Mr. Roger O. Anderson, Director
Licensing and Management Issues
Northern States Power Company
414 Nicollet Mall
Minneapolis, Minnesota 55401

February 21, 1997

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON THE PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2, AMENDMENT OF COOLING WATER SYSTEM EMERGENCY INTAKE DESIGN BASIS (TAC NOS. M97816 AND M97817)

Dear Mr. Anderson:

By letter dated January 29, 1997, as supplemented February 11 and 12, 1997, Northern States Power Company (NSP) submitted a request to amend the licensing basis for the Prairie Island cooling water system emergency intake. In order to review the proposed changes the staff requires some additional information. Our request for additional information (RAI) is enclosed.

In order to continue our review of your submittal on an exigent basis, please provide your response to the staff's RAI as soon as practical. If you have any questions regarding the content of the RAI, please contact me at (301) 415-1355.

Sincerely,

Original Signed by:

Beth A. Wetzel, Project Manager
Project Directorate III-I
Division of Reactor Projects - III/IV
Office of Nuclear Reactor Regulation

Docket Nos. 50-282, 50-306

Enclosure: As stated

cc w/encl: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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Mr. Roger O. Anderson, Director
Northern States Power Company

Prairie Island Nuclear Generating
Plant

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Welch, Minnesota 55089

Tribal Council
Prairie Island Indian Community
ATTN: Environmental Department
5636 Sturgeon Lake Road
Welch, Minnesota 55089

REQUEST FOR ADDITIONAL INFORMATION FOR REVIEW OF THE AMENDMENT OF THE COOLING WATER SYSTEM EMERGENCY INTAKE STRUCTURE DESIGN BASES

1. It appears that the N values shown in Reference 1 are the values calculated from the results of the Cone Penetration Tests (CPT) using the equation, $N = 0.833 * q_c^{0.69} + 3.75 * f_s$. Provide the results of any existing liquefaction studies or empirical tests that verify the validity of such an equation with comparison of the Standard Penetration Tests (SPT) test results; specifically, the soil types at the site should be considered.

2. With respect to the calculated N values, you modified the SPT N_1 values using the equation, $N_1 = N * C_n$.

   a) The values of C_n, the correction factor, shown in Figure 3 of Reference 1 are based on the SPT test results. Explain the applicability of the values for the CPT test results.

   b) These values of C_n are based on the material being fine sands. Discuss the applicability of these values for the soils present at your site.

   c) There are two curves in Figure 3 of Reference 1 for determining the values of C_n: one curve is for the relative density of fine sand, D_r = 40 to 60 % and the other curve for D_r = 60 to 80 %. You have used the average of these two curves for finding C_n, while the small N values (i.e., N = 7 to 11) have the relative density of D_r less than 40 %. Justify why you did not use the curve for D_r = 40 to 60 % rather than using the average curve to obtain a more accurate liquefaction analysis.

   d) Justify the use of D_r = 40 to 60 % curve for fine sand that has a relative density of D_r less than 40 %.

   e) You have concluded that there is no liquefaction potential based on the Cyclic Strength Ratio (CSR) which is related to the N_1 value, thereby to the C_n. However, if one uses a C_n value from the D_r = 40 to 60 % curve or even a smaller C_n value because of smaller D_r (less than 40 %), then a smaller CSR should be found. Therefore, it may be concluded that there is a liquefaction problem in the Intake Canal soil layers. Justify your conclusion of the liquefaction analysis with respect to the accuracy of your C_n values.

   f) All eight (8) CPT tests were performed at the heel side of the Intake Canal embankment. Considering your use of the Seismic Stress Ratio (SSR) which is a function of a stress reduction coefficient and a ratio of the total and effective overburden pressures, you

ENCLOSURE

should have performed CPT and/or SPT tests near to the toe of the embankment and/or away from the toe on the floor of the canal to identify a liquefiable soil. They are the locations which provide a higher SSR and thus a smaller factor of the safety against a liquefaction. Discuss the adequacy of your test locations. Discuss also whether you can extend the soil condition from the heel side to the toe side and to the location of the intake pipe for a liquefaction analysis.

g) The CPT tests were performed to the depths approximately 43 to 46 feet below the grade. Explain why the tests were not extended to a deeper layer and how you are certain that there are no liquefiable soil layers beyond 46 feet.

h) Three (3) SPT tests were performed, and two SPT tests were done near the two CPT test locations. The NRC staff compared the SPT and CPT test results, and found that the SPT test results show smaller N values (i.e., 4 to 7). Using the actual SPT N values, which is a more common approach in practice, demonstrate there is no liquefaction problem in the intake canal.

i) Your previous contractors, Blume & Associates, Dames & Moore, and Bolton Seed, concluded that there are liquefiable soils around the intake canal area. However, your new contractor, STS Consultants Ltd., concluded that there are no liquefiable soils. Explain such inconsistent conclusions based on: (1) the SPT and CPT testing methods, (2) reliability of the testing results from both tests, (3) contractors' engineering judgment and interpretation of the testing results, and (4) the contractors' view and understanding on the importance of the seismically qualified Category 1 structure.

3. Using the Bishop's and Spencer's methods, you performed the slope stability analyses for the Intake Canal embankment. In the analyses, a full soil shear strength was assumed along a circular failure surface, since you assumed that there is no liquefaction in the soil layer. However, the slope stability is coupled with the earthquake loading. Therefore, it is more appropriate to use other methods (e.g., a dynamic finite element analysis with an appropriate time history input, a Wedge analysis with a possible failure line where the shear strength is low (small N values), etc.) for a slope stability analysis. Justify the adequacy of your slope stability analysis methods in view of shear strength development along the failure circle and a postulated failure circle.

4. We understand that you are reanalyzing the slope stability with considerations of the horizontal (0.12 g) and vertical (0.08 g) inertial forces. We expect you to use two possible soil slope failures: (1) one failure circle at the lowest factor of safety from a family of the shallow slope failure circles and (2) the other failure circle at the lowest factor of safety from a family of the base slope failure circles. Provide the reanalysis report with complete calculations. If the reanalyses are done using computer programs, submit the programs, inputs

and outputs for a review. However, if the computer programs are proprietary information, you are requested to submit the hand calculations for only the final two cases.

5. With regards to the capacity of the emergency intake line, in your January 29, 1997, submittal, you proposed changes to USAR [updated safety analysis report], Section 10, to state that "preoperational testing, when extrapolated for minimum submergence, demonstrated that only 15,000 gpm is actually available." Your submittal does not indicate what the flow demand of the cooling water system will be after operator actions are completed to reduce that demand to within the capacity of the intake line. What is the flow demand of the cooling water system after the operator actions, and what actions are planned to ensure that the flow capacity of the intake line (at the minimum submergence level) will continue to meet or exceed the cooling water system flow demand for the life of the plant? Will the minimum required capacity of the intake line be 15,000 gpm or some other justifiable flow rate?