DOR 026

Docket Nos. 50-282
and 50-306

Mr. D. M. Musolf
Nuclear Support Services Department
Northern States Power Company
414 Nicollet Mall
Midland Square - 4th Floor
Minneapolis, Minnesota 55401

Dear Mr. Musolf:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION: NUREG-0737 ITEM II.D.1, PERFORMANCE TESTING OF RELIEF AND SAFETY VALVES

A review of your response transmitted by letters dated July 19, 1982, March 15, 1983 and March 14, 1984 related to the performance testing of the relief and Safety valve testing (NUREG-0737 Item II.D.1) for the Prairie Island Nuclear Generating Plant, Unit Nos, 1 and 2 has been completed.

Based on the review performed by our consultant, EG&G, we conclude that additional information described in the enclosure is necessary in order to complete our evaluation. Therefore we request that you provide a response to each item in the enclosure within 60 days from your receipt of this letter.

The reporting and/or recordkeeping requirements of this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511

Sincerely,

/s/

James R. Miller, Chief
Operating Reactors Branch No. 3
Division of Licensing

Enclosure:
As stated

cc w/enclosure:
See next page

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Region V Office
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230 South Dearborn Street
Chicago, Illinois 60604

REQUEST FOR ADDITIONAL INFORMATION

TMI ACTION NUREG-0737 (II.D.1)

FOR

PRAIRIE ISLAND

UNITS 1 AND 2

DOCKET NO.: 50-282 AND 50-306

JANUARY 1985

SAFETY EVALUATION QUESTIONS TMI ACTION NUREG-0737 II.D.1
FOR PRAIRIE ISLAND UNITS 1 AND 2

Questions related to selection of transients and inlet fluid conditions:

1. The Westinghouse valve inlet fluid conditions report stated that liquid discharge through both the safety and Power Operated Relief Valves (PORVs) is predicted for an FSAR feedline break event. The Westinghouse report gave expected peak pressure and pressurization rates for some plants having a FSAR feedline break analysis. The Prairie Island plants were not included in this list of plants having such a FSAR analysis. Nor does the Prairie Island plant specific submittal address the FSAR feedline break event. NUREG-0737, however, requires analysis of accidents and occurrences referenced in Regulatory Guide 1.70, Revision 2, and one of the accidents so required is the feedline break. Provide a discussion on the feedwater line break event either justifying that it does not apply to this plant or identifying the fluid pressure and pressurization rate, fluid temperature, valve flow rate, and time duration for the event. Assure that the fluid conditions were enveloped in the EPRI tests and demonstrate operability of the safety and relief valves for this event. Further, assure that the feedline break event was considered in analyses of the safety/relief valve piping system.

2. In valve operability discussions on cold overpressurization transients, the submittal only identifies conditions for water discharge transients. According to the Westinghouse valve inlet fluid conditions report, however, the PORVs are expected to operate over a range of steam, steam-water, and water conditions because of the potential presence of a steam bubble in the pressurizer. To assure that the PORVs operate for all cold overpressure events, discuss the range of fluid conditions for expected types of fluid discharge and identify the test data that demonstrate operability for these cases.

Since no low pressure steam tests were performed for the relief valves, confirm that the high pressure steam tests demonstrate operability for the low pressure steam case for both opening and closing of the relief valves.

3. Results from the EPRI tests on the Crosby safety valves indicate that the test blowdowns exceeded the design value of 5% for both "as installed" and "lowered" ring settings. If the blowdowns expected for the plant (see Question 4) also exceed 5%, the higher blowdowns could cause a rise in pressurizer water level such that water may reach the safety valve inlet line and result in a steam-water flow situation. Also the pressure might be sufficiently decreased such that adequate cooling might not be achieved for decay heat removal. Discuss these consequences of higher blowdowns if increased blowdowns are expected.

<u>Questions related to valve operability</u>:

4. The submittal states that Westinghouse and Crosby are developing optimum ring settings for the safety valves. Identify the final ring settings selected as a result of this effort. Since EPRI tests on the Crosby 3K6 and 6M6 safety valves were used to evaluate performance of the 6M16 valve of Prairie Island, identify which EPRI tests on the 3K6 and 6M6 valves had ring settings representative of those used on the plant 6M16 valve. Identify the expected blowdowns corresponding to the plant ring settings and explain how these blowdowns were extrapolated or calculated from test data. Verify that with the ring settings used the valves can perform their pressure relief function and the plant can be safely shutdown with the blowdown, backpressure, and fluid conditions occurring at the plant.

