Consumers Energy

A CMS Energy Company

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U.S. Nuclear Regulatory Commission
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DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT
SUPPLEMENTAL INFORMATION - GENERIC LETTER 95-07, "PRESSURE LOCKING AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE VALVES"

This letter provides the supplemental information requested by the NRC to support the Palisades Safety Evaluation Report for NRC Generic Letter (GL) 95-07, "Pressure Locking and Thermal Binding of Power-Operated Gate Valves."

Two attachments provide the necessary information. Attachment 1 is a table which summarizes the safety function and the pressure locking and thermal binding susceptibility bases for each of the valves covered in the 180-day response to GL 95-07, dated February 13, 1996. The table also provides the corrective actions that have been or will be taken to address the pressure locking or thermal binding concerns. This table lists valves in the same order as presented to the NRC in the 180-day submittal.

Attachment 2 addresses power-operated gate valves that were susceptible to pressure locking and for which analytical models were used to determine the unseating forces. This attachment provides the necessary information to quantify the margins available to overcome pressure locking.

A056 1/1

SUMMARY OF COMMITMENTS

This letter contains no new commitments and no revisions to existing commitments.

Thomas C. Bordine
Manager, Licensing

CC Administrator, Region III, USNRC
Project Manager, NRR, USNRC
NRC Resident Inspector - Palisades

2 Attachments

CONSUMERS ENERGY COMPANY

To the best of my knowledge, the contents of this supplemental information supporting GL 95-07 response, are truthful and complete.

By _____
Thomas C. Bordine
Manager, Licensing

Sworn and subscribed to before me this 23rd day of February 1998.

_____
Alora M. Davis, Notary Public
Berrien County, Michigan
(Acting in Van Buren County, Michigan)
My commission expires August 26, 1999

[SEAL]

ATTACHMENT 1

CONSUMERS ENERGY COMPANY
PALISADES PLANT
DOCKET 50-255

SUPPLEMENTAL INFORMATION - GENERIC LETTER 95-07 "PRESSURE LOCKING AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE VALVES"

TABLE- VALVE LIST CONTAINING SAFETY FUNCTION AND PLTB SUSCEPTIBILITY

7 Pages

ATTACHMENT 1
TABLE- VALVE LIST CONTAINING SAFETY FUNCTION AND PLTB SUSCEPTIBILITY

Tag No.	Description	Susceptible to PL or TB	Pressure Locking Justification/Action	Thermal Binding Justification/Action
CV-0521	Alternate Steam Supply to AFW Pump P-8B	N/A	Valve was removed from the plant in 1996 as part of modification FC-966.	Valve was removed from the plant in 1996 as part of modification FC-966.
MO-1042A	PORV Block Valve	PL & TB	Drilled hole in upstream disc. Completed 12/96	Converting from torque seating to limit seating in 98 REFOUT.
MO-1043A	PORV Block Valve	PL & TB	Drilled hole in upstream disc. Completed 12/96	Converting from torque seating to limit seating in 98 REFOUT.
CV-3055	Shutdown Cooling Inlet to Shutdown Cooling Heat Exchanger	N/A	Excluded from scope of NRC GL 95-07 based on Palisades being a Hot Shutdown Plant.	Excluded from scope of NRC GL 95-07 based on Palisades being a Hot Shutdown Plant.
CV-3070	HPSI Sub Cooling Valve	PL & TB	Bonnet vent path to upstream side of valve will be installed prior to conclusion of 98REFOUT.	Valve ΔT of 32° F is below the threshold for thermal binding of double disc gate valves.
CV-3071	HPSI Sub Cooling Valve	PL & TB	Bonnet vent path to upstream side of valve will be installed prior to conclusion of 98REFOUT.	Valve ΔT of 32° F is below the threshold for thermal binding of double disc gate valves.
CV-3027	SIRW Tank Recirculation	N/A	Valve is normally open and only has to close to perform its safety function. It does not have to reopen.	Valve is normally open and only has to close to perform its safety function. It does not have to reopen.
CV-3031	SIRW Tank Outlet	N/A	Valve is normally open and only has to close to perform its safety function. It does not have to reopen.	Valve is normally open and only has to close to perform its safety function. It does not have to reopen.
CV-3056	SIRW Tank Recirculation	N/A	Valve is normally open and only has to close to perform its safety function. It does not have to reopen.	Valve is normally open and only has to close to perform its safety function. It does not have to reopen.

