Northern States Power Company

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

May 14, 1996

10 CFR Part 50
Section 50.73

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

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

LER 96-004
Inboard Main Steam Isolation Valve Leakage
Greater Than allowed by Technical Specifications

The Licensee Event Report for this occurrence is attached. This report contains no new NRC commitments.

Please contact Tom Parker at (612) 295-1014 if you require further information.

William J Hill

William J Hill
Plant Manager
Monticello Nuclear Generating Plant

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

Attachment

200044

IE22

NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
MONTICELLO NUCLEAR GENERATING PLANT	05000 - 263	1 OF 8

TITLE (4)
Inboard Main Steam Isolation Valve Leakage Greater Than allowed by Technical Specifications

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER 05000
04	14	96	96	004	00	05	14	96	FACILITY NAME	DOCKET NUMBER 05000

		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
OPERATING MODE (9)	N		20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)
POWER LEVEL (10)	80 %		20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)
			20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER
			20.405(a)(1)(iii)	✓	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)
			20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
			20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Tom Parker	612-295-1014

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
B	SB	ISV	A585	YES						

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (IF YES, COMPLETE EXPECTED SUBMISSION DATE)	✓ NO				

ABSTRACT LIMIT TO 1400 SPACES, I.E., APPROXIMATELY 15 SINGLE-SPACED TYPEWRITTEN LINES) (16)
NCR FORM 366 (5-91)

The local leak rate testing of the Main Steam Isolation Valves conducted during a refueling outage determined that the Technical Specification leakage limits were exceeded. The measured leakage from 3 of the 8 Main Steam Isolation Valves exceeded the Technical Specification limit. All three valves are inboard Main Steam Isolation Valves. The causes of the high leakage rates are believed to be associated with tipping of the poppet, resulting in failure of the poppet and/or pilot to seat properly.

The valve poppets and stems were replaced with a new design that will reduce poppet tipping. Also, the new poppets and stems have no pilot, thereby eliminating one potential leak path. All valves seats were repaired as needed. All three valves were re-tested with satisfactory results.

Leakage associated with Main Steam Isolation Valves has been a continuing condition. All the outboard valves were replaced with valves of a different design during the previous refueling outage. The new poppets will improve the performance of the three inboard valves.

There was no safety significance associated with these higher leakages on the inboard Main Steam Isolation Valves, since the performance of the outboard Main Steam Isolation Valves has been well within the acceptance criteria.

Description

On April 14, 1996, with the plant in a refueling outage, it was determined that the Primary Containment leakage (combined maximum flow path leakage rate) was greater than allowed by Technical Specifications due to leakage associated with three of the Main Steam Isolation Valves (EIIS System Code: SB, JM)(EIIS Component: ISV). This was discovered when plant personnel were performing the "as found" local leak rate tests on the Main Steam Isolation Valves. This condition is assumed to be the condition of the valves prior to the refueling outage. Monticello has four main steam lines; each with two isolation valves in series. Table 1 below provides a summary of the "as found" Containment Isolation Valve leakage.

Table 1 - As Found Leakage

Main Steam Line	INBOARD ISOLATION VALVE LEAKAGE	OUTBOARD ISOLATION VALVE LEAKAGE[1]
Line A	683 scfh	0.4[2] scfh
Line B	721 scfh	0.4[2] scfh
Line C	10 scfh	1.5 scfh
Line D	1,207 scfh	2.7 scfh

[1] The four outboard valves were replaced with double disc gate valves during the 1994 refueling outage
[2] No leakage was measured, but the minimum discernible leakage is 0.4 scf per hour.

Cause

The excessive inboard Main Steam Isolation Valve leakages were the result of failures of each valve's poppet and/or pilot to seat properly. It is believed that these failures were caused by poppet tipping during valve closure (see Figure 1). Poppet tipping results from two features of the original valve design: 1) the poppet and the stem are not solidly connected and 2) the poppet sits at a 45° angle.

Since the poppet sits at a 45° angle, all diametrical clearances exist on the upper surface of the poppet. This causes the poppet to be non-concentric with the valve seat. As a result when the valve is closed, the lower poppet seat will contact the valve body seat first. If the poppet does not slide on the lower body seat, then the poppet may tip due to the poppet not being rigidly connected to the stem. This can cause angular misalignment and incomplete contact between the poppet seat and the valve body seat resulting in excessive leakage. When the poppet is tipped, excessive leakage can also occur through the pilot since the poppet pilot seat and the stem pilot seat are mis-aligned and not in complete contact.

Analysis of Reportability

This event is reportable per 10 CFR Part 50, Section 50.73(a)(2)(i)(B), which requires "Any operation or condition prohibited by the plant's Technical Specifications" must be reported.

