cause	(vlvs A & B)	= 3.72E-04-4.76E-04	(Medium)
	(vlvs C)	= 3.72E-04	(Medium)

ENVIRONMENTAL TEMPERATURES: The subject valve's are located in harsh environments in the Reactor Containment Building. Although, the accident temperature for these two sets of valves is equal to 328°F. these valves are not required to operate under this accident environmental temperature.
The subject valves are required to open during a long term decay heat removal from the reactor core during the recirculation phase of a small break LOCA. This action is to take place approximately twenty four hours after the small break when the Auxiliary Feedwater Storage Tank (AFST) is about to deplete. Under this scenario, the maximum environmental temperature at this time is approximately equal to the maximum normal operating temperature of 120°F.

SUMMARY OF CALCULATION RESULTS

These valves (12 total) are 12"/1500# Westinghouse EMD flexible wedge gate valves located in the RCB. RH0060 is located in the RHR system suction line upstream of the RHRS pump and RH0061, and directly aligns the RCS hot leg through the 12" suction line. Both valves are normally closed except when the RHRS is in operation. The valves must open to align the RHRS for normal cooldown and closed to isolate the RHRS from the RCS during RCS operation. Prevent-open interlocks (both valves) and a power-close lockout (RH0061 only) allow valve operation only at RCS pressures ≤350 psig and temperatures ≤350°F.

a. **PRESSURE LOCKING (by Thermal, Pressurization, Depress. effect)**

THERMAL EFFECT

Connecting Piping Case

A pressure locking (thermal effect) analysis due to RCS header temperature was performed. The valve's corresponding pipelines were postulated to be at stagnant conditions. The analysis indicated that there is no thermal effect pressure locking in the bonnet as a result of subject valve's pipelines being connected to the RCS.

Heat Source Case due to Small LOCA Containment temperature

Pressure locking analysis due to thermal effects per the subject case is not required because the containment temperature is approximately equal to the maximum normal environmental temperatures at the time the subject RHR valve's are required to open, and because according to Westinghouse's correspondence no pressure locking analysis due to thermal effects is required for flex wedge gate valves operating within the normal ambient temperature swings.

PRESSURIZATION

Normal high-pressure fluid enters the bonnet area if the valve has a high Δp across the disc that causes the disc to move slightly away from the seat and the fluid to seep in. If the valve is closed and leak tight, the pressure will be retained if the rest of the system becomes depressurized (the depressurization effect). As above this will cause the increase in double-disc drag forces that could result in binding (pressure locking) of the valve.

RH0060A, B & C

During the Hot Shutdown mode of operation valves RH0060A, B & C are required to open, it is postulated that the RHR cut-in pressure of 350 psig locks-in the bonnet of the 1,2RH0060A, B & C. The upstream and downstream pressure are considered to be equal to RHR cut-in pressure of 350 psig.

RH0061A, B & C

The postulated scenario is same as the RH0060A, B, C valves except that the bonnet pressure is considered to be equal to 350 psig, the upstream pressure is 350 psig and the downstream pressure is equal to zero for conservative purposes.

The pressurization cases were evaluated and the resultant increase in stem loads required to unseat the valves was calculated to be **7143 lbs.**

DEPRESSURIZATION

The depressurization scenario for valves RH0060A, B & C and RH0061A, B & C may potentially occur during operational mode 6 of the unit when the RCS is depressurized. A review of the surveillance history on these valves did not revealed any malfunctioning due to this potential effect. Also, since stroking the valve during mode 6 is not a safety related operation, depressurization analysis is not required.

b. **THERMAL BINDING (Large ΔT)**

The analysis assumes that when a valve is closed at a high temperature and allowed to cool to a much lower temperature, differences in contraction between the disc and body seat stellite facings and stainless steel body and seat material can result in binding forces beyond the normal seating forces to pull these surfaces apart.

The large ΔT scenario considered by the analysis assumes the valve is closed at 350°F (Plant Heat-up) and opened at the maximum normal ambient temperature of 120°F (Hot Shutdown). The resultant increase in stem loads required to unseat the valves was calculated to be **9020 lbs.**

c. **CONCLUSION**

Existing actuator capability margins assure the effects from Pressure Locking and Thermal Binding can be overcome. Utilizing the stem factors and pullout forces measured during the latest diagnostic test these valves demonstrated greater than a 10% margin after applying instrument errors, 5% SF degradation, and 5% valve factor/coefficient of friction degradation. The average margin is greater than 31%.

STP is confident that these valves will remain functional and plan to perform a diagnostic test of one of these valves during shutdown for the next unit 2 refueling outage (2RE05). The results of the test will provide positive evidence to support long term operation of these valves AS-IS. Should the tests identify unexpected thermal binding effects STP will establish a corrective action plan to adequately address the long term functionality of these valves.

