Northern States Power Company

Monticello Nuclear Generating Plant
2807 West Hwy 75
Monticello, Minnesota 55362-9637

February 12, 1996

NRC Generic Letter 95-07

US Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

MONTICELLO NUCLEAR GENERATING PLANT
Docket No. 50-263 License No. DPR-22

180 Day Response to Generic Letter 95-07: Pressure Locking and
Thermal Binding of Safety-Related Power-Operated Gate Valves (TAC M93487)

The purpose of this letter is to provide the 180 day response required by NRC Generic Letter 95-07 for the Monticello Nuclear Generating Plant.

Generic Letter 95-07 (dated August 17, 1995) was issued by the NRC requesting licensees to provide information concerning (1) the evaluation of operational configurations of safety-related, power-operated gate valves for susceptibility to pressure locking and thermal binding; and (2) analyses, and needed corrective actions, to ensure that safety-related power-operated gate valves that are susceptible to pressure locking or thermal binding are capable of performing the required safety function.

Generic Letter 95-07 contained the following required response:

1. *Within 60 days from the date of* [Generic Letter 95-07], *a written response indicating whether or not the addressee will implement the action(s) requested* [by the generic letter]. *If the addressee intends to implement the requested action(s), provide a schedule for completing implementation. If an addressee chooses not to take the requested action(s), provide a description of any proposed alternative course of action, the schedule for completing the alternative course of action (if applicable), and the safety basis for determining the acceptability of the planned alternative course of action.*

2. *Within 180 days from the date of [Generic Letter 95-07], a written response to the information request specified [by the generic letter].*

By letter dated October 16, 1995, with subject, "Response to Generic Letter 95-07: Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," Monticello responded to item 1 above. Attachment 1 to this letter provides the information requested by item 2 above.

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This letter contains the following new NRC commitments:

1. MO-2006 and MO-2007 are to be modified by drilling an anti-pressure locking hole in the pump side of the disc to prevent pressure locking due to potential high ambient area temperatures after an accident. MO-2007 is to be modified prior to completion of the 1996 refueling outage. MO-2006 is to be modified prior to completion of the 1998 refueling outage. (M96002A)

Please contact Marv Engen, Sr Licensing Engineer, at (612) 295-1291 if you require further information.

William J Hill

William J Hill
Plant Manager
Monticello Nuclear Generating Plant

c: Regional Administrator - III, NRC
NRR Project Manager, NRC
Sr Resident Inspector, NRC
State of Minnesota, Attn: Kris Sanda

Attachments: Affidavit to the US Nuclear Regulatory Commission
(1) Monticello Nuclear Generating Plant, 180 Day Response to Generic Letter 95-07
(2) Pressure Locking and Thermal Binding Criteria

UNITED STATES NUCLEAR REGULATORY COMMISSION

NORTHERN STATES POWER COMPANY

MONTICELLO NUCLEAR GENERATING PLANT DOCKET NO. 50-263

180 DAY RESPONSE DATED February 12, 1996
TO GENERIC LETTER 95-07:
PRESSURE LOCKING AND THERMAL BINDING OF
SAFETY-RELATED POWER-OPERATED GATE VALVES

Northern States Power Company, a Minnesota corporation, hereby provides response to NRC Generic Letter 95-07, Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves. This letter contains no restricted or other defense information.

NORTHERN STATES POWER COMPANY

By William J Hill
William J Hill
Plant Manager
Monticello Nuclear Generating Plant

On this 12th day of February 1996 before me a notary public in and for said County, personally appeared William J Hill, Plant Manager, Monticello Nuclear Generating Plant, and being first duly sworn acknowledged that he is authorized to execute this document on behalf of Northern States Power Company, that he knows the contents thereof, and that to the best of his knowledge, information, and belief the statements made in it are true and that it is not interposed for delay.

