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

NRC Bulletin 88-08

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

Response to NRC Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems" (TAC Nos. M69673 and M69674)

Reference: Letter, A. S. Masciantonio (NRC) to T. M. Parker (NSP), dated November 4, 1991, NRC Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems"

This letter is provided in response to Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems".

We initiated an evaluation and actions upon receipt of Bulletin 88-08 and the associated supplements and we responded to the Bulletin by letters dated September 30, 1988 and June 2, 1989. Per the referenced letter, we have been asked to further respond to Action 3 of the original Bulletin.

While our 1988 response to Bulletin 88-08 did not commit to continuous temperature monitoring, we have since then implemented temperature monitoring for both Prairie Island units. We have determined that this monitoring complies with the guidelines given in the referenced "Evaluation Criteria for Responses to NRC Bulletin 88-08, Action 3 and Supplement 3."

Attachment 2 summarizes the review of Prairie Island activities in regard to this Bulletin, following the outline of the "Evaluation Criteria."

Please contact us if you have any questions related to our response.

Thomas M Parker
Manager
Nuclear Support Services

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c: Regional Administrator - Region III, NRC
Senior Resident Inspector, NRC
NRR Project Manager, NRC
J E Silberg

Attachments
1. Affidavit
2. Prairie Island Response to Bulletin No. 88-08

Attachment 1

UNITED STATES NUCLEAR REGULATORY COMMISSION

NORTHERN STATES POWER COMPANY

PRAIRIE ISLAND NUCLEAR GENERATING PLANT DOCKET NO. 50-282
50-306

Thermal Stresses in Piping
Connected to Reactor Coolant Systems

Northern States Power Company, a Minnesota corporation, with this letter is submitting information requested by NRC Bulletin 88-08.

This letter contains no restricted or other defense information.

NORTHERN STATES POWER COMPANY

By _____
Thomas M Parker
Manager, Nuclear Support Services

On this 31st day of January 1992 before me a notary public in and for said County, personally appeared Thomas M Parker, Manager, Nuclear Support Services, 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.

Marcia K. LaCore

MARCIA K. LaCORE
NOTARY PUBLIC—MINNESOTA
HENNEPIN COUNTY
My Commission Expires Sept. 24, 1993

Attachment 2

PRAIRIE ISLAND RESPONSE TO BULLETIN No. 88-08

THERMAL STRESSES IN PIPING CONNECTED TO
REACTOR COOLANT SYSTEMS

1.0 OBJECTIVE

To provide continuing assurance that unisolable sections of all piping connected to the reactor coolant system (RCS) will not be subjected to thermal stratification and thermal cycling that could cause fatigue failure during the remaining life of the Prairie Island plant.

2.0 PURPOSE

To summarize actions taken and planned by the Prairie Island plant, including procedures and criteria to prevent crack initiation in susceptible unisolable piping.

3.0 IDENTIFICATION OF POTENTIALLY SUSCEPTIBLE PIPING

(1) The only Prairie Island lines which meet the characteristics of the "Evaluation Criteria" (1) A, B, C, and D are the auxiliary pressurizer spray lines between the charging line and the main pressurizer spray line. Prairie Island has one charging line which is always in service (i.e., there is no alternate charging line where one line is out of service).

(2) Prairie Island lines which meet the characteristics of "Evaluation Criteria" (2) A, B, and C are the residual heat removal (RHR) lines. Leak-off piping from the RHR valves is routed to the Pressurizer Relief Tank and potential leakage can be monitored and corrective action taken if necessary.

4.0 ACTIONS TAKEN AND PLANNED

The following actions were considered and implemented as appropriate:

(1) The auxiliary spray line is a branch line off of the charging line so the option of reducing the pressure of the water upstream of the isolation valve below the RCS pressure during power operation is not applicable to the Prairie Island configuration.

(2) The option of relocating check valves is assumed to be for the case of potential in-leakage of cold water and having the check valve beyond 25 pipe diameters would be so that the cold water would not be in close proximity to the turbulent region containing hot water from the reactor coolant loop. This has also been determined to be not applicable for the Prairie Island configuration.

(3) Temperature monitoring has been installed on the auxiliary spray lines for both Unit 1 and Unit 2 for detection of piping thermal cycling due

to valve leakage into the RCS.

