Northern States Power Company

Prairie Island Nuclear Generating Plant

1717 Wakonade Dr. East
Welch, Minnesota 55089

April 18, 1994

10 CFR Part 2
Appendix C

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

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
Docket Nos. 50-282 License Nos. DPR-42
50-306 DPR-60

Reply to a Notice of Violation
NRC Inspection Report Nos. 282/94002(DRP) and 306/94002(DRP)
Procedural Deficiency Allowing Damage to a Safety-related Valve

Your letter of March 18, 1994 transmitted the subject inspection report and violation notice which required a 30 day response. Attached is our response.

In our response, we have made new NRC commitments which are identified as such in the attachment as the statements which are in italics.

If you have any questions regarding this response, please contact Jack Leveille (612-388-1121, extension 4662).

E L Watzl
General Manager
Prairie Island Site

cc: Regional Administrator III, NRC
Senior Resident Inspector, NRC
NRR Project Manager, NRC
J.E. Silberg

Attachment: RESPONSE TO VIOLATION

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JE01

RESPONSE TO VIOLATION

Violation

Criterion V of 10 CFR 50, Appendix B, requires that activities affecting quality be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings.

Contrary to the above, on January 24, 1994, extensive damage to the normally closed outboard containment isolation valve (MV-32181) between the containment building sump and the suction of No. 22 residual heat removal pump occurred when the electrician, stroking the valve locally from the motor control center, continually depressed the close contactor instead of depressing the open contactor. The maintenance procedure used to locally stroke the valve was not appropriate to the circumstances in that: 1) the procedure did not require that direct communications be established between the electrician and operators during stroking of the valve; 2) expected values for motor current draw were not included; 3) the method of making up the contactor was not specified (i.e. the open contactor did not have to be continually depressed in order to operate the valve); and 4) the procedure required errorless human performance because of the absence of actuator protective features.

This is a Severity Level IV Violation (Supplement I).

Background

We consider this failure to be significant since a risk-significant component failed, albeit not while performing in the accident functional mode.

Although the work procedure for cycling the valve had the deficiencies noted in the violation, it should be noted that the plant electricians have cycled motor valves locally at the breaker using the contactors numerous times as part of motor-operated valve (MOV) testing efforts. Such cycling activities have occurred since the 1980's. In an effort to reduce the likelihood of error, the motor valve and system engineers initiated the procedure referenced in the violation. In preparing the procedure the engineer had spoken with electrical maintenance personnel experienced in motor operated valve testing to ensure that the procedure would be appropriate. Based on this input, the procedure was developed for cycling MV-32181.

MV-32181 was the third valve to be cycled in response to a NRC identified concern regarding the potential for pressure locking. The person assigned to perform the task was a journeyman electrician. Previously in January, two different electricians had used the same procedure satisfactorily on the two Unit 1 valves.

Reason for the Violation

Two root cause analyses were initiated - one to determine the root cause for the event and the second to determine the valve failure root cause (this is discussed in the "Corrective Steps Taken and Results Achieved" section). The event root cause analysis was performed by the on-site Error Reduction Task Force (ERTF) and is documented in ERTF Report 94-01.

The ERTF report identified two primary causes, two secondary causes, and two additional possible causes for the event. The primary cause was determined to be human error. The causes were:

Primary causes - Human Error

1. Self-checking was not applied to verify that the choice of contactor was correct, or that the intended action was correct. The electrician depressed the wrong contactor.

2. The electrician did not have the proper information at the job site to verify whether the valve's circuit was seal-in or not. Without this information, the electrician pressed and held the contactor to ensure the valve would go open for the required 30 seconds. Holding the contactor in bypasses the torque switch trip.

Secondary causes - Ergonomic

1. The open and close contactors in the MCC breaker cubicle were not labeled.

2. The work request was somewhat generic in that it did not specify the expected current draw. Also, the work request did not contain instructions to push and release the contactor, nor did it mention the seal-in feature.

Possible contributing causes

1. No communications were established between the MCC breaker cubicle and the motor valve.

2. Consequences of potential error were not discussed before starting the work.

Corrective Steps Taken and Results Achieved

The affected valve was repaired and restored to service on January 26, 1994. Prior to cycling additional motor operated valves (e.g., MV-32180, Containment

Sump B to 21 RHR Pump) by this method, the causes of the event were identified and corrective actions to prevent a similar event were discussed with the plant electricians. A more detailed procedure was used for the cycling of the next valve, MV-32180, which was cycled successfully on February 4, 1994.

Prairie Island has developed a videotape intended to emphasize self-checking. This video, "Right from the Start", has now been viewed by some, but not all, of the plant staff, including the electricians.

A method was implemented to label the open and close contactors in motor valve MCC breaker cubicles. To date, the contactors in 142 MCC breaker cubicles have been labeled.

