Northern States Power Company

414 Nicollet Mall
Minneapolis, Minnesota 55401-1927
Telephone (612) 330-5500

April 14, 1993

Report Required by
10 CFR Part 50, Section 50.73

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

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

Failure to Meet Secondary Containment
Performance Requirements Due to Design Deficiencies

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

Please contact Terry Coss, Sr Licensing Engineer, at (612) 295-1449 if you require further information.

Roger O Anderson
Director
Licensing and Management Issues

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

Attachment

200018

IE22 1/1

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)
Failure to Meet Secondary Containment Performance Requirements Due to Design Deficiencies

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
03	17	93	93	-- 89-040 --	02	04	14	93	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
		20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)	00.0%	20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v) X	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(viii)	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)
Dave Scott, System Engineer	(612) 295-1341

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

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	NO X				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On December 19, 1989, while the plant was operating at 100% power, Secondary Containment failed to meet operability requirements during a special test performed to verify Secondary Containment Capability. Secondary Containment was declared inoperable and a Notice of Unusual Event was declared. Preparations for shutdown were initiated per Technical Specifications. Design deficiencies caused this event. Review of the Standby Gas Treatment System revealed that, during normal operation, system flow was limited by flow to the Offgas Stack from the Steam Packing Exhauster. Three other design deficiencies were also identified. Corrective actions completed including revising operating procedures and placing an administrative hold on one system component. Secondary Containment was declared operable and the NUE was terminated on 12/19/89. On March 17, 1993 while performing a modification review, personnel identified another design deficiency concerning a single failure in the Main Stack Fan Damper Controls that could prevent the Standby Gas Treatment system from achieving rated flow. A modification was completed that eliminates Stack Fan controller single failure concern.

REQUIRED NUMBER OF DIGITS/CHARACTERS
FOR EACH BLOCK

BLOCK NUMBER	NUMBER OF DIGITS/CHARACTERS	TITLE
1	UP TO 46	FACILITY NAME
2	8 TOTAL 3 IN ADDITION TO 05000	DOCKET NUMBER
3	VARIES	PAGE NUMBER
4	UP TO 76	TITLE
5	6 TOTAL 2 PER BLOCK	EVENT DATE
6	7 TOTAL 2 FOR YEAR 3 FOR SEQUENTIAL NUMBER 2 FOR REVISION NUMBER	LER NUMBER
7	6 TOTAL 2 PER BLOCK	REPORT DATE
8	UP TO 18 -- FACILITY NAME 8 TOTAL -- DOCKET NUMBER 3 IN ADDITION TO 05000	OTHER FACILITIES INVOLVED
9	1	OPERATING MODE
10	3	POWER LEVEL
11	1 CHECK BOX THAT APPLIES	REQUIREMENTS OF 10 CFR
12	UP TO 50 FOR NAME 14 FOR TELEPHONE	LICENSEE CONTACT
13	CAUSE VARIES 2 FOR SYSTEM 4 FOR COMPONENT 4 FOR MANUFACTURER NPRDS VARIES	EACH COMPONENT FAILURE
14	1 CHECK BOX THAT APPLIES	SUPPLEMENTAL REPORT EXPECTED
15	6 TOTAL 2 PER BLOCK	EXPECTED SUBMISSION DATE

DESCRIPTION:

On December 19, 1989, with the plant operating at 100% power, Special Test #8234, Secondary Containment Capability Test with Turbine Building Ventilation Shutdown and Plant at Power Operation, was performed. The test was performed as part of a periodic testing program developed following the discovery of degraded conditions in the Secondary Containment System (see LER 89-029). During the test, the Standby Gas Treatment system (EIIS Component Code: BH) could not maintain a vacuum of 0.25 inches water within Secondary Containment as required for Secondary Containment operability during isolation conditions.

Secondary Containment was declared inoperable and a Notice of Unusual Event (NUE) was declared at 0640. Preparations for a normal orderly shutdown were initiated which would have placed the reactor in the cold shutdown condition within 24 hours per Technical Specification 3.7.C.4.

