ENCLOSURE 5 CONTAINS PROPRIETARY INFORMATION
WITHHOLD FROM PUBLIC DISCLOSURE IN ACCORDANCE WITH 10 CFR 2.390

Prairie Island Nuclear Generating Plant
1717 Wakonade Drive East
Welch, MN 55089

December 5, 2013

L-PI-13-106
10 CFR 72.56

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Director, Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety and Safeguards
Washington, DC 20555-0001

Prairie Island Independent Spent Fuel Storage Installation
Docket No. 72-10
Materials License No. SNM-2506

Supplement to License Amendment Request to Revise Thermal Conductance Requirements for Neutron Absorbers and Aluminum Plates in TN-40HT Casks – Response to Request for Additional Information (TAC No. L24773)

References:

1. Letter from J.E. Lynch (NSPM) to Document Control Desk (NRC), "License Amendment Request (LAR) to Revise the Thermal Conductance Requirement for Neutron Absorbers and Aluminum Plates in the TN-40HT Cask," L-PI-13-050, dated July 17, 2013 (ADAMS Accession No. ML13205A141).

2. Letter from W.C. Allen (NRC) to J.E. Lynch (NSPM), "Request for Additional Information Related to the Proposed Amendment to Special Nuclear Materials License No. 2506," TAC No. L24773, dated November 4, 2013 (ADAMS Accession No. ML13309A103).

Pursuant to 10 CFR 72.56, Northern States Power Company, a Minnesota corporation doing business as Xcel Energy (hereafter "NSPM"), submitted in Reference 1 a license amendment request (LAR) to revise the minimum thermal conductance requirement for neutron absorber and aluminum plates to be used in fuel storage baskets in the TN-40HT casks at the Prairie Island Independent Spent Fuel Storage Installation (ISFSI). The Reference 1 LAR proposed changes to Technical Specification (TS) Design Feature 4.3.2.b, *Thermal Conductivity Testing of Neutron Absorbers.*

In Reference 2, the Nuclear Regulatory Commission (NRC) provided a request for additional information (RAI) to support the staff's technical review of the subject LAR, and requested a response by December 31, 2013. The Reference 2 RAI was also discussed during a conference call with the NRC technical staff on October 28, 2013

NMSS26

(ADAMS Accession No. ML13303B986). This letter provides NSPM's responses to the Reference 2 RAI.

Enclosure 1 to this letter contains the oath or affirmation statement required pursuant to 10 CFR 72.16.

Enclosure 2 to this letter provides NSPM's responses to the subject RAI. Attachments to Enclosure 2 provide a clarified version of TS Table 4.3-3 and an update to several tables that were provided in Reference 1 as part of a proposed new section of the ISFSI Safety Analysis Report (SAR). NSPM submits this supplemental information in accordance with 10 CFR 72.56.

Enclosure 3 to this letter contains a summary and description of the computer files contained in Enclosure 5.

Enclosure 4 to this letter provides the affidavit and withholding request, pursuant to the requirements in 10 CFR 2.390(b)(1)(iii), of trade secret information contained in Enclosure 5.

Enclosure 5 to this letter is a portable hard drive containing computer input and output files used in the revised transient thermal analysis of the TN-40HT cask design. These files are provided to aid NRC review of the proposed changes. The transient thermal analysis was revised by Transnuclear, Inc. (TN, the cask supplier) to correct erroneous aluminum density values that were inadvertently included in analyses submitted in Reference 1. These files contain trade secret information proprietary to TN.

NSPM has determined that the supplemental information provided in this letter does not affect the conclusions of the Reference 1 LAR regarding continued protection of the health and safety of the public, and the proposed changes do not require any changes to the PI ISFSI Environmental Report.

If there are any questions or if additional information is needed, please contact Gene Eckholt, Projects Licensing Manager, at 651-267-1742.

Summary of Commitments

This letter contains no new commitments and no revisions to existing commitments.

Kevin K. Davison
Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota

Enclosures (5)

cc: Administrator, Region III, USNRC (letter only)
SFST Project Manager, PI ISFSI, USNRC (2 copies with Enclosures 1 through 4; 1 copy of Enclosure 5)
NRR Project Manager, Prairie Island Nuclear Generating Plant, USNRC (letter only)
Resident Inspector, Prairie Island Nuclear Generating Plant, USNRC (letter only)
State of Minnesota (letter only)

ENCLOSURE 1

Oath or Affirmation Pursuant to 10 CFR 72.16

1 Page Follows

UNITED STATES NUCLEAR REGULATORY COMMISSION

NORTHERN STATES POWER COMPANY - MINNESOTA

PRAIRIE ISLAND INDEPENDENT SPENT FUEL STORAGE INSTALLATION
DOCKET NO. 72-10

LICENSE AMENDMENT REQUEST FOR
MATERIALS LICENSE No. SNM-2506

SUPPLEMENT TO LICENSE AMENDMENT REQUEST TO REVISE MINIMUM THERMAL CONDUCTIVITY FOR NEUTRON ABSORBER AND ALUMINUM PLATES - RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

The Northern States Power Company – Minnesota, provides additional information that supports the application to revise the minimum thermal conductivity requirement in Technical Specification 4.3.2.b for neutron absorber and aluminum plates for the Prairie Island Independent Spent Fuel Storage Installation.

