Northern States Power Company

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

September 26, 1995

Response to Request for
Additional Information
TAC No. M90979

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

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

Additional Information
Main Steam Isolation Valve Testing

The purpose of this letter is to respond to the NRC Staff's Request for Additional Information (TAC No. M90979) dated August 28, 1995. The specific information requested by the Staff is included in Attachment 1.

Your August 28, 1995 letter indicated that the failure of main steam isolation valves (MSIVs) to pass 10 CFR 50, Appendix J, testing at the beginning of the 1994 Monticello refueling outage is being reviewed for abnormal occurrence reportability. The details of this event were reported to the Commission in Licensee Event Report 94-10 dated October 19, 1994.

In the NRC Staff's evaluation of this event, we believe a number of mitigating factors should be considered. These factors include:

a. Conservatism of MSIV Testing

MSIV testing during the 1994 refueling outage was conservatively performed with the valves closed after establishing a reactor pressure of 0 psig, and with no pneumatic pressure supplied to the actuators. Under design accident conditions, the valves would close with steam flow and pressure assisting to firmly seat them.

b. Probability of Release of Radioactive Material

MSIV leak tightness is required for those accidents in which radioactive material is released as the result of fuel clad damage. Redundant emergency core cooling systems (ECCS) are provided at Monticello which prevent significant fuel clad damage in event of accidents and transients. ECCS equipment was

A001

fully functional. It was unlikely that a significant accidental release of radioactive material could occur via the steam lines during the period in question.

c. Radiological Dose Assessment Conservatism

The NRC Staff will independently assess the radiological consequences of the as-found MSIV leakage using methodology similar to that recently developed by the Boiling Water Reactor Owners Group (BWROG). While this provides a more realistic treatment of the radiological consequences of iodine over earlier techniques, many conservative "licensing" assumptions continue to be commonly used. Conservatisms include:

- In cases of large MSIV leakage, the actual release to the environment will be substantially less than the reported total leakage for all main steam lines. Because main steam and condensate drain piping downstream of the MSIVs will remain intact, actual release to the environment will be governed by the turbine stop valve and steam line drain flow paths. Most of the radioactive iodine will reach the main condenser where plateout and condensation will occur. Realistic leakage flow rates via the main steam lines should be used.

- A large amount of radioactive material is generally assumed to be released from the fuel based on the TID-14844, March 23, 1962, source term. In particular, the quantity and chemical form of radioactive iodine which is assumed greatly overestimates the radiological hazard presented by this nuclide. A more realistic, but still conservative, radiological "source term" (NUREG-1465) was recently approved by the Commission and should be used in this evaluation.

- The reactor containment is assumed to remain at peak accident pressure, Pa, for the 30-day duration of the event. Leakage of radioactive material is assumed to continue at a rate corresponding to the peak accident pressure. In reality the duration of peak pressure is brief and containment pressure and leakage is significantly reduced for the duration of the postulated event. A realistic containment pressure and leakage rates should be used in this evaluation.

- Very conservative atmospheric dispersion models are generally used (short term worst case conditions). This often results in calculated doses ten to 100 times greater than those which would result under more typical meteorological conditions. A realistic assumption for atmospheric dispersion should be used in this evaluation.

- Radiological doses at the site boundary and low population zone outer boundary are calculated for 10 CFR Part 100 compliance purposes. No

credit is given for sheltering or evacuation over the assumed 30-day duration of the event. Dose calculations are therefore not representative of a realistic situation and should be carefully qualified when reported.

As explained in Licensee Event Report 94-10, several measures have been taken to improve MSIV performance at the Monticello Plant. All four outboard MSIVs were replaced during the 1994 refueling outage with improved design gate valves and actuators which are independent of instrument air for closure. In addition, a major overhaul of inboard MSIVs was completed and a safety-related instrument air supply was installed. These improvements will make a repetition of MSIV problems at Monticello unlikely in the future.

This submittal does not contain any new commitments to the NRC, nor does it modify any existing NRC commitments. Please contact Marvin Engen, Sr Licensing Engineer, (612-295-1291), if you have any questions concerning the information we have provided.

