NSP

Northern States Power Company

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

January 28, 1997

Generic Letter 96-06

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

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

120 Day Response to NRC Generic Letter 96-06
Assurance of Equipment Operability and Containment Integrity
During Design-Basis Accident Conditions

NRC Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," issued September 30, 1996 provided licensee notification of safety-significant issues that could affect containment integrity and equipment operability during accident conditions. The generic letter requests information concerning waterhammer and two phase flow conditions in cooling water systems serving containment air cooling systems, and thermally induced over pressurization of fluid filled piping systems.

Generic Letter 96-06 contains the following requested actions.

Addressees are requested to determine:

(1) if containment air cooler cooling water systems are susceptible to either water hammer or two phase flow conditions during postulated accident conditions;

(2) if piping systems that penetrate the containment are susceptible to thermal expansion of fluid so the overpressurizaticn of piping could occur.

In addition to the individual addressee's postulated accident conditions, these items should be reviewed with respect to the scenarios referenced in the generic letter.

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Requested Information

> *Within 120 days of the date of this generic letter, addressees are requested to submit a written summary report stating actions taken in response to the requested actions noted above, conclusions that were reached relative to susceptibility for waterhammer and two-phase flow in the containment air cooler cooling water system and overpressurization of piping that penetrates containment, the basis for continued operability of affected systems and components as applicable, and corrective actions that were implemented or are planned to be implemented. If systems were found to be susceptible to the conditions that are discussed in this generic letter, identify the systems affected and describe the specific circumstances involved.*

Accordingly, in NSP's 30 day response to Generic Letter 96-06, Monticello committed to the following:

> Monticello will complete the actions requested by Generic Letter 96-06 and will submit a summary report of requested information in accordance with the schedule specified by the generic letter.

Attachment A to this submittal fulfills the above commitment and the 120 day Generic Letter 96-06 required response.

Within this submittal, Monticello commits to the following:

> Monticello will install pressure relieving devices or other equivalent means to resolve the overpressure conditions identified by this submittal prior to startup from the next refueling outage. The next refueling outage is currently scheduled for January 1998.

Please contact Sam Shirey, Sr Licensing Engineer at (612) 295-1449, 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
Attachment A - 120 Day Response to NRC Generic Letter 96-06

UNITED STATES NUCLEAR REGULATORY COMMISSION

NORTHERN STATES POWER COMPANY

MONTICELLO NUCLEAR GENERATING PLANT DOCKET NO. 50-263

120 DAY RESPONSE TO NRC GENERIC LETTER 96-06
ASSURANCE OF EQUIPMENT OPERABILITY AND CONTAINMENT INTEGRITY
DURING DESIGN-BASIS ACCIDENT CONDITIONS

Northern States Power Company, a Minnesota corporation, by letter dated January 28, 1997, provides the required 120 day response to NRC Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions." 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 28th day of January 1997 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.

Samuel I. Shirey

Samuel I. Shirey
Notary Public - Minnesota
Sherburne County
My Commission Expires January 31, 2000

SAMUEL I. SHIREY
NOTARY PUBLIC - MINNESOTA
My Comm. Exp. Jan. 31, 2000

Attachment A

120 DAY RESPONSE TO NRC GENERIC LETTER 96-06

Waterhammer and Two-phase Flow in the Containment Air Cooler Cooling Water System:

Affected Systems:

At Monticello, the Containment Air Cooler Cooling Water function is provided by the Reactor Building Closed Cooling Water System (RBCCW) which supplies cooling water to the primary containment coolers. The Reactor Building Closed Cooling Water System (RBCCW) was determined not to be susceptible to damaging waterhammer or two-phase flow conditions.

Specific Circumstances:

WATERHAMMER: The RBCCW system may be susceptible to waterhammer during a design basis loss-of-coolant accident (LOCA) coincidental with a loss of normal auxiliary power. Under these conditions, the RBCCW pumps and the Drywell Atmospheric Cooling (DAC) fans would be tripped by an ECCS load shed signal. Steam voids could form in the DAC cooling since the saturation temperature of the RBCCW water is 264°F with the peak primary containment air temperature at 282°F for a large break, and up to 335°F for a small break LOCA. Since the RBCCW pumps are tripped under these conditions, the operator receives low RBCCW system pressure control room annunciators. Annunciator response procedures for this condition is to close the RBCCW containment isolation valves. If the piping system inside the drywell were not leak tight, the pressure head supplied by the surge tank could dissipate and steam voids could exist at drywell temperatures less than 264°F. Under these conditions, reestablishing RBCCW flow to the drywell portion of the system could potentially create a waterhammer situation.