This letter contains no restricted or other defense information.

NORTHERN STATES POWER COMPANY - MINNESOTA

By Kevin K. Davison
Kevin K. Davison
Site Vice President
Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota

State of Minnesota

County of Goodhue

On this 5 day of December, 2013, before me a notary public acting in said County, personally appeared Kevin K. Davison, Site Vice President, Prairie Island Nuclear Generating Plant, and being first duly sworn acknowledged that he is authorized to execute this document on behalf of NSPM, that he knows the contents thereof, and that to the best of his knowledge, information, and belief the statements made in it are true.

Catherine S McEathron

CATHERINE S MCEATHRON
Notary Public
Minnesota
My Comm. Expires
Jan 31, 2017

ENCLOSURE 2

**Response to Request for Additional Information
Regarding a License Amendment Request to Revise the
Minimum Thermal Conductivity Requirement for
Neutron Absorber and Aluminum Plates in TN-40HT Casks**

Prairie Island Independent Spent Fuel Storage Installation

Introduction

This Enclosure provides supplemental information from the Northern States Power Company, a Minnesota corporation (hereafter "NSPM") doing business as Xcel Energy, in support of a License Amendment Request (LAR) for the Prairie Island Independent Spent Fuel Storage Installation (ISFSI). The subject LAR was submitted July 17, 2013 in Reference 1 (Agencywide Document Access and Management System (ADAMS) Accession No. ML13205A141). The LAR proposed to lower the minimum thermal conductance of the TN-40HT neutron absorber and aluminum 1100 plates, and to revise associated thermal conductivity testing requirements as specified in Technical Specification (TS) 4.3.2.b, *Thermal Conductivity Testing of Neutron Absorbers).*

The Nuclear Regulatory Commission (NRC) provided a request for additional information (RAI) in a letter dated November 4, 2013 (Reference 2, ADAMS Accession No. ML13309A103), to support the staff's technical review of the LAR. In addition, a telephone conference for clarification of the RAI questions was held between NSPM and the NRC technical staff on October 28, 2013 (ADAMS Accession No. ML13303B986).

This Enclosure provides NSPM's responses to the RAI questions provided in Reference 2. Each RAI question is quoted in italics and each question is then followed by the NSPM response in normal font. Reference documents are identified at the end of this Enclosure.

RAI Responses

NRC Question 1:

Clarify Technical Specification Table 4.3-3 and Table A9.7-2 to indicate that the listed neutron absorber thermal conductivity properties do not necessarily reflect actual values.

The modified Technical Specification Table 4.3-3 allows a neutron absorber thermal conductivity of 0 Btu/hr-in-F. Although a zero value satisfies the minimum total conductance of 3.55 Btu/hr-F, it results in a very small serial (i.e., transverse) thermal conductivity. These inputs result in cladding temperatures above allowable values when they are applied to the ANSYS thermal model that defines the cask basket using orthrotropic properties.

This information is needed to determine compliance with 10 CFR 72.128.

NSPM Response to Question 1:

Technical Specification Table 4.3-3 and SAR Table A9.7-2 provide thermal conductivity acceptance criteria for three different combinations of thicknesses of aluminum 1100 and neutron absorber plates. These three combinations are examples of various plate thicknesses, and the table illustrates minimum acceptance criteria for thermal conductivity testing of neutron absorber materials.

In the "thinner neutron absorber" example, the aluminum 1100 plate is thick enough to provide all of the heat transfer required by the thermal analysis and the neutron absorber plate thermal conductivity test acceptance criterion was therefore previously indicated to be "0." In reality, the neutron absorber plate is a conductive material and this value will be greater than "0." In this example, there is no minimum conductivity test acceptance criterion for the neutron absorber and the material need not be tested.