The applicable Technical Specifications are:

	Technical Specification Limit
3.7.A.2.b.2	A combined maximum flow path leakage rate of less than or equal to $0.6L_a$ for all penetrations and valves, subject to Type B and C tests when pressurized to P_a, 42 psig.
3.7.A.2.b.3	Less than or equal to 46 scf per hour combined maximum flow path leakage for all main steam isolation valves when tested at 25 psig.

From the table above, the combined maximum flow path leakage for all main steam isolation valves is: 683 + 721 + 10 + 1207 = 2,621 scf per hour at 25 psig. This exceeds the 46 scf per hour Technical Specification limit in Section 3.7.A.2.b.3.

The Main Steam Isolation Valve combined maximum flow path leakage at 42 psig has been calculated to be 5,779 scf per hour. The Main Steam Isolation Valves combined maximum flow path leakage exceeds specification 3.7.A.2.b.2, as $0.6 \times L_a = 0.6 \times 458$ scf per hour = 275 scf per hour at 42 psig.

These Technical Specifications are required to be met when Primary Containment Integrity is required (when reactor coolant temperature is above 212°F). These leakages were found during the current refueling outage when Primary Containment Integrity was NOT required. These valves were satisfactorily leak tested before the plant started up following the refueling outage in the fall of 1994. However, the leakage could have existed during power operation in the last cycle when this specification was required to be met. Therefore, this condition is being reported per 10 CFR 50, Section 50.73(a)(2)(i)(B).

Safety Significance

The Main Steam Isolation Valve leakage was greater than allowed by Technical Specifications. In the unlikely event that an accident occurred which released fission products outside the fuel cladding, the Main Steam Isolation Valves are designed to prevent the radioactivity from being released to the turbine and subsequently the Turbine Building. As long as one of the Main Steam Isolation Valves in each steam line closes and seats properly, the release through the main steam lines will be within current dose analyses. Since the outboard Main Steam Isolation Valves tested satisfactorily, the leakage associated with the inboard valves would have been contained by the outboard valves (see table above). Therefore, the leakage associated with the three inboard Main Steam Isolation Valves would not have affected the health and safety of the public.

The "as found" combined minimum flow path leakage rate was 5 scf per hour. This is much less than the leakage rate assumed in accident analyses.

Actions

Immediate Actions

No immediate actions were necessary as the condition was discovered when the reactor coolant temperature was less than 212°F and the Main Steam Isolation Valves were not required to be operable.

Corrective Actions

1. The valve poppets and stems were replaced with the following design enhancements (see Figure 2):

   The poppet is solidly connected to the valve stem to eliminate tipping.

   The elimination of the spring between the poppet and the stem, i.e., solid connection between the two, will increase the initial force and momentum which drives the poppet into the seat. This will improve poppet seating.

   The new poppets and stems also have no pilot thereby eliminating one potential leakage path.

   The new poppets are equipped with anti-rotation hardware which will prevent poppet spinning and the resulting wear and damage.

2. The valve body profiles were measured with equipment that more accurately checks runout and concentricity. These measurements were used to machine the poppet to assure minimum clearances between the poppet and the valve body.

3. The valve seats were machined or lapped as appropriate.

4. The clearances between the poppet and the valve bore were reduced.

5. The valves re-tested satisfactorily. All the "as left" leakage rates for the repaired valves are well less than 1 scf per hour.

Preventative Actions

The design of the new poppets will reduce/eliminate the chances of poppet tipping in the future. With no pilot in the poppets, a leakage path has been eliminated.

Failed Component Identification -

Main Steam Isolation Valves (3)
Manufacturer: A585, Atwood and Morrill Company Incorporated
Type: 18" Y Globe Valve