Under the above loss of power scenario, there is no automatic restart of the RBCCW pumps. Additionally, the operating procedure for manually starting the RBCCW pumps require the pump discharge valve to be closed prior to starting the pump. Once the pump has started, the discharge valve is manually opened. The manual opening of the discharge valve will result in a gradual restoration of flow and pressure and minimize any potential waterhammer due to collapse of steam voids. The controlled restoration of flow and pressure would result in very minor waterhammer as compared to events described in NUREG/CR-5220. Therefore, any waterhammer that may occur is not expected to have the

intensity to challenge the integrity of the piping system or containment penetrations.

This start-up procedure is required to be followed whenever restarting a pump after both pumps have been idle. This includes restarts after accident situations.

TWO-PHASE FLOW: The conditions most likely to result in two-phase flow would be a small break LOCA where the peak drywell temperature reaches 335°F. The DAC fans are tripped for a small break LOCA due to high drywell pressure. With no DAC fans running, RBCCW temperature above saturation (264°F) is not anticipated due to the heat transfer rate being very small. If the trip signal for the DAC fans is bypassed as permitted by the Emergency Operating Procedures (EOPs), there would be a potential for two phase flow to occur if drywell temperatures were to be maintained above 264°F for an extended period. However, the EOPs require that the drywell sprays be used before the drywell temperature reaches 281°F. For the small break LOCA, the drywell reaches 281°F requiring EOP operator actions to place the drywell sprays into operation. DAC fans would not be placed in operation since the drywell fan motor windings would be wet and could cause electrical faults after the drywell sprays are initiated. Additionally, the sprays would drop the drywell temperature to less than the RBCCW saturation temperature of 264°F such that two-phase flow would no longer be a concern.

Conclusions Reached:

WATERHAMMER: Any waterhammer that may occur is not expected to have the intensity to challenge the integrity of the piping system or containment penetrations. Operating practices already in place further minimize any potential impact due to pump restart.

TWO-PHASE FLOW: System design and operating procedure evaluation has shown that two-phase flow is not expected to occur in the RBCCW system.

In the unlikely event that two-phase flow did occur, no safety related functions would be affected. The DAC system has no safety related function and there are no safety related loads supplied by RBCCW, requiring operation under post LOCA conditions.

Actions Taken:

No actions required. The RBCCW system was evaluated to determine its susceptibility to both waterhammer and two phase flow. It has been determined that current system configuration, operating practices and procedures preclude detrimental waterhammer and two-phase flow conditions.

Basis for Continued Operability:

Neither waterhammer or two-phase flow are considered likely events due to system design and current operating procedures. If waterhammer or two-phase flow were to occur, the consequences have been determined to be minor. Additionally, the RBCCW system provides no safety function, no credit is taken for its use during an accident, and therefore loss of RBCCW would not be a concern.

Overpressurization of Containment Penetration Piping

Affected Systems:

To evaluate Monticello for overpressurization, all primary containment penetrations and associated systems were reviewed. Penetrations and associated systems were identified as having a potential for overpressurization if they had the attributes of being a closed volume containing fluid, (either air or water), were at a low initial temperature, most of the volume could be heated by the containment atmosphere after an accident, and no installed pressure relieving device was available to prevent the buildup of pressure. The affected systems and their respective containment penetration numbers are:

1. Drywell Equipment Drain Sump (X-19)
2. Drywell Floor Drain Sump (X-18)
3. RHR Shutdown Cooling (X-12)
4. RHR Head Spray (X-17)
5. Reactor Water Cleanup (RWCU) (X-14).
6. Main Steam Line Drain (X-8)
7. Recirculation Sample Line (X-41)
8. Service Air (X-21)
9. Instrument Air (X-22)
10. Alternate N2 Supply to SRV C, H, F and MSIV Inboard Actuators (X-34A)
11. Alternate N2 Supply to SRV A, B and E (X-105B-G)

12. Vacuum Breaker Line (X-229B)
13. Demineralized Water Line (X-20)

Specific Circumstances and Actions Taken:

All containment penetrations and associated piping systems were reviewed. Of all containment penetrations, 13 lines were initially evaluated as being susceptible to overpressurization. These lines are discussed below along with their final disposition.