To clarify that the thermal conductivity of the "thinner neutron absorber" material will not actually be "0" and a minimum value need not be demonstrated by testing, NSPM proposes to replace the "0" value in TS Table 4.3-3 with an "*" and to add clarifying notes that explain the following:

- The table identifies neutron absorber plate thermal conductivity acceptance criteria for several examples of various neutron absorber and aluminum plate thickness combinations.
- The "*" value for neutron absorber conductivity for the thinner neutron absorber example indicates that the required conductance value can be met solely by the aluminum plate and the neutron absorber materials need not be tested.

A revised markup of TS Table 4.3-3 is provided in Attachment 1 to this enclosure, and a clean, typed version is provided in Attachment 2.

NRC Question 2:

Clarify that the material density values (e.g., aluminum) in the ANSYS thermal model provide bounding results.

Certain material properties, such as density, appear to have incorrect inputs in the ANSYS thermal model.

This information is needed to determine compliance with 10 CFR 72.128.

NSPM Response to Question 2:

Transnuclear, Inc. (TN) has confirmed that the aluminum density values in the ANSYS thermal analysis calculations provided in Reference 1 were incorrect. This error resulted in higher calculated component temperatures than would have resulted with the correct input values. While the results presented in Reference 1 are conservative and bounding, TN has revised the ANSYS thermal analysis with corrected aluminum density values. The results continue to demonstrate acceptable component temperatures and are shown in revised proposed SAR Tables A3.3-37, A3.3-38, and A3.3-39 in Attachment 3 to this Enclosure.

The revised ANSYS thermal analysis supersedes the transient thermal analysis on the hard drive included with Reference 1. A new hard drive containing computer input and output files used in the revised transient thermal analysis is included in Enclosure 5 to this letter.

NRC Question 3:

Clarify if the basket design change discussed in the public meeting were incorporated into the analyses provided with the amendment request and identify the impact of this change on the peak cladding temperature.

During the August 15, 2013, public meeting, it was mentioned that Enclosure 5 of the amendment submittal are the pages to a future SAR update that reflect a change in the basket design. It was also mentioned that this change was incorporated into the amendment analysis. However, the amendment does not provide a description of the change which prevents a complete understanding of the submittal's analyses and associated boundary conditions.

This information is needed to determine compliance with 10 CFR 72.56 and 10 CFR 72.128.

NSPM Response to Question 3:

The basket design change discussed during the August 15, 2013 public meeting has been incorporated into the analyses provided in Reference 1.

The design change involves changes to gaps in the thermal model as described in SAR Section A3.3.2.2.1.1.1, *Full Length Cask Model,* on page A3.3-5. These include the following changes:

- Added a 1.00" gap at each end of the poison and aluminum plates.
- Revised the as-modeled axial cold gap that allows for thermal expansion between the stainless steel structural bars and the poison/aluminum plates, from 0.07" to 0.20". The 0.07" gap is conservatively modeled as a larger axial gap that includes a 0.01" gap at the bottom and a 0.19" gap at the top of the stainless steel bars, instead of the previous 0.01" axial gap at the bottom and 0.06" axial gap at the top.

This design change was previously made to the TN-40HT cask thermal analysis model prior to performing the lower conductivity calculations in support of the Reference 1 LAR. The changes were performed in accordance with the provisions of 10 CFR 72.48 and were included in the biennial update to the Prairie Island ISFSI SAR provided in Reference 3.

The impact of this design change is that peak clad temperatures are slightly higher but still within the limits identified in the SAR. Peak clad temperature limits identified in SAR Section A3.3.2.2, *Heat Transfer Design,* are 752°F for normal operations and 1058°F for off-normal and accident conditions. These limits continue to be met with the shorter plates and larger gaps described in the design change as shown below:

Storage or Accident Condition	Fuel cladding temperature without design change (°F) [SAR Revision 13]	Fuel cladding temperature with design change (°F) [SAR Revision 15P]	Fuel cladding temperature with lower conductivity (°F) [Provided in LAR]
Normal / Off-normal Storage	680	694	672
Fire	772	788	692
Buried Cask	1058 at 95.75 hrs	1058 at 93 hrs	907 at 93 hrs
Vacuum drying	725	731	713

References

1. Letter from J.E. Lynch (NSPM) to Document Control Desk (NRC), "License Amendment Request (LAR) to Revise the Thermal Conductance Requirement for Neutron Absorbers and Aluminum Plates in the TN-40HT Cask," L-PI-13-050, dated July 17, 2013 (ADAMS Accession No. ML13205A141).

2. Letter from W.C. Allen (NRC) to J.E. Lynch (NSPM), "Request for Additional Information Related to the Proposed Amendment to Special Nuclear Materials License No. 2506," TAC No. L24773, dated November 4, 2013 (ADAMS Accession No. ML13309A103).