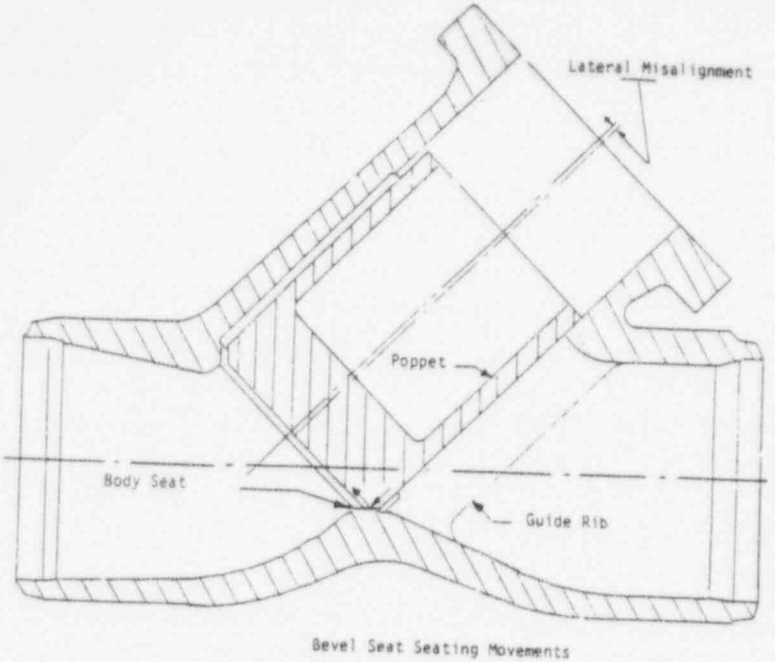
Previous Similar Events

Licensee Event Report 91-005 reported the failure of three Main Steam Isolation Valves to pass the local leak rate test. The cause of the failure was an oxide film on the valve seats and normal wear. At that time, it was concluded that the oxide film was a normal buildup and that further corrective actions were not needed. The valves were repaired and tested satisfactorily.

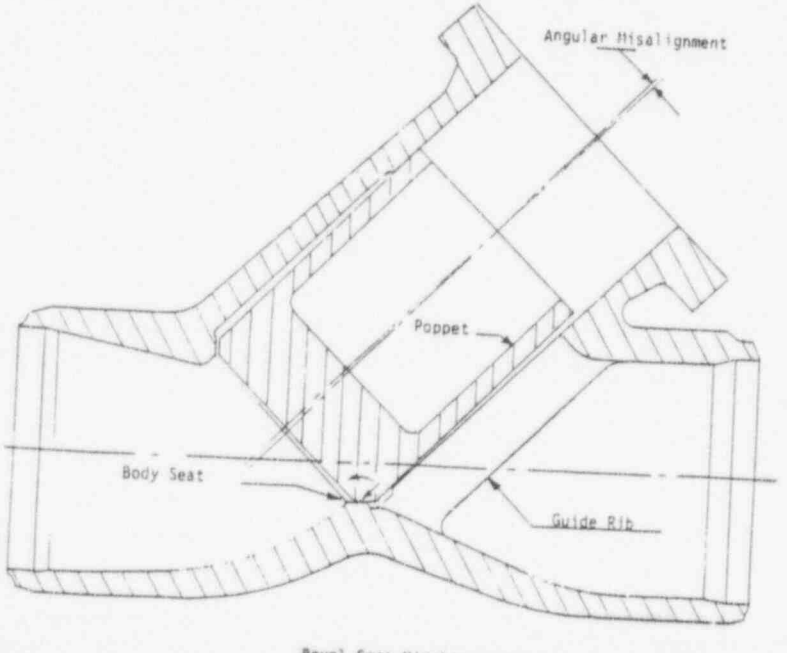
Licensee Event Report 93-003 reported the failure of 7 Main Steam Isolation Valves to pass the local leak rate test. All were machined and lapped.

License Event Report 94-10 reported the failure of 7 Main Steam Isolation Valves to pass the local leak rate test. The corrective action: 1) replaced the main steam line "A" inboard seat, 2) machined the valve body seats, 3) replaced the four outboard Main Steam Isolation Valves with 4 new valves of a different design, and 4) added a safety grade supply of air to the inboard valves.

Figure 1 Poppet Tipping



Bevel Seat Seating Movements

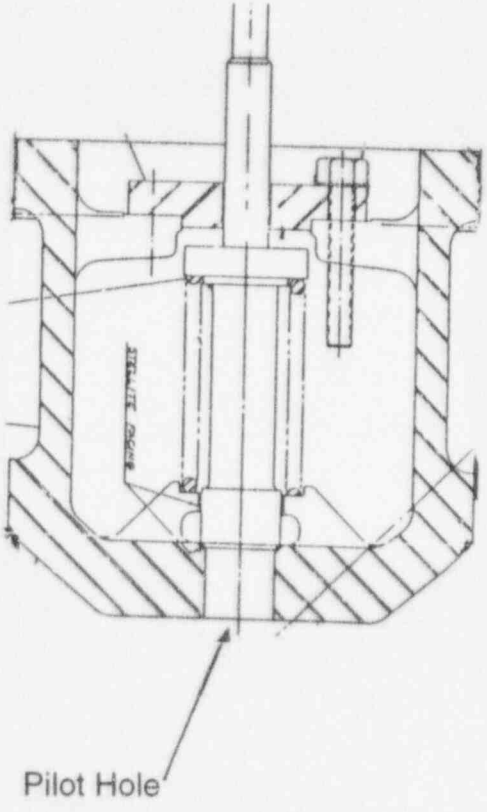


Bevel Seat Misalignment Movements

Figure 2

Main Steam Isolation Valve Poppets

Original Design



New Design
(With no pilot opening in the poppet bottom)