ADDITIONAL JUSTIFICATION

During periodic diagnostic testing, STP's Diagnostic Testing Error Analysis and Acceptance Criteria procedure, 0POP06-ZE-0001, performs an evaluation of PL/TB loads, combined with the latest measured pullout forces to assure DVAC design margin is maintained.

These valves are opened several hours into an event or during cold shutdown and the likelihood of having a DVAC condition concurrent with the remote manual opening of these valves is very remote. These valves are normally powered by the 480 VAC essential busses with alternate power supplied from the Emergency Diesel Generators. When full voltage capability is utilized the lowest capability margin for these valves to open is 35%.

An additional consideration of capability is that the motor operators are running prior to opening, allowing the utilization of running efficiencies versus pullout efficiencies which are currently used.

Condition Report 93-1327 performed as-found testing after 2 years of service on 1R161XRH0060A and 1R161XRH0061C and concluded that the previously measured stem factors had not degraded. This provides assurance that utilizing the as-left stem factors from the latest test is bounded by the utilization of a 5% degradation factor. This also supports the utilization of the as-left stem factors in the basis for continued acceptability of these valves.

These valves are modeled by the Probabilistic Safety Assessment (PSA) during steam generator tube rupture events only. During these events the area temperature conditions would not be as severe as those postulated following a small break LOCA. During normal shutdown scenarios there is no contribution to risk.

2R161XRH0066A, 2R161XRH0066B
2R162XRH0066A, 2R162XRH0066B

VALVE DESCRIPTION:	RHR Outlet to CVCS (LP Letdown) Valves
SAFETY FUNCTIONS:	These valves must maintain the ability to close to preserve the integrity of the RHR path during a safety grade shutdown.
NORMAL FUNCTIONS:	These valves are closed during power operations and opened to allow a portion of RHR flow to CVCS for purification and RCS pressure control during reactor startup and cooldown.
SURVEILLANCE REQUIREMENTS:	The subject valve's are required to be exercised (full stroke) for operability once every three months, except when other train of a redundant system are inoperable.
PSA RANKING:	FV based on CDF = Not required for Accident mitigation FV with Common Cause = 0.00E+00 (Low)

2R161XRH0067A, 2R161XRH0067B, 2R161XRH0067C
2R162XRH0067A, 2R162XRH0067B, 2R162XRH0067C

VALVE DESCRIPTION:	RHR Recirculation (mini-flow)Valves
SAFETY FUNCTIONS:	These valves do not perform any safety functions or mitigate the effects of a fire hazard as identified in the FHAR.
NORMAL FUNCTIONS:	These miniflow stop valves are opened and used in a flow circuit to preheat the RHRS prior to opening the system isolation valves from the RCS.
SURVEILLANCE REQUIREMENTS:	The subject valve's are required to be exercised (full stroke) for operability once every three months, except when other train of a redundant system are inoperable.
PSA RANKING:	FV based on CDF = 1.15E-04 - 4.13E-04 (Low) *Component does not have to change positions to perform safety function. FV with Common Cause = 0.00E+00 (Low)

SUMMARY OF CALCULATION RESULTS

RH0066A & B are Low Pressure Letdown Isolation Valves. RH0067A, B, & C are the RHR Pump Mini-flow Isolation Valves.

The subject valve's are 4" Westinghouse EMD Gate, limit controlled, with a Limitorque SB-00-15 actuator, and are located in the Reactor Containment Building.

Prevent-open interlocks (both valves) and a power-close lockout (RH61 only) allow valve operation only at RCS pressures ≤350 psig and temperatures ≤350°F.

CONCLUSION

RH0067A,B,C were removed from the scope of GL 95-07 because they do not perform an active safety function.

RH0066A,B,C do not require pressure locking or thermal binding analysis because their safety function is to close and there are no requirements to reopen them.

These valves are designated as USE-AS-IS.

2N121XSI0008A, 2N121XSI0008B, 2N121XSI0008C
2N122XSI0008A, 2N122XSI0008B, 2N122XSI0008C

VALVE DESCRIPTION:	HHSI Hot Leg Isolation Valves
SAFETY FUNCTIONS:	These valves are normally - closed and located in the HHSI hot leg injection line. The valve are opened to provide flow ta a corresponding RCS hot leg from a HHSI pump during the switchover for cold-leg to hot-leg recirculation.
NORMAL FUNCTIONS:	These valves are normally closed but are opened during periodic testing to verify flow through check valves, which isolate RCS from SIS.
SURVEILLANCE REQUIREMENTS:	The subject valve's are required to be exercised (full stroke) for operability once every three months, except when other train of a redundant system are inoperable.
PSA RANKING:	FV based on CDF = Not required for Accident mitigation FV with Common Cause = 0.00E+00 (Low)
ENVIRONMENTAL TEMPERATURES:	The subject valve's are located in harsh environments in the Reactor Containment Building. Although, the accident temperature for these valves is equal to 328°F. These valves are not required to operate under this accident environmental temperature. The environmental temperature during the switchover from cold-leg to hot-leg recirculation, is approximately equal to 149.8°F. The maximum normal operating ambient temperature is equal to 120°F.