An inspection of Secondary Containment revealed no degraded conditions which could cause reduced Secondary Containment vacuum. Interfaces of Standby Gas Treatment with Non-Safety Related systems were also verified to be functioning as designed. However, investigations identified two design deficiencies that either directly affected or could potentially affect Standby Gas Treatment flow and one design deficiency that could potentially affect the source of Standby Gas Treatment flow. Corrective actions were implemented for the above design deficiencies and the NUE was terminated at 1831 on December 19, 1989.

On October 11, 1990, while performing a field verification of the design basis review for Secondary Containment and Standby Gas Treatment systems, it was determined that during operation of the Standby Gas Treatment system, a failure of the operating Offgas Dilution fan (V-EF-18A or V-EF-18B) would not initiate a low flow start of the standby Offgas Dilution fan. The setpoint for each of the low flow pressure switches (PS-8000-J15 or PS-8000-J16) (EIIS Component Code: PS) was less than the flow that a Standby Gas Treatment fan operating alone could produce through the Offgas flow path. Depending on operating conditions and system alignment, a system failure could then result in only one Standby Gas Treatment fan operating during an accident condition and no Offgas Dilution fan operating. Under this condition there would be insufficient flow through Standby Gas Treatment to maintain the required vacuum within Secondary Containment. This deficiency made the Standby Gas Treatment system susceptible to a single active failure and therefore had effectively lost its redundancy feature. Due to this vulnerability Plant Management invoked a 7-day Limiting Condition for Operation consistent with Technical Specification 3.7.B.1.a. The design deficiency was corrected on October 18, 1990 by raising the setpoint for starting the standby Offgas Dilution Fan on low flow and normal operation of Standby Gas Treatment system was resumed.

On March 17, 1993, during cold shutdown and while performing a modification review, engineering personnel identified that a single failure in the Main Stack Fan Damper Controls could prevent the Standby Gas Treatment system from achieving rated flow. The Standby Gas Treatment system discharges to the suction of the Stack Fans which discharge out the Stack. The control system which regulates damper position was vulnerable to a single failure. The failure of either of two pressure relays in the Offgas Dilution Flow Control circuits could cause both fan inlet dampers to close, preventing adequate flow from the Standby Gas Treatment system. At the time of the event the system was not required to be operable. A modification was completed and the system was returned to operable status. This event was a condition outside the design basis of the plant and is reportable per 10CFR50.73(a)(2)(v).

CAUSE

The root cause of the December 19, 1989 event was design inadequacy. The original design resulted in a condition where normal operation of Non-Safety Related equipment (i.e. Steam Packing Exhauster blowers (K-3A, K-3B) (EIIS Component Code: FAN)) could adversely affect a Safety Related system (i.e. Standby Gas Treatment).

The maximum flow through Standby Gas Treatment that could be achieved during the test was 3500 CFM which produced only a 0.22 to 0.23 inches water vacuum within Secondary Containment. Investigation of the operation of Standby Gas Treatment revealed that, during Secondary Containment isolation conditions with the reactor at power and without a loss of offsite power, Standby Gas Treatment system flow was being limited by flow to the Offgas Stack from the Steam Packing Exhauster discharge (See Figure 1.) Steam Packing Exhauster flow injects into the Offgas Stack after the discharge of the Offgas Dilution Fans (V-EF-18A, V-EF-18B) (EIIS Component Code: FAN) and before the flow sensors (SPS 8000-H1, SPS 8000-H2) (EIIS Component Code: TC) which are used to control the flow through the dilution fans. This causes a reduction in flow through the Dilution Fans and Standby Gas Treatment Fans (V-EF-17A, V-EF-17B) (EIIS Component Code: FAN). This condition may then prevent the achievement of the 0.25 inches water vacuum required within Secondary Containment.