1. Drywell Equipment Drain Sump (X-19)

The enclosed boundary is formed between the sump pump discharge check valve and the outside containment isolation valves. The enclosed boundary is postulated to pressurize. Included within this boundary are two ball valves which are both located inside primary containment. These valves are postulated to leak or experience pressure boundary failure first since their pressure rating is approximately 2 1/2 times less than the containment isolation valves and piping components outside the drywell.

Since the ball valves inside primary containment will be the first component to fail or relieve pressure, Primary Containment integrity is maintained. Primary containment integrity is the only safety related function associated with this system. Installation of a permanent pressure relieving device will be pursued.

2. Drywell Floor Drain Sump (X-18)

The enclosed boundary is formed between the sump pump discharge check valve and the outside containment isolation valves. The water leakage rate calculated from current Appendix J test results is greater than the calculated leakage rate required to relieve pressure at the faulted pressure of ASME Section III, Appendix F. Additionally, non-quantified boundary leakage, i.e., leakage past the drywell sump pump discharge check valves could also assist in relieving pressure. Therefore during pressurization, the valve leakage will relieve pressure and maintain Primary Containment integrity.

Primary containment integrity is maintained which is the only safety related function associated with this system. Installation of a permanent pressure relieving device will be pursued.

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3. RHR Shutdown Cooling (X-12)

The enclosed boundary is formed by piping bounded by normally closed inboard and outboard isolation valves. Calculations show the pipe is operable in a faulted condition using conservative assumptions. One assumption postulated is that all pipe insulation is removed from the pipe as a result of the accident. This results in a greater heat transfer rate so the water inside the pipe heats up faster. With this assumption, the piping exceeds the code allowables. Even though the pipe exceeds code allowables and the valves exceed their design rating, the piping/components meet faulted condition acceptance criteria as established in ASME Section III, Appendix F. Primary containment integrity is maintained which is the only safety related function associated with this section of piping. Installation of a permanent pressure relieving device will be pursued.

4. RHR Head Spray (X-17)

The enclosed boundary is formed by piping bounded by normally closed inboard and outboard isolation valves. Calculations show the pipe is operable in a faulted condition using conservative assumptions. One conservative assumption postulated is that all pipe insulation is removed from the pipe as a result of the accident. This results in a greater heat transfer rate so the water inside the pipe heats up faster. With this assumption, the piping exceeds code allowables. Even though the pipe exceeds code allowables and the valves exceed their design rating, the piping/components meet the acceptance criteria as established in ASME Section III, Appendix F. Primary Containment integrity is maintained which is the only safety related function of this section of piping. Installation of a permanent pressure relieving device will be pursued.

5. Reactor Water Cleanup (X-14)

The enclosed boundary is formed by piping bounded by inboard and outboard isolation valves. Since the process stream water in the RWCU piping of concern is approximately 512°F, isolation of the piping by a containment isolation signal will not result in any increase in water temperature so overpressurization cannot occur. For infrequent maintenance activities that require closing of both penetration isolation valves during normal operation, administrative controls have been established to drain part of the pipe once isolated. Draining eliminates the possibility of water heating up to overpressurize the piping. Primary Containment integrity is maintained which is the only safety related function associated with this system. No modifications are required with the

administrative controls. However, in lieu of administrative controls, installation of a permanent pressure relieving device is being evaluated.

6. Main Steam Line Drain (X-8)

The enclosed boundary is formed by piping bounded by normally closed inboard and outboard isolation valves. By procedure, these valves are closed during startup under hot conditions at approximately 500 PSIG. During operation, process steam remains on both ends of the isolation boundary keeping the line hot. No modifications are required.

7. Recirculation Sample Line (X-41)

The enclosed boundary is formed by piping bounded by inboard and outboard isolation valves. Since the process stream water in the recirculation sample line piping is approximately 520°F, isolation of the piping by a containment isolation signal will not result in any water temperature increase so overpressurization cannot occur. For infrequent maintenance activities that result in the closing of both penetration isolation valves, administrative controls have been established to drain part of the pipe once isolated. Draining eliminates the potential of water heating up to overpressurize the piping. Primary Containment integrity is maintained which is the only safety related function associated with this system. No modifications are required with the administrative controls. However, in lieu of administrative controls, installation of a permanent pressure relieving device is being evaluated.