SUMMARY OF CALCULATION RESULTS

The primary safety function of SI0008A,B,C is to open during the injection phase of accident mitigation to provide sump recirculation flow to the hot leg from the HHSI pump. Transferring the SI system to hot leg recirculation occurs at approximately 13 hours after LOCA. During the transfer, the SI0008 valve is opened before the cold leg injection valve (SI0006)is closed.

These valve's are 6" Westinghouse EMD Gate, limit controlled, with a Limitorque SB-1-60 actuator, and are located in the Reactor Containment Building.

a. **PRESSURE LOCKING (by Thermal, Pressurization, Depress. effect)**

THERMAL EFFECT

Connecting Piping Case

A pressure locking analysis (thermal effect) due to RCS header temperature was performed. The valve's corresponding pipelines were postulated to be at stagnant conditions. The analysis indicated that there is no thermal effect pressure locking in the bonnet as a result of subject valve's pipelines being connected to the RCS.

Heat Source Case due to Containment Temperature of 165°F

Pressure locking analysis due to thermal effects per the subject case was performed and determined that the bonnet fluid temperature at the initiation of Hot-Leg recirculation is equal to 149.8°F. The pressurization rate is considered to be equal to 23 psi/deg°F. This case is combined with the pressurization case.

PRESSURIZATION

This scenario is postulated concurrent with the previous thermal effect scenario. The initial pressure in the bonnet is due only to static head since these valves have been stroked quarterly as part of the surveillance test requirements combined with the fact that everytime a dynamic test is performed a functional static stroke test is also performed immediately afterwards. These actions provide assurance that no high pressure remains in the bonnet once the valve has been declared operable and are part of normal plant procedures.

The maximum static pressure is due to the difference in elevation between the maximum elevation of the RWST and the subject valve elevations. The normal level of the RWST of 30.4' (based on injection volume of 350000 gallons) and the subject valves lowest elevation is 23'-9". The upstream pressure and bonnet fluid pressure is then calculated equal to 2.9 psig. For practical purposes the downstream pressure is considered equal to zero.

The pressurization cases were evaluated and the resultant increase in stem loads required to unseat the valves was calculated to be **11387 lbs.**

DEPRESSURIZATION

Potential depressurization scenarios have been postulated and have been determined to be enveloped by the above thermal/pressurization effect scenario.

b. **THERMAL BINDING (Large ΔT)**

Since these valves are normally closed and their safety function is to open, no thermal binding analysis is required.

During normal plant operations, these valves are stroked for surveillance testing under normal temperature swings conditions which do not require thermal binding analysis.

c. **CONCLUSION**

These valves are not susceptible to Thermal binding.

Existing actuator capability margins assure the effects from Pressure Locking can be overcome. Utilizing the stem factors and pullout forces measured during the latest diagnostic test these valves demonstrated greater than a 20% margin after applying instrument errors, 5% SF degradation, and 5% valve factor/coefficient of friction degradation. The average margin is greater than 31%.

These valves are designated as USE-AS-IS.

ADDITIONAL JUSTIFICATION

During periodic diagnostic testing, STP's Diagnostic Testing Error Analysis and Acceptance Criteria procedure, 0PEP06-ZE-0001, performs an evaluation of PL/TB loads, combined with the latest measured pullout forces to assure DVAC design margin is maintained .

c. **CONCLUSION** (continued)

These valves are opened several hours into an event and the likelihood of having a DVAC condition concurrent with the remote manual opening of these valves is very remote. These valves are normally powered by the 480 VAC essential busses with alternate power supplied from the Emergency Diesel Generators. When full voltage capability is utilized the lowest capability margin for these valves to open is 20%.

An additional consideration of capability is that the motor operators are running prior to opening allowing the utilization of running efficiencies versus pullout efficiencies which are currently used.

These valves are not modeled by the Probabilistic Safety Assessment (PSA). Hot Leg recirculation is not assumed to be required to mitigate a significant core damage event. This assumption is also supported by Westinghouse as outlined in WCAP-14486.