ATTACHMENT 1
TABLE- VALVE LIST CONTAINING SAFETY FUNCTION AND PLTB SUSCEPTIBILITY

Tag No.	Description	Susceptible to PL or TB	Pressure Locking Justification/Action	Thermal Binding Justification/Action
CV-3057	SIRW Tank Outlet	N/A	Valve is normally open and only has to close to perform its safety function. It does not have to reopen.	Valve is normally open and only has to close to perform its safety function. It does not have to reopen.
CV-0704	Blowdown Tank Discharge to Condensate Discharge	N/A	Valve has no active safety function to reposition.	Valve has no active safety function to reposition.
CV-0733	Hotwell 12" Makeup Valve	N/A	Valve has no active safety function to reposition.	Valve has no active safety function to reposition.
MO-0501	MSIV Bypass Valve	N/A	Valve has no active safety function to open.	Valve has no active safety function to open.
MO-0510	MSIV Bypass Valve	N/A	Valve has no active safety function to open.	Valve has no active safety function to open.
CV-3212	Shutdown Cooling Hx Inlet Valve	N/A	Valve is normally open and has no active safety function to open.	Valve is normally open and has no active safety function to open.
CV-3213	Shutdown Cooling Hx Outlet Valve	N/A	Valve is normally open and has no active safety function to open.	Valve is normally open and has no active safety function to open.
CV-3223	Shutdown Cooling Hx Inlet Valve	N/A	Valve is normally open and has no active safety function to open.	Valve is normally open and has no active safety function to open.
CV-3224	Shutdown Cooling Hx Outlet Valve	N/A	Valve is normally open and has no active safety function to open.	Valve is normally open and has no active safety function to open.
MO-0798	Aux Feedwater Isolation Valve	N/A	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.

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TABLE- VALVE LIST CONTAINING SAFETY FUNCTION AND PLTB SUSCEPTIBILITY

Tag No.	Description	Susceptible to PL or TB	Pressure Locking Justification/Action	Thermal Binding Justification/Action
MO-3041	Safety Injection Tank T-82A Outlet Isolation	N/A	Valve is normally open and has no active safety function to reopen if closed.	Valve is normally open and has no active safety function to reopen if closed.
MO-3045	Safety Injection Tank T-82B Outlet Isolation	N/A	Valve is normally open and has no active safety function to reopen if closed.	Valve is normally open and has no active safety function to reopen if closed.
MO-3049	Safety Injection Tank T-82C Outlet Isolation	N/A	Valve is normally open and has no active safety function to reopen if closed.	Valve is normally open and has no active safety function to reopen if closed.
MO-3052	Safety Injection Tank T-82D Outlet Isolation	N/A	Valve is normally open and has no active safety function to reopen if closed.	Valve is normally open and has no active safety function to reopen if closed.
CV-3036	HPSI Pump P-66A to HPSI Train 2 Isolation	N/A	Valve is normally open and has no active safety function to open.	Valve is normally open and has no active safety function to open.
CV-3037	HPSI Pump P-66A to HPSI Train 1 Isolation	N/A	Valve is normally closed and has no active safety function to open.	Valve is normally closed and has no active safety function to open.
CV-3059	HPSI Pump P-66B to HPSI Train 1 Isolation.	N/A	Valve is normally open and has no active safety function to open.	Valve is normally open and has no active safety function to open.
MO-0743	Aux Feedwater Isolation Valve	N/A	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.
MO-0748	Aux Feedwater Isolation Valve	N/A	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.

ATTACHMENT 1
TABLE- VALVE LIST CONTAINING SAFETY FUNCTION AND PLTB SUSCEPTIBILITY

Tag No.	Description	Susceptible to PL or TB	Pressure Locking Justification/Action	Thermal Binding Justification/Action
MO-0753	Aux Feedwater Isolation Valve	N/A	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.
MO-0754	Aux Feedwater Isolation Valve	N/A	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.
MO-0755	Aux Feedwater Isolation Valve	N/A	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.
MO-0759	Aux Feedwater Isolation Valve	N/A	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.
MO-0760	Aux Feedwater Isolation Valve	N/A	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.	SC 95-041 disconnected power to this valve. Valve retired in place and locked open.
MO-3080	HPSI Hot Leg Injection Mode Select	N/A	Valve is normally open and has no active safety function to reopen after it is closed.	Valve is normally open and has no active safety function to reopen after it is closed.
MO-3081	HPSI Hot Leg Injection Mode Select	N/A	Valve is normally open and has no active safety function to reopen after it is closed.	Valve is normally open and has no active safety function to reopen after it is closed.
MO-3189	LPSI Pump P-67B Inlet from SIRW Tank	N/A	Valve is normally open and has no active safety function to open.	Valve is normally open and has no active safety function to open.