William J Hill

William J Hill
Plant Manager
Monticello Nuclear Generating Plant

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

Attachments: 1 - Response to NRC Letter Dated 8/28/95 Request for Additional Information Monticello Nuclear Generating Plant Regarding Leakage of Main Steam Isolation Valves

RESPONSE TO NRC LETTER DATED 8/28/95
REQUEST FOR ADDITIONAL INFORMATION
MONTICELLO NUCLEAR GENERATING PLANT
REGARDING LEAKAGE OF MAIN STEAM ISOL VALVES

1. Provide the following information and references which will allow the staff to calculate off-site doses from increased MSIV leakage: (a drawing may be helpful)

	Data	Reference
a) Main steam line (MSL) inside and outside pipe diameters	16.12 Inches (ID)	Monticello Line Designation Table M-163A
	18.00 Inches (OD)	"
b) MSL pipe length between the MSIV and the drain line	Note 1	Note 2
c) MSL pipe material	Carbon Steel (A-106B)	Monticello Specification M-40
d) MSL initial operating and ambient temperatures	550 °F operating	Nominal full power steam temperature
	120 °F ambient	Nominal area temperature
e) Drain line inside and outside pipe diameters	Note 1	Note 2
f) Drain line pipe length to the drain header	Note 1	Note 2
g) Drain line pipe material	"	"
h) Drain line header inside and outside pipe diameters	"	"
i) Drain line header length to common drain line to condenser	Note 1	Note 2
j) Drain line header material	Carbon Steel (A-106B)	Monticello Specification M-40
k) Drain line initial (operating) and ambient temperature	300 °F operating	Nominal temperature
	120 °F ambient	Nominal area temperature
l) Common drain line length to the condenser	Note 1	Note 2
m) Condenser total volume	59,600 Ft^3	Vendor proposal technical supplement
n) Condenser air space volume	44,400 Ft^3	"
o) Condenser hotwell (liquid) volume	15,200 Ft^3	"
p) Condenser temperature	95 °F operating	Saturation temperature for design pressure
q) Type of material used to insulate the main steam and drain lines	Fiberglass	Monticello Specification M-43A
r) Thickness of insulating material used on the main steam and drain lines	Note 1	Note 2

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s) The MSIV leakage rate used in your calculations and the justification for that value.

The MSIV leakage rate used was the sum of the minimum pathway leakage rates for the four steamlines. Minimum pathway leakage rate was used since there was no failure of any of the MSIVs to close.

The leakage rates were measured at test pressures slightly greater than 25 psig and corrected to equivalent leakage rates at 42 psig. This allowed all containment leakage test results to be evaluated at 42 psig (Pa). The correlation used was formula A-3 in Appendix A to Franklin Research Center Report TER-C5257-30 which was transmitted to Northern States Power Company with NRC letter dated June 3, 1984. This transmittal was related to the NRC Staff's evaluation of Appendix J exemptions. The formula is:

$$m_a/m_t = \frac{(P_a + P_{at})^2 - (P_{at})^2}{(P_e + P_{at})^2 - (P_{at})^2}$$

m_a/m_t = ratio of mass flow of air at accident pressure to mass flow at test pressure
P_a = peak accident pressure, gauge
P_e = test pressure, gauge
P_{at} = one atmosphere, absolute

Valve	Leakage at Test Pressure (>25 psig) scfh	Mimimum Path Leakage (42 psig) scfh
AO-2-80A	95 scfh at 25.5 psig	203
AO-2-86A	9284 scfh at 25.0 psig	
AO-2-80B	6109 scfh at 25.0 psig	
AO-2-86B	2298 scfh at 25.0 psig	5067
AO-2-80C	10 scfh at 25.5 psig	21
AO-2-86C	88 scfh at 25.0 psig	
AO-2-80D	114 scfh at 25.5 scfh	245
AO-2-86D	173 scfh at 25.0 psig	
Total Reported Leakage		5536

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2. Provide the following information and references which will allow the staff to calculate control room operator doses from increased MSIV leakage:

	Data	Reference
a) Iodine protection factor	3.38 - 52.9	Note 3
b) Control room geometry factor	37.3	Note 4
c) Recirculation flow rate (cfm)	0	No recirculation cleanup
d) Charcoal adsorber thickness in inches	Two 2-inch beds	Monticello Operations Manual
e) Adsorber efficiency (%)	90 - 99	Note 3

NOTES:

1) Refer to the attached tables for information related to MSIV piping downstream of the last main steam isolation valve (MSIV) and the three drain paths for each steam line.