8. Service Air (X-21)

The boundary analyzed for the penetration is between containment valves and the penetration. The internal pressure in this section of piping reaches 162 PSIG due to the temperature increase of the air contained in the attached piping inside the drywell. Calculations show the piping outside the drywell is within code allowables at 162 PSIG. Primary Containment integrity is maintained which is the only safety related function associated with this section of piping. No modifications are required.

9. Instrument Air (X-22)

The first boundary analyzed for the penetration is between the outboard containment valve and the penetration. The internal pressure in this section of piping reaches 145.2 PSIG due to the temperature increase in the air/nitrogen

contained in the attached piping inside the drywell Calculations show the piping outside the drywell is within code allowables at 162 PSIG. Primary Containment integrity is maintained which is the only safety related function associated with this section of piping. No modifications are required.

The second boundary analyzed is established by accumulator check valves and their respective SRV air accumulators downstream. Assuming a drywell temperature of 335°F, the internal pressure this section of piping and accumulators reaches is 145.2 PSIG. The containment pressure at this temperature is 21.9 PSIG. Thus the internal pressure of the pipe and accumulators is the difference between 145.2 PSIG and 21.9 PSIG which equals 123.3 PSIG. Since the postulated pressure is less than the 125 PSIG design pressure of the piping and accumulators and less than the maximum operating pressure for the SRV solenoid valves, operability of all the components is maintained.

For the small break LOCA accident, drywell sprays are initiated in accordance with Emergency Operating Procedures. The small break LOCA analysis assumed drywell sprays are placed in service at 10 minutes. This lowers containment pressure and temperature and the temperature inside the piping such that unacceptable pressures are not expected to occur. The safety function of this piping is to provide pneumatic supply to one ADS SRV and one low low set SRV which will be maintained. Due to the small difference between the postulated pressure and the design pressure, a method to improve the margin will be pursued.

10. Alternate N2 Supply to SRV C, H, F and MSIV Inboard Actuators (X-34A)

The first boundary analyzed for the penetration is between the outboard valve and the penetration. The internal pressure in this section of piping reaches 145.2 PSIG due to the temperature increase in the air/nitrogen contained in the attached piping inside the drywell. Calculations show the piping outside the drywell is within code allowables at 174 PSIG. Primary Containment integrity and pressure integrity of Train B of the Alternate N2 system are maintained which are the only safety related functions associated with this section of piping.

The second boundary analyzed for the penetration is between the penetration and SRV C, H, F and the MSIV inboard actuators and their respective air accumulators. Assuming a drywell temperature of 335°F, the internal pressure this section of piping and accumulators reaches is 145.2 PSIG. The containment pressure at this temperature is 21.9 PSIG. Thus the internal pressure of the pipe

and accumulators is the difference between 145.2 PSIG and 21.9 PSIG which equals 123.3 PSIG. Since the postulated pressure is less than the 125 PSIG design pressure of the piping and accumulators, less than the 125 PSIG maximum operating pressure for the SRV solenoid valves and less than the 150 PSIG maximum operating pressure for the MSIV actuators, operability of all the components is maintained.

For the small break LOCA, drywell sprays are initiated in accordance with Emergency Operating Procedures. The small break LOCA analysis assumed drywell sprays are placed in service at 10 minutes. This lowers containment pressure and temperature and the temperature inside the piping such that unacceptable pressures are not expected to occur. The safety function of this piping is to provide pneumatic supply to one ADS SRV, to one low low set SRV and to the inboard MSIVs to maintain their leaktightness which will be maintained. Due to the small difference between the postulated pressure and the design pressure, a method to improve the margin will be pursued.

11. <u>Alternate N2 Supply to SRV A, B and E (X-105B-G)</u>

The first boundary analyzed for penetration X-105B-G is between the outboard check valve and the penetration. The internal pressure in this section of piping reaches 145.2 PSIG due to the temperature increase in the air/nitrogen contained in the attached piping inside the drywell. Calculations show the piping outside the drywell is within code allowables at 174 PSIG. Primary Containment integrity and pressure integrity of Train A of the Alternate N2 system are maintained which are the only safety related functions associated with this section of piping.