ATTACHMENT 1
TABLE- VALVE LIST CONTAINING SAFETY FUNCTION AND PLTB SUSCEPTIBILITY

Tag No.	Description	Susceptible to PL or TB	Pressure Locking Justification/Action	Thermal Binding Justification/Action
MO-3198	LPSI Pump P-67A Inlet from SIRW Tank	N/A	Valve is normally open and has no active safety function to open.	Valve is normally open and has no active safety function to open.
CV-0939	MZ-11 Shield Cooling Surge Tank	N/A	This valve is excluded from further GL 95-07 consideration because it is a globe valve. See Note 1	This valve is excluded from further GL 95-07 consideration because it is a globe valve. See Note 1
MO-2087	Volume Control Tank Outlet	N/A	Valve is normally open and does not have an active safety function to reopen after it closes.	Valve is normally open and does not have an active safety function to reopen after it closes.
CV-0437A	Iodine Removal Tank Outlet	N/A	The valve was retired in place as part of FC 949. It currently has no safety function.	The valve was retired in place as part of FC 949. It currently has no safety function.
CV-0437B	Iodine Removal Tank Outlet	N/A	The valve was retired in place as part of FC 949. It currently has no safety function.	The valve was retired in place as part of FC 949. It currently has no safety function.
CV-0438A	Iodine Removal Tank Outlet	N/A	The valve was retired in place as part of FC 949. It currently has no safety function.	The valve was retired in place as part of FC 949. It currently has no safety function.
CV-0438B	Iodine Removal Tank Outlet	N/A	The valve was retired in place as part of FC 949. It currently has no safety function.	The valve was retired in place as part of FC 949. It currently has no safety function.
MO-2160	SIRW Tank to CVCS Isolation	PL & TB	Valve has 81% margin based on COMED Analysis Method. See Attachment 2 for Inputs.	Valve ΔT of 45° F is below the threshold for thermal binding of flex wedge gate valves. There is no heat trace on this CVCS valve.

ATTACHMENT 1
TABLE- VALVE LIST CONTAINING SAFETY FUNCTION AND PLTB SUSCEPTIBILITY

Tag No.	Description	Susceptible to PL or TB	Pressure Locking Justification/Action	Thermal Binding Justification/Action
MO-2169	Boric Acid Gravity Feed Isolation	PL & TB	Valve has 4% margin based on COMED Analysis Method. See Attachment 2 for Inputs.	Valve ΔT of 25° F is below the threshold for thermal binding of flex wedge gate valves. The valve is heat traced and maintains a temperature of 165° F ±5°. Low alarm set point is 145° F.
MO-2170	Boric Acid Gravity Feed Isolation	PL & TB	Valve has 21% margin based on COMED Analysis Method. See Attachment 2 for Inputs.	Valve ΔT of 25° F is below the threshold for thermal binding of flex wedge gate valves. The valve is heat traced and maintains a temperature of 165° F ±5°. Low alarm set point is 145° F.
MO-2140	Boric Acid Gravity Feed Isolation	PL & TB	Valve has 31% margin based on COMED Analysis Method. See Attachment 2 for Inputs.	Valve ΔT of 25° F is below the threshold for thermal binding of flex wedge gate valves. The valve is heat traced and maintains a temperature of 165° F ±5°. Low alarm set point is 145° F.
CV-3018	HPSI Train Cross Connect Isolation	N/A	Valve is normally closed and has no active safety function to open.	Valve is normally closed and has no active safety function to open.
MO-3190	LPSI Pump P-67B Shutdown Cooling Inlet Isolation	N/A	Excluded from scope of NRC GL 95-07 based on Palisades being a Hot Shutdown Plant.	Excluded from scope of NRC GL 95-07 based on Palisades being a Hot Shutdown Plant.
MO-3199	LPSI Pump P-67A Shutdown Cooling Inlet Isolation	N/A	Excluded from scope of NRC GL 95-07 based on Palisades being a Hot Shutdown Plant.	Excluded from scope of NRC GL 95-07 based on Palisades being a Hot Shutdown Plant.