Marvin R Engen
Notary Public - Minnesota
Sherburne County
My Commission Expires January 31, 2000

MARVIN RICHARD ENGEN
NOTARY PUBLIC - MINNESOTA
My Comm. Exp. Jan. 31, 2000

Attachment 1

Monticello Nuclear Generating Plant
180 Day Response to Generic Letter 95-07

Requested Action

Within 180 days of the date of [Generic Letter 95-07], *each addressee of* [the] *generic letter is requested to implement and complete the guidance provided in Attachment 1* [of Generic Letter 95-07] *to perform the following actions:*

1. *Evaluate the operational configurations of 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;*

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

Requested Information

All addressees, including those who have already satisfactorily addressed pressure locking and thermal binding for MOVs by implementing the guidance in Supplement 6 to GL 89-10 (or equivalent industry methods), are requested to provide a summary description of the following:

1. *The susceptibility evaluation of operational configurations performed in response to (or consistent with) 180-day Requested Action 1, and the further analyses 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;*

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

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.*

Monticello Response

Summary Description of Susceptibility Evaluation

The following provides a summary description of our susceptibility evaluation performed in response to Requested Action 1 of the generic letter 180 day action items, in accordance with item 1 of the information requested by NRC Generic Letter 95-07.

All Motor Operated Valves (MOVs), Air Operated Valves (AOVs), and Hydraulically Operated Valves (HOVs) were reviewed to determine applicability of this issue. The initial screening consisted of a review for the following:

1. Safety related power operated (electric, air or hydraulic) gate valves which have a safety function to open.

2. Normally open valves which do not have a safety function to cycle open, but which are closed for surveillance testing were evaluated for pressure locking and thermal binding unless the technical specification limiting condition for operation is entered during the time that the valve is closed.

3. Mispositioning was not considered.

The initial screening results for each valve type are provided below.

1) Air Operated Valves

All safety related air operated valves were reviewed. The majority of air operated valves were found to be not of a gate valve design. Of the gate valves which are air operated, none had a safety function to open, or the valves were not required to be in the open position for system operability. Therefore, the pressure locking/thermal binding issue identified in Generic Letter 95-07 was determined to be not applicable to Monticello's population of air operated valves.

2) Hydraulically Operated Valves

Monticello has three hydraulically operated, safety related valves; two in the High Pressure Coolant Injection (HPCI) system (HO-7 and HO-8) and one in the Reactor Core Isolation Cooling (RCIC) system (HO-8). All three of these valves are globe type valves and are therefore not susceptible to pressure locking or thermal binding. The pressure locking/thermal binding issue identified in Generic Letter 95-07 was determined to be not applicable to Monticello's population of hydraulically operated valves.

3) Motor Operated Valves (MOVs)

Evaluation of pressure locking and thermal binding of MOVs was most recently performed per Generic Letter 89-10 supplement 6 and received favorable NRC review as part of Monticello's Generic Letter 89-10 closeout inspection. Although Generic Letter 95-07 states that if satisfactory implementation of supplement 6 guidance was performed the licensee need not perform any additional action for MOVs, a thorough review of all safety related motor operated gate valves was re-performed for this response.

Each valve identified as being within the scope of this evaluation was further evaluated to determine susceptibility based on the criteria set forth in Attachment 2 of this submittal. Procedural practices as well as surveillance testing, hydrostatic pressure testing, accident environments, and industry and plant historical events were considered for each valve.

Summary of Susceptibility Evaluation Results

The following provides the susceptibility evaluation results in accordance with item 2 of the information requested by NRC Generic Letter 95-07.

The following table lists those valves which were identified as having operational configurations such that the valves are potentially susceptible to pressure locking or thermal binding. As a result of actions taken to address valve pressure locking and thermal binding prior to issuance of NRC Generic Letter 95-07, few potentially susceptible valves were identified. The bases for determining that a valve is not susceptible to pressure locking or thermal binding is provided in the table notes. Valves identified as potentially susceptible based on the Generic Letter 95-07 review are indicated with bold text in the table. For those valves which were identified to be potentially susceptible, an evaluation was performed to ensure each valve can perform its intended safety function. All valves were found to be capable of performing the intended safety function.

Valves Identified for Evaluation Based on Operational Configurations
and Identified as Potentially Susceptible to
Pressure Locking and/or Thermal Binding Phenomena

