September 18, 2012

Mr. James E. Molden
Site Vice President
Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota
1717 Wakonade Drive East
Welch, Minnesota 55089-9642

SUBJECT: APPLICATION FOR AMENDMENT TO MATERIALS LICENSE NO. SNM-2506, DOCKET NO. 72-10 – SUPPLEMENTAL INFORMATION NEEDED

Dear Mr. Molden:

By letter dated June 10, 2012, you submitted an application to amend Materials License No. SNM-2506, Docket 72-10. The application proposes to revise the thermal conductance requirement for neutron absorbers and aluminum plates in the TN-40HT. NRC staff performed an acceptance review of the proposed amendment to determine if the application contained sufficient technical information in scope and depth to allow the staff to complete the detailed technical review.

This letter is to advise you that, based on our acceptance review, the application does not contain sufficient technical information. The information needed to continue our review is described in the enclosure to this letter as Requests for Supplemental Information (RSIs). In order to schedule our technical review, the RSI responses should be provided by September 28, 2012. If the RSI responses are not received by this date, the review of this application may be delayed. This letter confirms our phone call on August 31, 2012, with respect to the supplemental information needed. If you have any questions regarding this matter, please contact me at (301) 492 - 3148.

Sincerely,

/RA/

Chris Allen, Project Manager
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No. 72-10

TAC No.: L24666

Enclosure: Request for Supplemental Information

Mr. James E. Molden
Site Vice President
Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota
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Enclosure: Request for Supplemental Information

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Filename: G:\SFST\Allen\Part 72\Prairie Island\Acceptance\RSI Letter.doc

ADAMS P8 Accession No.: ML12263A155

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NORTHERN STATES POWER COMPANY

DOCKET NO. 72-10

REQUESTS FOR SUPPLEMENTAL INFORMATION (RSI)

RELATED TO THE PROPOSED MATERIALS LICENSE NO. SNM-2506 AMENDMENT

THERMAL

1. Provide further details on the fabrication issue addressed in the submittal to better understand the proposed changes and the effect on the thermal analyses.

   - Briefly describe the basket plate fabrication issue (type of plate, thickness discrepancy from the expected value, its effect in relation to the stainless steel support bar thickness) and the effect of not meeting the technical specification. A simplified sketch (e.g., hand-drawn) of the adjacent three plates (aluminum, neutron absorber, and basket) and air gaps would be helpful. This will allow one to put the changes presented in Table A9.7-2 in perspective.

   - Of the four cases shown in Table A9.7-2, which one or two represent the expected arrangement that would be implemented? Considering that heat transfer occurs both parallel and perpendicular to the aluminum, basket, and neutron absorber plates, the two cases that have zero conductivity and conductance do not seem representative. For example, how does heat transfer from the basket plate near the fuel assembly to the aluminum plate across a neutron absorber plate with 0.0 Btu/hr-in-F thermal conductivity and with air gaps of 0.01"?

   This information is needed to determine compliance with 10 CFR 72.24(c) and 72.120.

2. Provide further explanation of the thermal modeling philosophy, especially as it relates to appropriately modeling series and parallel thermal circuits in a three-dimensional model.

   The changes in the SAR that are related to heat transfer focused on a parallel thermal resistance modeling approach. Therefore, it appears the heat transfer optimally occurs along the aluminum and neutron absorber plate of the basket structure. However, heat transfer would occur in both parallel and perpendicular directions to the aluminum, neutron absorber, and basket plates. Therefore, it is important that the modeling approach allow the inherently spatial solution of the energy equation without directly imposing a favored direction of the heat transfer. The need for proper spatial modeling of the heat transfer is especially relevant if a k_effective modeling algorithm is used. Further explanation of the thermal model should be provided, including:

   - Explain how heat transfer occurs parallel and perpendicular to the basket, aluminum, and neutron absorber plates from the fuel assemblies to the cask wall.
   - Explain how the k_effective algorithm was implemented.

   This information is needed to determine compliance with 10 CFR 72.24(c) and 72.120.

3. Provide further explanations of the thermal ANSYS model and the equations, etc., found in the ANSYS files.

   Further explanations of the thermal ANSYS model and information presented in the ANSYS files should be provided in order to better understand the model, including:

   - Derive the "solverp" equation in the .inp file.

   - The major change in this amendment is associated with the thermal conductivity, "conductance", and thickness of the absorber plates, per Table A9.7-2. Provide comments in the appropriate lines of the .inp, .mac, etc. files that indicate units of properties, constants, and other values.

   - It was stated in Enclosure 2 that the Stefan-Boltzmann constant was updated in the analysis. What filename.extension includes the Stefan-Boltzmann constant? What line number is the constant located? What are the constant's units?

   - Table A3.3-35 through A3.3-38 provides temperatures of cask components. These temperatures are noted as the "volumetric average temperature at the hottest cross section".

     - Explain how those maximum temperatures were defined and provide the filename, file extension, and line number which contain that algorithm.
     - The .inp file defines an average temperature as Tavggam_=TVtot/Vtot; is this the relevant algorithm?
     - Is Tavggam the average temperature of a component or the average temperature of a region of maximum temperature? How large of a volume is averaged?
     - What is the temperature standard deviation of the average temperatures listed in the tables? Since averaging tends to reduce a maximum temperature, the concern is that critical maximum temperatures may not be calculated.

   - Provide the conditions of the neutron absorber (Table 4.3-3) associated with the "Design Basis Model", described in Table A3.3-35, A3.3-36, A3.3-37. Likewise, provide the conditions associated with the "Lower conductivity model".

   - Resistances in series should include gap resistances. It appears these resistances are not included in the equation presented in Section A3.3.2.2.1.4. This should be explained.

   This information is needed to determine compliance with 10 CFR 72.24(c) and 72.120.

4. Provide further explanation on the small component temperature changes reported in Table A3.3-35.

   Provide a simple explanation of why an increase in Stefan-Boltzmann constant by 60 times and a total conductance change of aluminum/neutron absorber plates of 10% (from 3.98 Btu/hr-F to 3.55 Btu/hr-F) did not result in (essentially) any change in component temperatures in Table A3.3-35. This is difficult to understand, considering that changes in component temperatures were observed in Tables A3.3-36 and A3.3-37.

   This information is needed to determine compliance with 10 CFR 72.24(c) and 72.120.

5. Explain why comparisons between the “Design Basis Model” and “Lower Conductivity Model” were not provided for normal storage and vacuum drying conditions?

   Comparison between the “Design Basis Model” and the “Lower Conductivity Model” were provided for off-normal storage (Table A3.3-35), fire accident (Table A3.3-36), and buried cask accident (Table A3.3-37). Two important situations, including normal storage and vacuum drying operations, did not include the side-by-side comparison analysis. An explanation for not including these two important situations should be provided.

   This information is needed to determine compliance with 10 CFR 72.24(c) and 72.120.