ATTACHMENT 1
TABLE- VALVE LIST CONTAINING SAFETY FUNCTION AND PLTB SUSCEPTIBILITY

Tag No.	Description	Susceptible to PL or TB	Pressure Locking Justification/Action	Thermal Binding Justification/Action
MO-3015	PCS to Shutdown Cooling Isolation	N/A	Excluded from scope of NRC GL 95-07 based on Palisades being a Hot Shutdown Plant.	Excluded from scope of NRC GL 95-07 based on Palisades being a Hot Shutdown Plant.
MO-3016	PCS to Shutdown Cooling Isolation	N/A	Excluded from scope of NRC GL 95-07 based on Palisades being a Hot Shutdown Plant.	Excluded from scope of NRC GL 95-07 based on Palisades being a Hot Shutdown Plant.
CV-3029	Containment Sump Isolation	N/A	Valve does have an active safety function to open. However, the valve disc is a solid wedge design which is not susceptible to an occurrence of pressure locking.	The Containment Sump Valves are only opened for surveillance testing during cold shutdown and then reclosed. The valves are not closed hot. Additionally, the valves are insulated by a column of water between the valves and the Containment Sump so they will not experience large thermal transients.
CV-3030	Containment Sump Isolation	N/A	Valve does have an active safety function to open. However, the valve disc is a solid wedge design which is not susceptible to an occurrence of pressure locking.	The Containment Sump Valves are only opened for surveillance testing during cold shutdown and then reclosed. The valves are not closed hot. Additionally, the valves are insulated by a column of water between the valves and the Containment Sump so they will not experience large thermal transients.

Note 1: During implementation of the Palisades AOV Program, CV-0939, Shield Cooling Surge Tank Inlet Valve, was verified as a globe valve. The Plant Equipment Data Base has been updated to reflect the proper valve type. The original submittal included this valve in the scope of safety related power operated gate valves. Additionally, the Palisades AOV Program has not found any other valves that were classified as globe valves that should have been gate valves.

ATTACHMENT 2

CONSUMERS ENERGY COMPANY
PALISADES PLANT
DOCKET 50-255

SUPPLEMENTAL INFORMATION - GENERIC LETTER 95-07 "PRESSURE LOCKING AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE VALVES"

INPUT AND ASSUMPTIONS TO PRESSURE LOCKING CALCULATIONS

3 Pages

ATTACHMENT 2
INPUT AND ASSUMPTIONS TO PRESSURE LOCKING CALCULATIONS

The following inputs and assumptions were used in the COMED methodology calculations for determining the additional forces needed to unwedge a pressure locked valve (Reference Palisades Engineering Analysis EA-PLTB-00). These calculations form the basis for determining the available MOV margin as reported in Attachment 1. The differences between the available margin reported in this submittal and the margin in the original 180 day submittal are as follows:

1. The original calculation used the Entergy Methodology and now the COMED Methodology is used. The methodology change reflects industry feedback on the validity of the two calculational methods.
2. There is an additional 20% margin added to the disc pullout forces to account for future changes in this force. The original calculations included the appropriate VOTES diagnostic accuracy assumptions, but this additional 20% is added to assure that future changes due to different torque switch trip settings do not create a need to revise the PLTB Calculations.
3. The original calculations used a generic 0.5 valve factor. This was revised to be consistent with the valve factor assumption used for NRC Generic Letter 89-10. The new valve factors for MO-2140, 2160, 2169 and 2170 are 0.8.