MOV No.	Disc Type	Normal Position	Open Safety. Function	Potential for Pressure Locking	Potential for Thermal Binding	Valve Description
MO-1741	Solid	Open	No	No (1)	No (3)	Core Spray Pump Suction
MO-1742	Solid	Open	No	No (1)	No (3)	Core Spray Pump Suction
MO-1751	Flex	Open	Yes	**Yes**	No (3)	Core Spray Outboard Injection valve
MO-1752	Flex	Open	Yes	**Yes**	No (3)	Core Spray Outboard Injection valve
MO-1753	Flex	Closed	Yes	No (2)	No (3)	Core Spray Inboard Injection valve
MO-1754	Flex	Closed	Yes	No (2)	No (3)	Core Spray Inboard Injection valve
MO-1986	Solid	Open	No	No (4)	No (3)	RHR Torus suction
MO-1987	Solid	Open	Yes	No (4)	No (3)	RHR Torus suction
MO-2006	Flex	Closed	Yes	**Yes**	No (3)	RHR Torus Cooling/Spray
MO-2007	Flex	Closed	Yes	**Yes**	No (3)	RHR Torus Cooling/Spray
MO-2014	Flex	Closed	Yes	No (2)	No (3)	A RHR LPCI Injection Inboard
MO-2015	Flex	Closed	Yes	No (2)	No (3)	B RHR LPCI Injection Inboard
MO-2020	Flex	Closed	Yes	No (5)	No (3)	A RHR Drywell Spray Inboard
MO-2021	Flex	Closed	Yes	No (5)	No (3)	B RHR Drywell Spray Inboard
MO-2022	Flex	Closed	Yes	No (5)	No (3)	A RHR Drywell Spray Outboard
MO-2023	Flex	Closed	Yes	No (5)	No (3)	B RHR Drywell Spray Outboard
MO-2033	Flex	Open	No	No (6)	No (6)	RHR Crosstie
MO-2034	Flex	Open	No	**Yes**	No (5)	HPCI Steam Isolation Inboard
MO-2035	Flex	Open	No	**Yes**	No (5)	HPCI Steam Isolation Outboard
MO-2036	Flex	Closed	Yes	No (2)	**Yes**	HPCI Steam Supply
MO-2061	Solid	Closed	Yes	No (4)	No (3)	HPCI Torus Suction
MO-2062	Solid	Closed	Yes	No (4)	No (3)	HPCI Torus Suction
MO-2063	Solid	Open	No	No (4)	No (3)	HPCI CST Suction
MO-2067	Flex	Closed	Yes	No (2)	No (3)	HPCI Injection
MO-2068	Flex	Closed	Yes	No (2)	**Yes**	HPCI Injection
MO-2075	Flex	Open	No	No (7)	No (5)	RCIC Steam Isolation Inboard
MO-2076	Flex	Open	No	No (7)	No (5)	RCIC Steam Isolation Outboard
MO-2100	Solid	Closed	Yes	No (4)	No (3)	RCIC Torus Suction
MO-2101	Solid	Closed	Yes	No (4)	No (3)	RCIC Torus Suction
MO-2102	Solid	Open	No	No (4)	No (3)	RCIC CST Suction
MO-2106	Flex	Closed	Yes	No (2)	No (3)	RCIC Injection
MO-2107	Flex	Closed	Yes	No (2)	**Yes**	RCIC Injection

NOTES:

(1) Normally open valve, does not need to open to perform it's safety function. Also, during surveillance testing when the valve is closed, the Tech Spec limiting condition for operation (LCO) is entered and the valve is re-opened prior to exiting the LCO.
(2) Anti-Pressure locking hole has been drilled in disc.
(3) Placed in closed position while valve is cool therefore will not thermally bind.
(4) This valve has a solid disc design and is therefore not susceptible to pressure locking.
(5) Operational practices preclude pressure locking or thermal binding.
(6) This valve remains open whenever LPCI is required and is not stroked during surveillance testing.
(7) Normally open valve, not required to open for pressure locking scenario.

Analysis of Safety Function Capability and Corrective Actions

The following provides a summary description of our evaluation performed per Requested Action 2, in accordance with items 1 and 2 of the information requested in NRC Generic Letter 95-07. The potentially susceptible valves are identified, the basis for determining susceptibility and when appropriate, a summary of the further analysis performed to confirm that the valves are capable of performing the required safety function. In accordance with item 3 of the information requested in NRC Generic Letter 95-07, the corrective actions are provided for the potentially susceptible valves.

MO-1751/1752, 11/12 Core Spray Outboard Injection

Analysis Summary

During the surveillance test these valves are placed in the closed position and are left closed during the run of the Core Spray pumps. While these valves are closed they are potentially susceptible to pressure locking.

Corrective Action

The surveillance test and system operating procedures have been revised to declare the affected system train inoperable during the time that these valves are in the closed position. If valve maintenance arises which would allow performance of a modification to provide a valve disc anti-pressure locking hole, then installation of an anti-pressure locking hole will be considered such that declaring the affected system train inoperable would no longer be necessary.