2N161XRH0019A, 2N161XRH0019B, 2N161XRHI0019C
2N162XRH0019A, 2N162XRH0019B, 2N162XRHI0019C

VALVE DESCRIPTION:	LHSI Hot Leg Isolation Valves
SAFETY FUNCTIONS:	These valves are opened to provide sump recirculation flow to the corresponding RCS hot-log from a LHSI pump during the switchover from cold-leg to hot-leg recirculation.
NORMAL FUNCTIONS:	These valves are normally closed except to periodically test check valves XSI0009 A, B, C for back leakage.
SURVEILLANCE REQUIREMENTS:	The subject valve's are required to be exercised (full stroke) for operability at least once every three months.
PSA RANKING:	FV based on CDF = Not required for Accident mitigation FV with Common Cause = 0.00E+00 (Low)

2N161XRH0031A, 2N161XRH0031B, 2N161XRHI0031C
2N162XRH0031A, 2N162XRH0031B, 2N162XRHI0031C

VALVE DESCRIPTION:	LHSI Cold Leg Isolation Valves
SAFETY FUNCTIONS:	These valves are normally open to provide cold-leg injection during ECCS injection and recirculation phases. They are closed to terminate recirculation flow from an LHSI pump to a corresponding RCS cold-leg during switchover from cold-leg to hot-leg recirculation.
NORMAL FUNCTIONS:	These valves are normally open as the normal RHR system return to the RCS. The valves are occasionally closed to permit boron equalization during initiation of RHRS operation and B and C may be closed during midloop operation
SURVEILLANCE REQUIREMENTS:	The subject valve's are required to be exercised full stroke) for operability at least once every three months.
PSA RANKING:	FV based on CDF = 1.91E-03 - 2.86E-03 (Medium) FV with Common Cause = 0.00E+00 (Low)
ENVIRONMENTAL TEMPERATURES:	The subject MOV's are located in harsh environments in the Reactor Containment Building.

RH0019A.B.C

The environmental temperature during the opening safety function of these valves is equal to 149.8°F.
The maximum environmental temperature during normal functions of these valves is equal to 120°F.

RH0031A.B.C

These valves are normally open and are required to remain opened during their safety function, where the initial accident environmental temperature

is 328°F.
The maximum environmental temperature during normal functions of these valves is equal to 120°F.

SUMMARY OF CALCULATION RESULTS:

Valves RH0019A,B,C and RH0031A,B,C are located in the Safety Injection (SI) system in the LHSI hot and cold leg injection lines. RH0019A,B,C valves are normally closed and open during the injection phase of accident mitigation to provide sump recirculation flow to the hot leg from the LHSI pump. The RH0019 valves are also isolated from the hot leg by check valves XSI0010 and XRH0020. RH0031 A,B,C valves are normally open to provide cold leg injection during ECCS injection and recirculation phases and are closed during hot leg recirculation. During the hot recirculation transfer, the RH0019 valve is opened before the cold leg injection valve (RH0031) is closed. When not in the injection mode, all the valves are power locked in their normal standby positions (RH0019: closed & RH0031: open).

All of the subject valve's are 8"/1500# Westinghouse EMD flexible wedge gate valves, controlled on limit, with SB-1-60 actuators, and are located in the Reactor Containment Building.

a. **PRESSURE LOCKING (by Thermal, Pressurization, Depress. effect)**

THERMAL EFFECT

Connecting Piping Case

A pressure locking (thermal effect) analysis due to RCS header temperature was performed. The valve's corresponding pipelines were postulated to be at stagnant conditions. The analysis indicated that there is no thermal effect pressure locking in the bonnet as a result of subject valve's pipelines being connected to the RCS.

Heat Source Case due to Cont. Temp. of 165°F (RH-19's only)

Pressure locking analysis due to thermal effects was performed and determined that the bonnet fluid temperature at the initiation of Hot-Leg recirculation is equal to 149.8°F. The pressurization rate is considered to be equal to 23 psi/deg F. This case was combined with the pressurization case.

PRESSURIZATION

RH0019 valves

The initial pressure in the bonnet, previous to the accident, is postulated to be most likely due to static head since these valves have been stroked quarterly as part of the surveillance test requirements combined with the fact that everytime a dynamic test is performed a functional static stroke test is also performed immediately afterwards. These actions provide assurance that no high pressure remains in the bonnet once the valve has been declared operable and are part of normal plant procedures. Additional assurance is provided by industry depressurization tests results which indicate that bonnets do depressurize fairly quickly.

The maximum static pressure in the bonnet is due to the difference in elevation between the maximum elevation of the RWST and the subject valve elevations. The normal level of the RWST of 30.4' (based on injection volume of 350000 gallons and the subject valves lowest elevations are 29' (RH0019's. The bonnet fluid pressure is then calculated to be approximately equal to 0 psig. For practical purposes the downstream pressure is considered equal to zero.