On March 24, 1994, temporary memos (94-24 and 94-25) were issued to both units' quarterly surveillance procedures, SP1089 and SP2089 (Residual Heat Removal Pumps and Suction Valves from the Refueling Water Storage Tank), respectively. These temporary memos are refinements of the procedure used for the MV-32180 cycling. These refinements were developed during a post-event evaluation by those involved in the event. These procedure changes involved cycling the Sump B valves locally for potential pressure locking. The procedure specified the following additional information/requirements beyond those specified in the original work request:

(1) precaution to self-check,

(2) perform a pre-job briefing,

(3) use of headset communication between the electrician at the MCC breaker cubicle and the operator at the valve,

(4) identification of the expected full load and nameplate locked rotor amperage,

(5) caution that the contactor need not be held in, but only momentarily depressed since it is a seal-in circuit, and

(6) verification that the open and closed contactors are labeled.

The MOV testing engineers were advised to ensure adequate instructions are provided for those cases where local operation of an MOV is required. *They will evaluate their procedures for necessary changes.*

A Safety Evaluation revision provides short term justification of the operability of the Sump B valves based on the calculational methodology of required opening thrusts under pressure locking condition. These valves will no longer be cycled for pressure locking concerns. A modification is being prepared to modify the valves to prevent pressure locking.

The Equipment Failure Root Cause evaluation was initiated by the engineering

staff with the assistance of the valve manufacturer (Crane/Aloyco), an independent engineering firm (Altran) experienced in failure analysis of this type, and the corporate Materials and Special Processes department. The vendor analyses are still in progress.

Mechanically the weld failed at the point where the yoke arm was attached to the actuator adapter plate. This failure location was not predicted by the valve manufacturer's weak link analysis. Rather, failure was anticipated in the yoke. The failure root cause analysis has determined that the following additional factors contributed to the premature failure:

(1) A shim was installed between the yoke and adapter plate that resulted in a lower failure stress than design,

(2) The shim was not indicated on the fabrication drawings,

(3) The shim was not included in the design calculations, and

(4) The weld that broke was poor quality as indicated by less-than-design fusion.

Preliminary data from Crane and Altran indicate that the as-built values for the weldments were less than the original Westinghouse specification design values. These additional factors are apparently due to inadequate Crane quality assurance and controls and inadequate Westinghouse oversight. Crane was the manufacturer and Westinghouse was the supplier.

We have determined that the as-built valve characteristics do not constitute a substantial safety hazard for the Prairie Island plant application. However, the existence of the shims in valves in different applications in other plants may present a substantial safety hazard. We have notified Westinghouse that they may need to perform an evaluation for 10 CFR Part 21 reporting purposes.

Although the torque switch was bypassed due to the actions of the electrician, the torque switch settings could have been set at a lower setting since the plant design differential pressure is 46 psid rather than the generic 700 psid design differential pressure.

The discovery of the shim led to expansion of the investigation to all other Crane valves of this type used in safety-related applications. These valves include:

Containment Sump B to RHR:	12"	32075, 32076, 32077, 32078	(Unit 1)
		32178, 32179, 32180, 32181	(Unit 2)
RWST to RHR Pumps:	10"	32084, 32085	(Unit 1)
		32187, 32188	(Unit 2)

The four RWST to RHR Pump valves and the other three outside Sump B to RHR

valves were inspected for presence of a shim and weld quality. The results of the inspections were satisfactory. The four inside Sump B to RHR valves were not inspected at this time since a unit shutdown would be needed and it is believed that inspection of the remaining valves provides a reasonable expectation that the valves inside the containment boundary are not different.

The torque switch setting for MV-32181 has been adjusted downward to correlate closer to the 46 psid plant design than the higher generic design differential pressure. This change had been planned prior to the event occurrence.

A further investigation of the maintenance history showed that one of the Unit 1 RWST to RHR pump valves failed in 1975. At that time those four valves were evaluated and rewelded as appropriate.

Corrective Steps That Will Be Taken To Avoid Further Violations

The need for a revision of the plant maintenance procedure writers' guide will be reevaluated, by June 1, 1994, in light of the observations made during the evaluation of this event.

A Maintenance section procedure will be completed, by June 1, 1994, that describes in detail the method for cycling a motor valve locally by using open and close contactors since this approach is used in the MOV testing program.

The remaining containment sump B valves will be inspected for presence of the shim and weld quality and the torque switch settings will be readjusted to correlate with the lower plant design differential pressure, by July 1, 1994 for Unit 1 and July 1, 1995 for Unit 2.

The videotape "Right from the Start" has been incorporated into the General Employee Training re-qualification program, which is presented to all personnel badged for access to the plant.

Date When Full Compliance Will Be Achieved

Full compliance has been achieved.