MO-2006/2007, 11/12 RHR Torus Cooling/Spray

Analysis Summary

Temperature profiles from the equipment environmental qualification analysis shows that the area temperature surrounding MO-2006 and MO-2007 would increase following a postulated accident to 6°F and 93°F respectively. Pressure locking could occur due to valve bonnet pressurization as a result of the elevated area temperatures. A calculation has been performed which demonstrates that sufficient margin exists such that the valves are capable of performing their intended function should bonnet pressurization occur. A long term solution to drill anti-pressure locking holes in the discs of these valves is planned and committed to with this response. The magnitude of the temperatures involved and the existing calculation provide appropriate justification until these modifications can be performed in a controlled, planned manner.

Corrective Action

MO-2006 and MO-2007 are to be modified by drilling an anti-pressure locking hole in the pump side of the disc to prevent pressure locking due to high area temperatures after an accident. MO-2007 is to be modified prior to completion of the 1996 refueling outage. MO-2006 is to be modified prior to completion of the 1998 refueling outage.

MO-2034/2035, HPCI Inboard/Outboard Steam Line Isolation

Analysis Summary

The Inboard and Outboard containment isolation valves for the High Pressure Coolant Injection (HPCI) turbine steam supply are normally open. During surveillance tests these valves are placed in the closed position. When these valves are closed they are potentially susceptible to pressure locking in the event of a rapid depressurization of the reactor vessel. For a large depressurization event, the HPCI system would not be required to mitigate the consequences of the accident, nor would it be capable of responding as sufficient steam pressure would not be available from the reactor system.

Corrective Action

The surveillance test and system operating procedures have been revised to declare the affected system train inoperable during the time that these valves are in the closed position. If valve maintenance arises which would allow performance of a modification to provide a valve disc anti-pressure locking hole, then installation of an anti-pressure locking hole will be considered such that declaring the affected system train inoperable would no longer be necessary.

MO-2036, HPCI Turbine Steam Supply

Analysis Summary

The HPCI turbine inlet valve will be affected by a decrease in the reactor steam temperature during plant shutdown. At 150 psig reactor pressure the steam saturation temperature will be 358°F, as compared to 544°F at 1000 psig reactor pressure, or a 184°F change in temperature. Since HPCI must be operable over the range of steam pressure of 150 psig to 1000 psig, MO-2036 must be able to open at the lower temperature. MO-2036 is normally left in the closed position until after plant shutdown, therefore it is not re-opened until after it has cooled to HPCI room ambient temperature (which is equivalent to a temperature differential of approximately 450°F).

Thermal binding has occurred on a similar valve in the industry, however MO-2036 has not had a thermal binding event. Since MO-2036 is normally opened when cool after the plant has been shutdown, and this represents a much greater temperature differential than that required for HPCI operability, the potential for thermal binding is considered low.

Corrective Action

The plant shutdown procedure has been revised to require cycling of MO-2036 during plant shutdown as the valve body temperature decreases. The periodic cycling will be performed during that portion of the shutdown when valve operability is required.

MO-2068, HPCI Pump Injection

Analysis Summary

The HPCI injection valve to feedwater will be affected during plant shutdown by a decrease in feedwater temperature. This valve is normally closed and is only cycled during valve surveillance testing or to mitigate accident consequences. At full power the feedwater temperature is approximately 375°F, however at 150 psig reactor pressure the feedwater temperature will have decreased to approximately

however at 150 psig reactor pressure the feedwater temperature will have decreased to approximately 140°F. Measured valve body temperature of MO-2068 at full power operation was found to be 279°F. Thermal binding has not occurred on MO-2068 even though it is routinely opened when cool after being closed hot. Based on the recent temperature measurements of MO-2068 and on the fact that no plant or industry events have been reported for this valve, the potential for thermal binding is considered low.

Corrective Action

The plant shutdown procedure has been revised to require periodic cycling of MO-2068 during plant shutdown as the valve body temperature decreases. The periodic cycling will be performed during that portion of the shutdown when valve operability is required.

MO-2107, RCIC Pump Injection

Analysis Summary

The RCIC Injection valve, will be affected during plant shutdown by a decrease in feedwater temperature, similar to MO-2068 as described above. Similar to MO-2068, the valve is normally closed and is only cycled during valve surveillance testing or to mitigate accident consequences. Measured valve body temperature of MO-2107 at full power operation was found to be 140°F. Based on the recent temperature measurements of MO-2107 and on the fact that no plant or industry events have been reported for this valve, the potential for thermal binding is considered low.