The upstream pressure at the time of the switchover was calculated to be:

$P_{up} = (h_{sump} - h_{rcs} - \Delta h_{piping} + \Delta h_{LHSI})\rho + P_{cont} - P_{rcs} =$
$P_{up} = [(-5.6 - 31.0 - 0.0 + 760)(62.2/144)] + 0.0 + 0.0$
$P_{up} = 312$ psi

The thermal effect and pressurization cases were evaluated and the resultant increase in stem loads required to unseat the valves was calculated to be:

1RH0019A	**8586 lbs.**
1RH0019B	**13745 lbs.**
1RH0019C	**13623 lbs.**
2RH0019A	**19331 lbs.**
2RH0019B	**9380 lbs.**
2RH0019C	**17041 lbs.**

RH0031 valves

These valves are postulated to be opened when the upstream and bonnet pressure is equal to the RHR pressure of 350 psig. The resultant increase in stem loads required to unseat the valves was calculated to be **4357 lbs.**

DEPRESSURIZATION

The depressurization case has been enveloped by the pressurization case.

b. **THERMAL BINDING (Large ΔT)**

RH0019 valves:

Thermal binding is not likely to occur with these valves because of the way it is normally operated. The valves are power locked closed at the MCC. During the surveillance testing, the RWST and stagnant lines in the SI system are at essentially ambient temperature at that time, and the valves are statically stroked to test check valve SI0009 for back leakage.

Thermal binding analysis is not required since the valves are being stroked during normal temperature swings. No further evaluation is required.

RH0031 valves:

The large ΔT scenario considered by the analysis assumes the valve is closed at 225°F and opens at 120°F during plant shutdown. The resultant increase in stem loads required to unseat the valves was calculated to be **2763 lbs.**

During normal RHR operation, the subject valves operation is controlled by operating procedure 0POP02-RH-0001. This procedure requires that these valves not be closed until the RHR water temperature is less than 225°F.

c. **CONCLUSION**

RH0031 Valves

Existing actuator capability margins assure the effects from Pressure Locking and Thermal Binding can be overcome. Utilizing the pullout forces measured during the latest diagnostic test and the design Stem Factor, these valves demonstrated greater than a 33% margin after applying instrument errors, 5% SF degradation, and 5% valve factor/coefficient of friction degradation.

c. <u>CONCLUSION (continued)</u>

Thermal Binding is prevented through procedural enhancement to 0POP02-RH-0001.

These valves are designated as USE-AS-IS and meet STP's GL 89-10 MOV performance acceptance criteria, including errors and uncertainties. In addition, during periodic diagnostic testing, STP's Diagnostic Testing Error Analysis and Acceptance Criteria procedure, 0PEP06-ZE-0001, performs an evaluation of PL loads, combined with the latest measured pullout forces to assure DVAC design margin is maintained.

RH0019 Valves

These valves are not susceptible to Thermal binding.

Existing actuator capability margins assure the effects from Pressure Locking can be overcome. Utilizing the stem factors and pullout forces measured during the latest diagnostic test these valves demonstrated greater than a 11% margin after applying instrument errors, 5% SF degradation, and 5% valve factor/coefficient of friction degradation. The average margin is greater than 34%.

These valves are designated as USE-AS-IS and meet STP's GL 89-10 MOV performance acceptance criteria, including errors and uncertainties. In addition, during periodic diagnostic testing, STP's Diagnostic Testing Error Analysis and Acceptance Criteria procedure, 0PEP06-ZE-0001, performs an evaluation of PL loads, combined with the latest measured pullout forces to assure DVAC design margin is maintained.

<u>ADDITIONAL JUSTIFICATION RH0019's ONLY.</u>

During periodic diagnostic testing, STP's Diagnostic Testing Error Analysis and Acceptance Criteria procedure, 0PEP06-ZE-0001, performs an evaluation of PL/TB loads, combined with the latest measured pullout forces to assure DVAC design margin is maintained .

These valves are opened several hours into an event and the likelihood of having a DVAC condition concurrent with the remote manual opening of these valves is very remote. These valves are normally powered by the 480 VAC essential busses with alternate power supplied from the Emergency Diesel Generators. When full voltage capability is utilized the lowest design capability margin for these valves to open is 9%.

An additional consideration of capability is that the motor operators are running prior to opening allowing the utilization of running efficiencies versus pullout efficiencies which are currently used.

These valves are not modeled by the Probabilistic Safety Assessment (PSA). Hot Leg recirculation is not assumed to be required to mitigate a significant core damage event. This assumption is also supported by Westinghouse as outlined in WCAP-14486.

2R171XCV0003, 2R172XCV0003
2R171XCV0006, 2R172XCV0006

VALVE DESCRIPTION: RCS Normal and Alternate Charging Flow Isolation Valves

SAFETY FUNCTION: The subject charging isolation valves are utilized as part of the safety grade shutdown boration path. Although the line is not required to mitigate the effects of a chapter 15 accident, the charging line is utilized for boration, pressure control, and RCS inventory control, if available during safety grade cold shutdown.