2) There are four main steam lines (PS1, PS2, PS3, & PS4) and three drain paths for each steam line. Drain paths are the main steam line drains, bypass valve manifold drain, and equalizing line drain. P&ID drawings M-115 and M-102 show the affected piping.

Pipe lengths for each drain path were obtained from isometric drawings NF-36271, FSK-826, NX-13142-15, FSK-625, NQ-86956, NQ-86957, and NX-13142-42. Drawings are available on site for review.

Piping diameter, schedule, and insulation class were obtained from Monticello Line Designation Table M-163A. Insulation thickness was obtained from Specification M-43A. These documents are available on site for review.

3) Iodine protection factor is calculated using equation (11) from the paper "Nuclear Power Plant Control Room Ventilation System Design for Meeting General Criterial 19," K G Murphy and K M Campe, USAEC, 13th AEC Air Cleaning Conference. Realistic charcoal iodine removal efficiency is 99% for the Monticello design. A conservative "design" value is 90%. Filtered intake air is 1000 cfm $\pm$ 10%. Unfiltered infiltration is assumed to vary from a conservative 250 cfm to 10 cfm.

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NOTES (contd):

4) Geometry factor is calculated using equation (9) of the Murphy Campe paper referenced above. Control room volume is estimated to be 27,000 cf.

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MAIN STEAM LINE A - PS1

PATHWAY (NOTE 1)	LINE SEGMENT	LENGTH(FEET)	PIPE ID(INCHES)	PIPE OD(INCHES)	INSULATION(INCHES)
STEAM LINE DRAIN	PS1 TO D1	2.4	16.1	18.0	3.0
	D1 TO D4	2.6	1.3	1.9	2.0
	D4 TO PS15	15.2	1.7	2.4	2.5
	PS15 TO D4	22.1	2.9	3.5	1.5
	D4 TO CONDENSER	118.7	5.8	6.6	2.0
	REMARKS:	Orifice RO-2567 3-inch Bypass Motor Operated Valve, MO-2565			
BYPASS MANIFOLD	PS1 TO PS11	81.2	16.1	18.0	3.0
	PS11 TO PS7	38.3	5.8	6.6	3.0
	PS7 TO D26	63.0	9.6	10.8	3.0
	D26 TO D4	86.0	0.8	1.3	2.0
	D4 TO CONDENSER	34.0	5.8	6.6	2.0
	REMARKS:	Orifice RO-2569 1-inch Bypass Motor Operated Valve, MO-1739			
EQUALIZING LINE DR	PS1 TO PS30	65.0	16.1	18.0	3.0
	PS30 TO D40	25.2	16.1	18.0	3.0
	D40 TO D4	35.5	1.3	1.9	2.0
	D4 TO CONDENSER	18.1	5.8	6.6	2.0
	REMARKS:	Orfice RO-4001 1-inch Bypass Motor Operated Valve, MO-4000			

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MAIN STEAM LINE B - PS2

PATHWAY (NOTE 1)	LINE SEGMENT	LENGTH(FEET)	PIPE ID(INCHES)	PIPE OD(INCHES)	INSULATION(INCHES)
STEAM LINE DRAIN	PS2 TO D2	2.4	16.1	18.0	3.0
	D2 TO D4	2.6	1.3	1.9	2.0
	D4 TO PS15	25.2	1.7	2.4	2.5
	PS15 TO D4	22.1	2.9	3.5	1.5
	D4 TO CONDENSER	118.7	5.8	6.6	2.0
	REMARKS:	Orifice RO-2567 3-inch Bypass Motor Operated Valve, MO-2565			
BYPASS MANIFOLD	PS2 TO PS12	72.2	16.1	18.0	3.0
	PS12 TO PS7	14.5	5.8	6.6	3.0
	PS7 TO D26	63.0	9.6	10.8	3.0
	D26 TO D4	86.0	0.8	1.3	2.0
	D4 TO CONDENSER	34.0	5.8	6.6	2.0
	REMARKS:	Orifice RO-2569 1-inch Bypass Motor Operated Valve, MO-1739			
EQUALIZING LINE DR	PS2 TO PS30	56.0	16.1	18.0	3.0
	PS30 TO D40	28.2	16.1	18.0	3.0
	D40 TO D4	35.5	1.3	1.9	2.0
	D4 TO CONDENSER	18.1	5.8	6.6	2.0
	REMARKS:	Orfice RO-4001 1-inch Bypass Motor Operated Valve, MO-4000			