Corrective Action

The plant shutdown procedure has been revised to require cycling of MO-2107 during plant shutdown as the valve body temperature decreases. The periodic cycling will be performed during that portion of the shutdown when valve operability is required.

Attachment 2

Pressure Locking and Thermal Binding Criteria

In order to review the susceptible population of power operated gate valves the following criteria was used.

A. Screening for Thermal Binding

T1. Valves with solid, split or flexible wedge type discs. Parallel wedge type designs may be excluded since they are not susceptible to thermal binding.

AND

T2. The valve is closed hot and must re-open when cooled to perform it's safety function. Operational configurations, including normal operating practice and surveillance procedures will be considered to determine if the valve is left in a position which may cause the valve to be susceptible (i.e. closed hot during surveillance test and allowed to cool). Based on current industry thinking the following temperature decreases will not cause the disc to become thermally bound.

⇒ Solid Disc Design 50°F
⇒ Flexible Disc Design 100°F

AND/OR

T3. Valves found to have a history of thermal binding through a review of industry events (Generic Letter 95-07 and NUREG 1275) and/or plant operational experience (NCR's, NPRDS & Maintenance History) should be reviewed for evidence of thermal binding.

B. Screening for Pressure Locking

P1. Flexible or double disc gate valves which have not had a hole drilled into the disc to prevent pressure locking. Solid disc gate valves are not susceptible.

AND

P2. Valves whose bonnet cavity is susceptible to a higher pressure than the disc upstream and downstream pressure, this can occur through rapid system pressure decreases (allowing the disc to seal without relieving bonnet pressure). Considered in this evaluation are running system pumps with the valve closed then shutting the pump down, relieving system pressure after a hydrostatic pressure test, line break scenarios and stroking of other system valves which could relieve system pressure. Upstream or downstream check valves cannot be assumed to hold pressure.

OR

P3. Valves whose bonnet cavity can become heated by either internal system fluid, or by external environmental temperature prior to the valve opening to perform it's safety function. This can allow the fluid in the bonnet to increase in temperature and pressure possibly leading to pressure locking. Normal operating ambient temperature swings can be ignored.

OR

P4. Valve found to have a history of pressure locking through a review of industry events (Generic Letter 95-07 and NUREG 1275) and/or plant operational experience (NCR's, NPRDS & Maintenance History) should be reviewed for evidence of pressure locking.

OR

P5. Valves which are left with the possibility of high bonnet pressure after inservice hydrostatic pressure testing per ASME Section XI, without further stroking of the valve to relieve pressure prior to returning the valve to service, should be considered susceptible.

OR

P6. Valves which are left with the possibility of high bonnet pressure after surveillance testing, without further stroking of the valve to relieve pressure prior to returning the valve to service, should be considered susceptible. Valves that are closed during a surveillance test when the plant technical specification LCO is entered and the valve is stroked prior to return to service will not be classified as susceptible.

C. Review of Industry Events

According to Generic Letter 95-07 and NUREG 1275 the following valves have been involved in pressure locking events:

⇒ Low Pressure Coolant Injection valves (LPCI)
⇒ Low Pressure Core Spray Injection valves
⇒ RHR System Hot-Leg Crossover Isolation Valves
⇒ Containment Spray Valves
⇒ RHR Shutdown Cooling Isolation valves
⇒ RHR Containment Sump and Suppression Pool Suction valves
⇒ High Pressure Coolant Injection (HPCI) Steam Admission valves
⇒ RHR Heat Exchanger Outlet valves
⇒ Emergency Feedwater Isolation valves
⇒ RCIC Steamline Isolation Valves

According to Generic Letter 95-07 and NUREG 1275 the following valves have been involved in thermal binding events:

- ⇒ Reactor Depressurization System Isolation valves
- ⇒ RHR Inboard Suction Isolation valves
- ⇒ HPCI Steam Admission valves
- ⇒ Power-Operated Relief valve (PORV) Block valves
- ⇒ Reactor Coolant System Letdown Isolation valves
- ⇒ RHR Suppression Pool Suction valves
- ⇒ Containment Isolation valves (sample line, letdown heat exchanger, inlet header)
- ⇒ Condensate Discharge valves
- ⇒ Reactor Feedwater Pump Discharge valves

D. Review of Plant Events

A review was performed of Monticello nonconformance reports, the Nuclear Plant Reliability Data System (NPRDS), and maintenance history.