5. The Prairie Island plant Crosby 6M16 safety valve was not tested by EPRI. Results from EPRI tests on the Crosby 3K6 and 6M6 safety valves were used to evaluate performance of the Crosby 6M16 valve of Prairie Island Units 1 and 2. The EPRI test results indicate that the 6M6 valve achieved rated flow for steam flow. Though the submittal states that the 3K6 valve also achieved rated flow, the EPRI test results

show that this valve had not achieved rated flow at 3% accumulation for the loop seal tests at certain ring settings. Provide a further evaluation as to whether the test results sufficiently show that the 6M16 valve will pass rated flow at the plant ring settings.

6. During an EPRI loop seal steam-to-water transition test on the 3K6 valve, the valve fluttered and chattered when the transition to water occurred. The test was terminated after the valve was manually opened to stop chattering. The 6M6 valve exhibited similar behavior on a subcooled water test, which was terminated after the valve was manually opened to stop chatter. Justify that the valve behavior exhibited in these tests is not indicative of the performance expected for the Prairie Island valves. Potential liquid flow through the plant safety valves cannot be disregarded unless the feedline break event is shown to be nonapplicable to this plant (See Question 1).

7. Bending moments are induced on the safety valves and PORVs during the time they are required to operate because of discharge loads and thermal expansion of the pressurizer tank and inlet piping. Make a comparison between the predicted plant moments with the moments applied to the tested valves to demonstrate that the operability of the valves will not be impaired.

8. NUREG-0737, Item II.D.1. requires that the plant-specific PORV control circuitry be qualified for design-basis transients and accidents. Please provide information which demonstrates that this requirement has been fulfilled.

Questions related to thermal hydraulic analysis:

9. The submittal indicates that thermal hydraulic analyses have been completed on Prairie Island Units 1 and 2 but does not describe these analyses. Identify the computer programs used to perform the thermal hydraulic analyses and provide verification that these programs have generated accurate fluid loads for similar problems.

10. Provide evidence that the analysis was performed on the fluid transient cases producing the maximum loading on the safety valve/PORV piping system. Identify the fluid conditions assumed including pressure, temperature, pressurization rate, fluid range, and number of valves actuated.

11. Report the flow rates through the safety valves and PORVs that were assumed in the thermal hydraulic analysis. Because the ASME Code requires derating of the safety valves to 90% of actual flow capacity, the safety valve analysis should be based on a flow rate of at least 111% of the flow rating of the valve, unless another flow rate can be justified. Provide information explaining how derating of the safety valves was handled.

12. The submittal indicates that the addition of insulation to the loop seals upstream of the safety valves was necessary to reduce the fluid loads. The loop seal temperature distribution corresponding to the insulated condition should be accurately represented in the thermal hydraulic analysis since the calculated forces could be significantly affected by the temperatures assumed. Explain how the temperature distribution was determined and provide verification of its accuracy.

<u>Questions related to structural analysis</u>:

13. The submittal indicates that the structural analysis has been completed but does not describe the analysis. Identify the program used to perform the analysis and provide verification that the program has produced accurate results on similar problems.

14. Identify the load combinations performed in the analysis together with allowable stress limits for piping and supports both upstream and downstream of the valves. Also, identify the governing codes and standards used to determine piping and support adequacy.

15. The submittal indicates that some modifications to the pipe supports are needed and that these modifications will be implemented in future refueling outages. Provide a comparison between calculated piping stresses and support loads with allowables for the modified piping system to verify structural adequacy of the new system.

16. According to results of EPRI tests, high frequency pressure oscillations of 170-260 Hz typically occur in the piping upstream of the safety valve while loop seal water passes through the valve. The submittal refers to an evaluation of this phenomenon that is documented in the Westinghouse report WCAP 10105 and states that the acoustic pressures occurring prior to and during safety valve discharge are below the maximum permissible pressure. The study discussed in the Westinghouse report determined the maximum permissible pressure for the inlet piping and established the maximum allowable bending moment for Level C Service Conditions in the inlet piping based on the maximum transient pressure measured or calculated. While the internal pressures are lower than the maximum permissible pressure, the pressure oscillations could potentially excite high frequency vibration modes in the piping, creating bending moments in the inlet piping that should be combined with moments from other appropriate mechanical loads. Provide one of the following: (a) a comparison of the allowable bending moments established in WCAP 10105 for Level C Service Conditions with the bending moments induced in the plant piping by dynamic motion and other mechanical loads or (b) justification for other alternate allowable bending moments with a similar comparison with moments induced in the plant piping.