MO-2140, MO- 2160

Assumptions:

1. The maximum pressure in the bonnet is assumed to be the highest pressure seen from upstream and downstream sources. The upstream and downstream pressures are conservatively set equal to 0.0 psi at the time of valve opening. This represents the worst possible scenario.
2. An additional 20% margin (on top of diagnostic accuracy) is conservatively included for the measured pullout thrust values to provide for future variances in actual pullout values.
3. The valves are 3", 150#, Velan flex wedge gate valves. Conversations with Velan revealed that Velan uses a 1500# class valve body for all pressure classes. As such, it is expected that the valve body/disc are indeed stiff and there is not a concern of the valve body stretching due to the bonnet pressure and the disc traveling further into the seat. As such, additional pinching of the valve disc due to this phenomena is not considered in the pressure locking calculations. These are forged valves and typically the forging process results in a thicker (and therefore more stiff) material than a cast valve. The stiffness of the valve body and disc should preclude any significant pinching effect.

ATTACHMENT 2
INPUT AND ASSUMPTIONS TO PRESSURE LOCKING CALCULATIONS

Inputs:

Upstream Pressure	0 psi	Modulus of Elasticity	$29X10^6$ psi
Downstream Pressure	0 psi	Disc Center to Hub Edge	0.736
Bonnet Pressure	120 psi	Disc Thickness	0.761 in.
Valve Disc Wedge Θ°	5°	Valve Factor	0.8
Structural Thrust Limit	22,894 lbf	Hub Length	1 in.
Mean Seat Radius	1.281 in.	Disc Coefficient of Friction	0.857
Stem Diameter	1.121 in.	Poisson's ratio (disc)	0.27

Required Unseating Forces:

Pressure Locking Force:	441.7 lbf
Piston Effect:	-118.4 lbf
Reverse Piston Effect:	107.8 lbf
Pullout Thrust (MO-2140):	4800 lbf
Pullout Thrust (MO-2160):	3000 lbf

Total Required Force:		Motor Gearing Capability:	
MO-2140	5231.1 lbf	MO-2140	6877 lbf
MO-2160	3431.1 lbf	MO-2160	6218 lbf

Margin:	
MO-2140	31.4%
MO-2160	81.2%

MO-2169, MO-2170

Assumptions:

1. The maximum pressure in the bonnet is assumed to be the highest pressure seen from upstream and downstream sources. The upstream and downstream pressures are conservatively set equal to 0.0 psi at the time of valve opening. This represents the worst possible scenario.
2. An additional 20% margin (on top of diagnostic accuracy) is conservatively included for the measured pullout thrust values to provide for future variances in actual pullout values.
3. The valves are 4", 150#, Velan flex wedge gate valves. Conversations with Velan revealed that Velan uses a 1500# class valve body for all pressure classes. As such, it is expected that the valve body/disc are indeed stiff and there is not a concern of the valve body stretching due to the bonnet pressure and the disc traveling further into the seat.

ATTACHMENT 2
INPUT AND ASSUMPTIONS TO PRESSURE LOCKING CALCULATIONS

As such, additional pinching of the valve disc due to this phenomena is not considered in the pressure locking calculations. These are forged valves and typically the forging process results in a thicker (and therefore more stiff) material than a cast valve. The stiffness of the valve body and disc should preclude any significant pinching effect.

Inputs:

Upstream Pressure	0 psi	Modulus of Elasticity	$29X10^6$ psi
Downstream Pressure	0 psi	Disc Center to Hub Edge	1.25
Bonnet Pressure	120 psi	Disc Thickness	0.941 in.
Valve Disc Wedge Θ°	5°	Valve Factor	0.8
Structural Thrust Limit	31,566 lbf	Hub Length	1 in.
Mean Seat Radius	1.859 in.	Disc Coefficient of Friction	0.857
Stem Diameter	1.37 in.	Poisson's ratio (disc)	0.27

Required Unseating Forces:

Pressure Locking Force:	698.5 lbf
Piston Effect:	-176.8 lbf
Reverse Piston Effect:	227.1 lbf
Pullout Thrust (MO-2169):	5025 lbf
Pullout Thrust (MO-2170):	4570 lbf

Total Required Force:		Motor Gearing Capability:	
MO-2169	5773.8 lbf	MO-2169	6022 lbf
MO-2170	5318.8 lbf	MO-2170	6444 lbf

Margin:

MO-2169	4.3%
MO-2170	21.1%

As noted earlier, the apparent low margin in MO-2169 is largely a function of the additional 20% margin that was added to the pullout forces. If the additional 20% conservatism is neglected, then the actual margin for MO-2169 is 21.9%.

Conclusion:
All valves have adequate margin to open under the assumed pressure locking conditions.