It was determined that a failure of either of two discharge dampers (EIIS Component Code: DMP) for the Turbine Building exhaust fans (V-EF-11 or V-EF-26) (EIIS Component Code: FAN) could lead to higher back pressure in the Standby Gas Treatment discharge line and likewise prevent Standby Gas Treatment from achieving full rated flow. These fans run in parallel to supply 50% of the dilution flow during normal operation. During a Secondary

Containment isolation, dampers on the discharge of these fans open to release their discharge to the Reactor Building Plenum Room. However, either of the discharge dampers could stick in a closed position and the respective fan would continue to discharge to the dilution fans. This flow could create a back pressure on the running Standby Gas Treatment fan and limit its flow.

It was also determined that failure of Primary Containment Exhaust to Plenum isolation valve (AO-2982) (EIIS Component Code: ISV) in the open position during a Secondary Containment Isolation would allow the Standby Gas Treatment fans to draw on the Reactor Building Exhaust Plenum Room instead of the Reactor Building. Therefore, Standby Gas Treatment would not be able to maintain the required vacuum within Secondary Containment.

The setpoint deficiency discovered On October 11, 1990, was caused by the original design which did not adequately consider interactions between the Offgas Dilution fans and the Standby Gas Treatment fans.

The cause of the March 17, 1993 event was also design inadequacy. The original design, which dated back to the time of initial plant construction, did not adequately protect against the postulated single pressure relay failure in the Offgas Dilution Flow Control circuits.

ANALYSIS

Since Standby Gas Treatment could not maintain 0.25" WC vacuum within Secondary Containment, Secondary Containment integrity can not be taken credit for in Offsite and Control Room dose calculations. As a result, Offsite and Control Room doses could not be assured to meet 10 CFR 100 and 10 CFR 50 limits assuming Reg. Guide 1.3 and Reg. Guide 1.25 source terms.

However, when assuming USAR source terms, Offsite and Control Room doses could be assured to be less than 10 CFR 100 and 10 CFR 50 limits with a complete loss of Secondary Containment integrity.

The actual vacuum obtained during the test conducted on 12/19/89 indicated only a slight degradation in Secondary Containment integrity (i.e., capable of maintaining 0.22 inches water instead of 0.25 inches water vacuum). The effect of decreased building vacuum is to increase Secondary Containment exfiltration under high wind velocity. At high wind speeds, Offsite and Control Room doses are significantly lower than the doses calculated for licensing purposes due to lack of fumigating effects at low wind speeds and due to increased dilution effects at high wind speeds.

Only two design basis accidents in the USAR take credit for Secondary Containment integrity and Standby Gas Treatment operation: the Loss of Coolant Accident and the Fuel Handling Accident. Required Operator actions would have secured the Steam Packing Exhauster blowers during reactor shutdown for the Loss of Coolant Accident. A hold was placed on fuel handling equipment as part of corrective actions for LER 89-029. The consequences of the design deficiencies would have been mitigated during either accident by Operator actions and Emergency Plan actions. Therefore, the risk to the public due to this event was minimal.

On December 19, 1989, following identification of system design inadequacies, a safety evaluation was performed and procedures revised to ensure that Secondary Containment integrity could be maintained during all design basis accident conditions. Operating procedures were revised such that, in the event of a Secondary Containment isolation due to a release of radioactivity from within Secondary Containment, the following would be accomplished:

a. The Turbine Building Exhaust Fans would be tripped.

b. Reactor recirculation flow would be reduced, the reactor would be manually scrammed, the main turbine would be tripped, and the Steam Packing Exhauster blowers would be tripped.

After the operating procedures were revised, Secondary Containment was declared operable, the NUE was terminated, and the preparations for a normal orderly shutdown were canceled. No reduction in reactor power had yet occurred. Secondary containment was declared inoperable for a total of 11 hours and 51 minutes on 12-19-89.