The second boundary analyzed for penetration X-105B-G is between the penetration and SRV A, B and E. Assuming a drywell temperature of 335°F, the internal pressure this section of piping and accumulators reaches is 145.2 PSIG. The containment pressure at this temperature is 21.9 PSIG. Thus the internal pressure of the pipe is the difference between 145.2 PSIG and 21.9 PSIG which equals 123.3 PSIG. Since the postulated pressure is less than the 125 PSIG design pressure of the piping and less than 125 PSIG maximum operating pressure for the SRV solenoid valves, operability of all the components is maintained.

For the small break LOCA, drywell sprays are initiated in accordance with Emergency Operating Procedures. The small break LOCA analysis assumed drywell sprays are placed in service at 10 minutes. This lowers containment

pressure and temperature and the temperature inside the piping such that unacceptable pressures are not expected to occur. The safety function of this piping is to provide pneumatic supply to one ADS SRV and one low low set SRV, which will be maintained. Due to the small difference between the postulated pressure and the design pressures, a method to improve the margin will be pursued.

12. Vacuum Breaker Line (X-229B)

The boundary analyzed for the penetration is between the outboard containment isolation valve and the penetration.

This line is designed for 125 PSIG. The internal pressure that this section of piping reaches is 162 PSIG due to the temperature increase in the air contained in the attached piping inside the suppression chamber. This determination conservatively used peak drywell temperature instead of peak suppression chamber temperature. Calculations show the piping is within code allowables at 162 PSIG. Primary Containment integrity is maintained which is the only safety related function associated with this section of piping. No modification is required.

13. Demineralized Water Line (X-20)

The boundary evaluated for the penetration is between the outboard containment isolation valve and the penetration.

A portion of the boundary has been drained, i.e. from the inboard containment isolation valve to hose station valves inside the drywell. With air initially at ambient pressure and temperature in this section of piping, heating to accident condition temperatures will only raise the pressure to approximately 8 PSIG. The piping is designed for 62 PSIG. Primary Containment integrity is maintained which is the only safety related function associated with this section of piping. This section of piping is only used during outages and administrative controls have been established to ensure the line is always drained during normal operation. The containment isolation valves associated with this penetration have very low leakage rates when tested for Appendix J, such that the drained section of piping is not expected to refill. However, changing the valve line-up upstream of the containment isolation valves would eliminate any possibility for refilling and would be a conservative action and is being evaluated.

Conclusions Reached:

All penetrations and associated piping systems components have been determined to either remain within code allowables, or to meet operability criteria. Based on the above evaluations Primary Containment integrity is maintained and no safety functions are lost.

Basis for Continued Operability:

The following table summarizes the operability determinations for each of the affected systems along with the long term fixes if required.

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	System	Operability	Long Term Fix
1	Drywell Equipment Drain Sump	Ball valves inside primary containment will be the first component to fail or relieve pressure	Installation of permanent pressure relieving device will be pursued
2	Drywell Floor Drain Sump	With leakage piping/components meet faulted condition acceptance criteria of ASME Section III, Appendix F	Installation of permanent pressure relieving device will be pursued
3	RHR Shutdown Cooling	Piping/components meet faulted condition acceptance criteria of ASME Section III, Appendix F	Installation of permanent pressure relieving device will be pursued
4	RHR Head Spray	Piping/components meet faulted condition acceptance criteria of ASME Section III, Appendix F	Installation of permanent pressure relieving device will be pursued
5	Reactor Water Cleanup	Normally hot/administrative controls established to drain if line manually isolated	Installation of permanent pressure relieving device being evaluated
6	Main Steam Line Drain	Normally hot	None
7	Recirculation Sample Line	Normally hot/administrative controls established to drain if line manually isolated	Installation of permanent pressure relieving device being evaluated
8	Service Air	Within code allowables	None
9	Instrument Air Outside Containment	Within code allowables	None
9	Instrument Air Inside Containment	Within code allowables	Method to improve margin will be pursued
10	Alternate N2 Outside	Within code allowables	None
10	Alternate N2 Inside	Within code allowables	Method to improve margin will be pursued
11	Alternate N2 Outside	Within code allowables	None
11	Alternate N2 Inside	Within code allowables	Method to improve margin will be pursued
12	Vacuum Breaker Line	Within code allowables	None
13	Demineralized Water Line	Administrative controls established to drain line	Evaluate enhancements to administrative controls