The charging line isolation valves are utilized to mitigate a high energy line break between the valves and RCS.

NORMAL FUNCTIONS: These valves are in the CVCS on the charging line just upstream of the class 1 and class 2 boundary. Under all normal modes of operation, of the subject valves is opened while the other is in the closed position. The valves provide for aligning either the normal or alternate charging line and serve to limit the number of thermal transients for each nozzle connection to the RCS cold loops to an acceptable number. One valve would normally be open during all modes of operation for proper inventory and chemistry control. Changes in alignment between the two charging lines is done at cold conditions (modes 5 & 6) to limit thermal transients.

At low temperatures (mode 4) the normally open charging line valve must be closed to provide auxiliary spray flow to the pressurizer.

The flow path through these valves is used as a 10CFR50 Appendix R fire hazard boration path.

SURVEILLANCE REQUIREMENT: The subject valve's are required to be exercised (full stroke) for operability during each cold shutdown and at each refueling outage. This is not required more often than once every three months.

PSA RANKING:

FV based on CDF	(CV0003)	= 6.75E-05-2.86E-03 (Medium)
	(CV0006)	= Not required for Accident mitigation
FV with Common Cause	(CV0003&0006)	= 0.00E+00 (Low)

ENVIRONMENTAL TEMPERATURES: The subject valves are located in a harsh environment in the Reactor Containment Building. During normal plant operation, the normal maximum environmental temperature at the valves location is equal to 120°F.

During the performance of the safety function of these valves (safety grade cold shutdown), the temperature in the containment building is enveloped by the normal ambient temperatures.

Since the safety function of these valves is to close during a high energy line break (between the subject valves and the RCS), it is not necessary to consider any accident temperatures in the analysis section.

SUMMARY OF CALCULATION RESULTS

The subject valve's are 4" Westinghouse EMD gate valves, limit controlled, with a Limitorque SB-00-15 actuator, and are located in the Reactor Containment Building 37'.

a. **PRESSURE LOCKING**

The 3/16" holes drilled on the upstream side of the flexible wedge disc were performed under 3 SPRs (88-0059, 90-0250, and 92-0121 preclude the possibility of pressure locking occurring. No analysis for pressure locking susceptibility of this valve is necessary.

b. **THERMAL BINDING (Large ΔT)**

Thermal binding analysis was conducted using the normal operating temperature of 550°F as the worst-case highest temperature and the normal maximum environmental temperature of 120°F as the low end temperature. Using a differential temperature (ΔT) of 430°F. For extra conservatism, some specific design input values. The resultant increase in stem loads required to unseat the valves was calculated to be **3681 lbs.**

c. **CONCLUSION**

No analysis for pressure locking susceptibility of these valves is necessary due to the 3/16 holes in the disc.

Existing actuator capability margins assure the effects from Thermal Binding can be overcome. Utilizing the pullout forces measured during the latest diagnostic test and the design stem factor, these valves demonstrated greater than a 36% margin after applying instrument errors, 5% SF degradation, and 5% valve factor/coefficient of friction degradation.

These valves are designated as USE-AS-IS and meet STP's GL 89-10 MOV performance acceptance criteria, including errors and uncertainties. In addition, during periodic diagnostic testing, STP's Diagnostic Testing Error Analysis and Acceptance Criteria procedure, 0PEP06-ZE-0001, performs an evaluation of PL loads, combined with the latest measured pullout forces to assure DVAC design margin is maintained.

1R171XCV0112B, 1R172XCV0112B
1R171XCV0113A, 1R172XCV0113A

VALVE DESCRIPTION: VCT Outlet Isolation Valves

SAFETY FUNCTIONS: These valves are manually closed when switching charging pump suction from the VCT to the RWST. The RWST serves as a backup boration source to the Boric Acid Tanks.

Upon generation of the Safety Injection actuation signal in coincidence with an open signal from valves CV-112C and CV-113B, the valves are automatically closed to switch charging pump suction from VCT to the RWST.

NORMAL FUNCTIONS: These valves are located in the CVCS system on the outlet line from the volume control tank (VCT) to the CVCS charging pump suction. Under normal plant operations, the valves are open and would only be closed (manually or automatically) under abnormally low levels in the VCT.

These valves are interlocked to switch the charging pump suction from the VCT to the RWST on receipt of a low-low VCT

Also, these valves are utilized to provide Boration and CVCS charging flow with respect to 10CFR50 Appendix R requirements.

SURVEILLANCE REQUIREMENTS: The subject valve's are required to be exercised (full stroke) for operability only during each cold shutdown and at each refueling outage.