On October 16, 1990, following identification of the system setpoint design inadequacy, a safety evaluation was performed on proposed setpoint changes. It was determined that a single Standby Gas Treatment fan operating without an Offgas Dilution fan could produce only 2300 to 2330 CFM through the system. Although this flow rate was lower than the estimated required flow to maintain 0.25 inches water vacuum in Secondary Containment, a vacuum would have been expected to be developed. Therefore, unfiltered exfiltration would not have been expected unless high winds developed. The effects of high wind speeds would result in lowered doses as discussed above. It was verified that a flow of 2300 to 2330 CFM was low enough to actuate Standby Gas Treatment system alarms and alert Operators of system degradation. Since there are indications and controls for the Offgas Dilution fans in the Control Room, the problems could be promptly diagnosed and corrected following existing alarm response procedures.

It was also demonstrated that the Division II Standby Gas Treatment fan would have automatically started on low flow through the Division I Standby Gas Treatment fan in the event of both Off Gas Dilution fans having failed. The flow developed under this condition may have been sufficient to maintain 0.25 inches water vacuum within Secondary Containment. However, due to testing limitations of Secondary Containment while the plant is operating, it could not be verified whether the required vacuum within Secondary Containment could have been maintained. The plant was in the Limiting Condition for Operation for the setpoint deficiency from 1600 on 10/11/90 to 1340 on 10/18/90 for a total of 6 days 21 hours 20 minutes.

The postulated single failure concern identified on March 17, 1993 is not a predominate failure mode of this type of control circuit and operating experience has not identified any previous failures of this type which resulted in closure of the dampers. If this were to have occurred during an accident condition requiring Standby Gas Treatment system operation, the reduced flow through the system may have limited secondary containment negative pressure. The effect of decreased building vacuum is to increase Secondary Containment exfiltration under high wind velocity. At high wind speeds, Offsite and Control Room doses are significantly lower than the doses calculated for licensing purposes due to lack of fumigating effects at low wind speeds and due to increased dilution effects at high wind speeds. If this event were to have occurred during an accident condition, operators would have had indication of low secondary containment negative pressure and may also have had indication of low dilution fan flow such that prompt identification and resolution to the problem would occur.

CORRECTIVE ACTIONS

Summary of Corrective Actions Taken:

1. An administrative hold was placed on AO-2982 to secure it in the closed position when Standby Gas Treatment is required to be operable.

2. Operating procedures were revised to require tripping the Turbine Building Exhaust Fans and tripping the Steam Packing Exhauster blowers after an initiation of Standby Gas Treatment and isolation of Secondary Containment which was caused by a radioactive release from within Secondary Containment.

3. The initial findings of this event were communicated to other utilities with nuclear plants via the "Nuclear Network".

4. The Secondary Containment Capability Test was performed satisfactorily while the Reactor was in cold shutdown on July 6, 1990.

5. Possible design changes were identified which would:

   a. Increase system flow
   b. Eliminate the effects of exhauster flow on dilution flow
   c. Eliminate the vulnerability of the Standby Gas Treatment and Secondary Containment Systems to single component failures.

6. The design basis review for Secondary Containment and Standby Gas Treatment systems was completed.

7. Field verification of the Design Bases Review has been completed.

8. The Offgas Dilution fan low flow standby start setpoint was raised to assure that the standby fan would receive a start signal.

9. Procedures for the Design Bases Review were revised to assure the review of similar setpoints as a part of the on-going design bases documentation program.

10. Standby Gas Treatment system low alarm response procedures were reviewed and determined to be adequate.

11. A modification was completed that eliminates Stack Fan controller single failure concern.

ADDITIONAL INFORMATION

1. Failed Component Identification:

   NONE

2. Previous Similar Events:

   LER 89-029

   Note: Corrective actions of LER 89-029 led directly to the discovery of the design deficiencies identified in this LER.

NRC FORM 366A (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)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Monticello Nuclear Generating Plant	05000 263	93	- 89-040 -	02	OF 8 8

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)