A. Type and location of sensors.

a. RTDs were used for temperature sensors.

b. Locating temperature monitoring instrumentation between the first elbow and the first check valve is for lines such as high pressure safety injection, and is not applicable for auxiliary spray lines.

c. RTDs on the auxiliary spray lines were installed near the "tee" connection to the main pressurizer spray line and on the "cold" portion of the line, as well as on intermediate positions for Unit 1. The critical location was judged to be the "cold" portion of the pipe just downstream of the check valve since that area would be expected to show a relatively large top-to-bottom temperature difference in the event of valve leakage.

d. RTDs were located within six inches of the welds.

e. RTDs were installed at the top and at the bottom of the pipe at the monitoring locations.

B. Determination of baseline temperature histories.

Baseline temperature histories were obtained for the auxiliary spray lines following the September 1990 outage for Unit 2 and the June 1991 outage for Unit 1. This monitoring demonstrated that no valve leakage was occurring and that there was not adverse temperature stratification or cycling. Baseline temperature histories were compared against the Reference 1 "Evaluation Criteria":

a. The top-to-bottom temperature differences were monitored downstream of the check valve. Average results were:

	Unit 1	Unit 2
Top	220°F	145°F
Bottom	200°F	135°F
Difference	20°F	10°F

These top-to-bottom temperature differences are well within the 50°F guideline in the "Evaluation Criteria." The cooler temperatures on Unit 2 can be explained by the lack of thermal insulation on the valve.

b. Top and bottom temperature time histories were in-phase for both Unit 1 and Unit 2 (i.e. the top-to-bottom temperature difference is relatively constant).

c. Peak-to-peak temperature fluctuations were monitored and were found to be not more than 5°F in a 24 hour period (The "Evaluation Criteria" says they should not exceed 60°F).

C. Monitoring time intervals.

a. Monitoring was performed at the following times:

1. Monitoring was done for the auxiliary spray lines at the beginning of power operation, after startup from the refueling shutdowns in October 1990 for Unit 2 and in June 1991 for Unit 1. The practice of collecting monitoring data following startup from refueling outages will continue in the future.

2. Monitoring has been done continuously for Unit 2 since October 1990. On Unit 1, monitoring was done during startup following the June 1991 outage and then monthly for the next three months.

Since the data has proven to be so constant, consideration will be given to increasing this interval to not more than six months, between refueling outages.

b. The monitoring period has been continuous for Unit 2 since October 1990. Monitoring periods on Unit 1 have varied from several days to "snapshots" to verify that the data has remained constant. The practice of monitoring and recording temperatures continuously for a period not less than 24 hours will continue in the future.

D. Exceedance Criteria.

The conditions determined from temperature monitoring have not required any corrective action to date.

a The maximum temperature difference between the top and the bottom of the pipe at the critical location have remained below 50°F (actual has been 10 - 20°F).

The Unit 1 auxiliary spray line has a 40 foot horizontal section leading to the pressurizer spray tee connection. Temperature monitoring has shown that convective heat transfer keeps this length of line relatively warm. The temperature drops by about 3°F for each foot going away from the hot source at the tee. The natural convective heat transfer currents in this long horizontal section cause the middle of the line to have a top-to-bottom temperature difference of about 20°F at the far end (370-350°F), about 70°F in the middle (465-395°F), and about 15°F was measured near the tee (480-465°F). Monitoring data has shown this is a steady

temperature distribution with no cycling occurring. Therefore, there is no fatigue concern for this situation and the slight global bending which might result is judged to be easily accommodated within the flexibility of the pipe hangers without increasing stress.

b. Top and bottom temperature histories have remained in-phase and both the top and the bottom peak-to-peak temperature fluctuations have been less than 6°F over a 24 hour period ("Evaluation Criteria" says not greater than 60°F).

c. Top and bottom temperature histories have remained in-phase and the bottom peak-to-peak temperature fluctuations have been less than 6°F over a 24 hour period ("Evaluation Criteria" says not greater than 50°F).

d. Temperatures at each location have remained relatively constant and are similar to the initially recorded baseline histories.

(4) Pressure monitoring cannot provide a measurement of thermal cycling in the unisolable pipe sections and was determined not suitable for use on the auxiliary spray lines