PSA RANKING:

FV based on CDF	(CV112B)	= 3.36E-04	(Medium)
	(CV113A)	= 1.53E-05	(Medium)
FV with Common Cause	(CV112B)	= 3.34E-04	(Medium)
	(CV113A)	= 0.00E+00	(Low)

1R171XCV0112C , 1R172XCV0112C
1R171XCV0113B, 1R172XCV0113B

VALVE DESCRIPTION: SIS RWST To Charging Suction Isolation Valves

SAFETY FUNCTIONS: These valves are manually open to provide charging pump suction from the RWST. The RWST serves as a backup boration source to the Boric Acid Tanks.

Upon generation of the Safety Injection , the valves are automatically opened to switch charging pump suction from VCT to the RWST.

NORMAL FUNCTIONS: These valves are located in the CVCS system on the outlet line from the RWST to the CVCS charging pump suction. Under normal plant operations, the valves are close and would only be opened (manually or automatically) under low levels in the VCT.

These valves are interlocked to automatically open when the charging pump suction from the VCT to the RWST on receipt of a low-low VCT level.

Also, these valves are utilized to provide Boration flow with respect to 10CFR50 Appendix R requirements.

SURVEILLANCE REQUIREMENTS: The subject valve's are required to be exercised (full stroke) for operability only during each cold shutdown and at each refueling outage.

PSA RANKING:

FV based on CDF	(CV112C)	= 3.21E-04 (Medium)
	(CV113B)	= 8.60E-04 (Medium)
FV with Common Cause	(CV112C)	= 3.30E-04 (Medium)
	(CV113B)	= 8.86E-04 (Medium)

ENVIRONMENTAL TEMPERATURES: CV0113A & -0112B and -0113B & -0112C are located in Harsh environments in the MAB building. The accident temperatures for these two sets of valves are equal to 125°F and 140°F correspondingly. These temperatures are due to a pipe break in adjacent rooms. These breaks are not required to be postulated concurrent with the safety function of these valves (i.e. double failures are not applicable). Consequently, only normal plant operating temperatures and not accident temperature for the subject valves need to be considered in the subject PL/TB analyses.

SUMMARY OF CALCULATION RESULTS

CV0112B and CV0113A are located in the CVCS system on the outlet line from Volume Control Tank (VCT) to the CVCS charging pump suction. These valves are interlocked to switch the charging pump suction from the VCT to the RWST on receipt of a low-low VCT level signal from a VCT level channel. The switch is accomplished by automatic opening of the parallel RWST isolation valves CV0112C & CV0113B and only after these valves are open, by closing the VCT outlet isolation valves CV0112B and CV0113A located in series. This sequence ensures the charging pumps of a suction source and protects them against loss of NPSH and possible cavitation damage.

The subject valve's are 6" Westinghouse EMD Gate, limit controlled, with a Limitorque SB-00-15 actuator, and are located in the Mechanical Auxiliary Building.

a. **PRESSURE KING**

THERMAL EFFECT

Since the normal and safety functions of valves CV0112B,C and CV0113A,B are to be performed under normal temperature swings and because there are no adjacent heat sources, these valves are not required to be analyzed for pressure locking due to thermal effect.

PRESSURIZATION / DEPRESSURIZATION

High-pressure fluid is assumed to enter the bonnet area if the valve has a high Δp across the disc that causes the disc to move slightly away from the seat and the fluid to seep in.

A condition which can be postulated is when the valve is maintained closed and leak tight, with the high pressure in the bonnet retained, and the rest of the system becoming depressurized.

Surveillance testing conditions may in some instances resemble this condition to a great extent. Therefore, this is the condition that will be considered for the depressurization scenario.

1,2-CVMOV-0112B & -0113A

The pressurization scenario would entrap process water at 125.5 psig (pressure conservatively assumed as a result of emergency boration) in the bonnet cavity of CV0112B & CV0113A due to a leakage thru downstream check valve XCV-0212.
The upstream pressure is conservatively considered to be equal to the maximum Volume Control Tank pressure of 75 psig, plus the difference in elevation between the subject valves (42'-3") and the maximum level in the tank of 57'. The upstream pressure is then equal to 81.4 psig per the following computation: 75psig + [[57'-(42'-3")]62.2# per $ft^3/(12in\ per\ ft)^2$]

The downstream pressure is conservatively considered to be equal zero since the lowest level of the RWST is 11.91' and the elevation of the subject valves is 42'-3", and because of the adjacent check valve XCV-0212.

The pressurization case was evaluated and the resultant increase in stem loads required to unseat the valves was calculated to be **1939 lbs.**

The worst-case depressurization scenario is considered for practical purposes same as pressurization case above with the exception that the Volume Control Tank is at a normal minimum pressure of 15 psig instead of the 75 psig maximum pressure and the minimum level in the VCT is 47.6'. Therefore, the upstream pressure is then equal to 17.3 psig.