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MAIN STEAM LINE C - PS3

PATHWAY (NOTE 1)	LINE SEGMENT	LENGTH(FEET)	PIPE ID(INCHES)	PIPE OD(INCHES)	INSULATION(INCHES)
STEAM LINE DRAIN	PS3 TO D3	2.4	16.1	18.0	3.0
	D3 TO D4	2.6	1.3	1.9	2.0
	D4 TO PS15	35.2	1.7	2.4	2.5
	PS15 TO D4	22.1	2.9	3.5	1.5
	D4 TO CONDENSER	118.7	5.8	6.6	2.0
	REMARKS:	Orifice RO-2567 3-inch Bypass Motor Operated Valve, MO-2565			
BYPASS MANIFOLD	PS3 TO PS13	63.2	16.1	18.0	3.0
	PS13 TO PS7	24.2	5.8	6.6	3.0
	PS7 TO D26	58.4	9.6	10.8	3.0
	D26 TO D4	86.0	0.8	1.3	2.0
	D4 TO CONDENSER	34.0	5.8	6.6	2.0
	REMARKS:	Orifice RO-2569 1-inch Bypass Motor Operated Valve, MO-1739			
EQUALIZING LINE DR	PS3 TO PS30	47.0	16.1	18.0	3.0
	PS30 TO D40	31.2	16.1	18.0	3.0
	D40 TO D4	35.5	1.3	1.9	2.0
	D4 TO CONDENSER	18.1	5.8	6.6	2.0
	REMARKS:	Orfice RO-4001 1-inch Bypass Motor Operated Valve, MO-4000			

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MAIN STEAM LINE D - PS4

PATHWAY (NOTE 1)	LINE SEGMENT	LENGTH(FEET)	PIPE ID(INCHES)	PIPE OD(INCHES)	INSULATION(INCHES)
STEAM LINE DRAIN	PS4 TO D4	2.4	16.1	18.0	3.0
	D4(1-1/2 INCH)	2.6	1.3	1.9	2.0
	D4 TO PS15	45.2	1.7	2.4	2.5
	PS15 TO D4	22.1	2.9	3.5	1.5
	D4 TO CONDENSER	118.7	5.8	6.6	2.0
	REMARKS:	Orifice RO-2567 3-inch Bypass Motor Operated Valve, MO-2565			
BYPASS MANIFOLD	PS4 TO PS14	54.2	16.1	18.0	3.0
	PS14 TO PS7	31.2	5.8	6.6	3.0
	PS7 TO D26	54.4	9.6	10.8	3.0
	D26 TO D4	86.0	0.8	1.3	2.0
	D4 TO CONDENSER	34.0	5.8	6.6	2.0
	REMARKS:	Orifice RO-2569 1-inch Bypass Motor Operated Valve, MO-1739			
EQUALIZING LINE DR	PS4 TO PS30	38.0	16.1	18.0	3.0
	PS30 TO D40	34.2	16.1	18.0	3.0
	D40 TO D4	35.5	1.3	1.9	2.0
	D4 TO CONDENSER	18.1	5.8	6.6	2.0
	REMARKS:	Orfice RO-4001 1-inch Bypass Motor Operated Valve, MO-4000			

TRANSMITTAL MANIFEST

NORTHERN STATES POWER COMPANY

NUCLEAR LICENSING DEPARTMENT

MONTICELLO NUCLEAR GENERATING PLANT

NSP Letter Dated 9/26/95; Additional Information
Main Steam Isolation Valve Testing

Manifest Date: September 26, 1995

Correspondence Date: September 26, 1995

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