The depressurization case was evaluated and the resultant increase in stem loads required to unseat the valves was calculated to be **2502 lbs.**

1,2-CVMOV-0112C & -0113B

The pressurization scenario would entrap process water at 125.5 psig (pressure conservatively assumed as a result of emergency boration) in the bonnet cavity.

The upstream pressure is equal to the difference in elevation between the normal level of the RWST of 30.4' (based on injection volume of 350000 gallons and the elevation of the subject valves of 11'-3". The upstream pressure is then calculated equal to 8.3 psig.

The downstream pressure is conservatively considered to be equal to the VCT minimum pressure of 15 psig, plus the difference between the minimum level of the VCT (47.6') and the elevation of the subject valves (11'-3"). The downstream pressure is then calculated to be equal to 30.7 psig.

Also, the maximum pressure-locking pressure of 125.5 psig is within the design pressure of the bonnet which, according to ANSI B16.34-1977 and the applicable valve drawings, is equal to 264.5 psi @130°F.

The pressurization case was evaluated and the resultant increase in stem loads required to unseat the valves was calculated to be **2403 lbs.**

The worst-case depressurization scenario is considered to be the same as the pressurization case.

b. **THERMAL BINDING (Large ΔT)**

A review of the applicable piping isometrics, piping flow diagrams, operating experience, equipment and surveillance history, did not reveal the existence of any connecting hot pipeline, adjacent thermal sources, or other than normal operating ambient temperature swings which could produce a thermal effect pressure locking scenario in the bonnet. According to Westinghouse's correspondence letter, no thermal binding analysis is required for flex wedge gate valves with temperature gradients of 100°F above maximum normal ambient operating temperature. Therefore, since these valves meet that criteria, no thermal

binding analysis is required.

c. <u>CONCLUSION</u>

There is no susceptibility to pressure locking(thermal Effects) or Thermal Binding.

Existing actuator capability margins assure the effects from pressurization/depressurization can be overcome. Utilizing the pullout forces measured during the latest diagnostic test and the design Stem Factor, these valves demonstrated greater than a 12% margin after applying instrument errors, 5% SF degradation, and 5% valve factor/coefficient of friction degradation.

These valves are designated as USE-AS-IS and meet STP's GL 89-10 MOV performance acceptance criteria, including errors and uncertainties. In addition, during periodic diagnostic testing, STP's Diagnostic Testing Error Analysis and Acceptance Criteria procedure, 0PEP06-ZE-0001, performs an evaluation of PL/TB loads, combined with the latest measured pullout forces to assure DVAC design margin is maintained.

1R171XCV0465, 1R172XCV0465
1R171XCV0468, 1R172XCV0468

VALVE DESCRIPTION:	RCS Letdown Stop Valves
SAFETY FUNCTIONS:	These valves provide automatic and redundant safety grade isolation of the letdown line on low pressurizer level. These valves are also manually closed to isolate a HELBA in the CVCS between the letdown stop valves and the letdown header isolation valves.
NORMAL FUNCTIONS:	These valves are normally open and close automatically on a low level signal derived from the pressurizer level control system. They are also manually closed to isolate the letdown line for maintenance and manually opened to establish letdown flow.
SURVEILLANCE REQUIREMENTS:	The subject valve's are required to be exercised (full stroke) for operability during each cold shutdown and at each refueling outage. This is not required more often than once every three months.
PSA RANKING:	FV based on CDF = 4.28E-05 (Medium) FV with Common Cause = 6.57E-05 (Medium)

SUMMARY OF CALCULATION RESULTS

MOV's CV0465 & CV0468 are located in the CVCS letdown line, are normally open and automatically close on a low level signal from the pressurizer level control system to prevent uncovering the heater elements in the pressurizer. Additionally, these valve's are manually closed to isolate a high energy line break in the CVCS, between the letdown stop valve and the letdown isolation valve.

The subject valve's are 4" Westinghouse EMD Gate, limit controlled, with a Limitorque SB-0-25 actuator, and are located in the Reactor Containment Building.

a. **PRESSURE LOCKING (Thermal or Depressurization)**

These valves are normally open and their safety function is to close. There are no requirements for these valves to reopen, therefore pressure locking analysis is not required.

b. **THERMAL BINDING (Large ΔT)**

These valves are normally open and their safety function is to close. There are no requirements for these valves to reopen, therefore Thermal Binding analysis is not required.

c. **CONCLUSION**

These valves are not susceptible to Pressure locking or Thermal Binding.

A review of the screening criteria identified that these were identified to be susceptible due to mispositioning only. These valves are designated as USE-AS-IS and meet STP's GL 89-10 MOV performance acceptance criteria, including errors and uncertainties.