3. Letter from J.E. Lynch (NSPM) to Document Control Desk (NRC), "Biennial Report of Changes, Tests, and Experiments, Updated Safety Analysis Report (SAR), and Updated Technical Specification (TS) Bases for Prairie Island ISFSI," L-PI-13-091, dated October 16, 2013.

Attachment 1

ISFSI Technical Specifications

Marked-Up Page

1 Page Follows

TABLE 4.3-3
SAMPLE DETERMINATION OF THERMAL CONDUCTIVITY ACCEPTANCE CRITERION

Single Plate Model	Al 1100	n absorber	total
thickness (inch)	0	0.437	0.437
conductivity at 70°F (Btu/hr-in-°F)	n/a	**8.129.11**	n/a
conductance (Btu/hr-°F)	0	3.5598	3.5598*

Dual Plate Construction	Al 1100	n absorber	total	
thickness (inch)	0.312	0.125	0.437	as modeled
conductivity at 70°F (Btu/h-in-°F)	11.09	**0.684.17**	n/a	
conductance (Btu/hr-°F)	3.46	0.0952	3.5598	
thickness (inch)	0.187	0.250	0.437	thicker neutron absorber
conductivity at 70°F (Btu/hr-in-°F)	11.09	**5.907.62**	n/a	
conductance (Btu/hr-°F)	2.07	1.4891	3.5598	
thickness (inch)	0.32059	0.117078	0.437	thinner neutron absorber
conductivity at 70°F (Btu/hr-in-°F)	11.09	*0	n/a	
conductance (Btu/hr-°F)	3.5598	n/a0	3.5598	

The boldface type values in this table identify the neutron absorber plate minimum thermal conductivity acceptance criteria for several examples of various neutron absorber and aluminum plate thickness combinations.

* The "*" value for neutron absorber conductivity indicates that the required total conductance value can be met solely by the aluminum plate and the neutron absorber material need not be tested.

Attachment 2

ISFSI Technical Specifications

Re-Typed Page

1 Page Follows

TABLE 4.3-3
SAMPLE DETERMINATION OF THERMAL CONDUCTIVITY ACCEPTANCE CRITERION

Single Plate Model	Al 1100	n absorber	total
thickness (inch)	0	0.437	0.437
conductivity at 70°F (Btu/hr-in-°F)	n/a	**8.12**	n/a
conductance (Btu/hr-°F)	0	3.55	3.55

Dual Plate Construction	Al 1100	n absorber	total	
thickness (inch)	0.312	0.125	0.437	as modeled
conductivity at 70°F (Btu/h-in-°F)	11.09	**0.68**	n/a	
conductance (Btu/hr-°F)	3.46	0.09	3.55	
thickness (inch)	0.187	0.250	0.437	thicker neutron absorber
conductivity at 70°F (Btu/hr-in-°F)	11.09	**5.90**	n/a	
conductance (Btu/hr-°F)	2.07	1.48	3.55	
thickness (inch)	0.320	0.117	0.437	thinner neutron absorber
conductivity at 70°F (Btu/hr-in-°F)	11.09	*	n/a	
conductance (Btu/hr-°F)	3.55	n/a	3.55	

The boldface type values in this table identify the neutron absorber plate minimum thermal conductivity acceptance criteria for several examples of various neutron absorber and aluminum plate thickness combinations.

* The "*" value for neutron absorber conductivity indicates that the required total conductance value can be met solely by the aluminum plate and the neutron absorber material need not be tested.

Attachment 3

ISFSI Safety Analysis Report

Proposed New Tables (Revised)

(For Information Only)

3 Pages Follow

TABLE A3.3-37
TEMPERATURES FOR FIRE ACCIDENT CONDITIONS WITH LOWER POISON PLATE CONDUCTIVITY

	Design Basis Model Fire Accident (Table A3.3-6)		Lower Conductivity Model Fire Accident				
	Transient / Steady State		Transient		Steady State		
Component	Maximum Temperature (°F)	Time (hr)	Maximum Temperature (°F)	Time (hr)	Maximum Temperature (°F)	Time (hr)	Temperature Limit (°F)
Fuel Cladding	788	∞	692	36.7	687	∞	1058
Fuel Compartment	742	∞	666	36.7	661	∞	---
Basket Rails	553	∞	493	12.7	486	∞	---
Cask Inner Shell *	370	∞	351	2.0	323	∞	---
Shield Shell *	361	∞	322	0.25 (end of fire)	316	∞	---
Radial Resin	N/A ‡	---	N/A ‡	---	N/A ‡	---	---
Cask Outer Shell †	913	0.25 (end of fire)	911	0.25 (end of fire)	277	∞	---
Average Cavity Gas ($\overline{T}$ cavity)	603 **	∞	481	36.7	475	∞	---

* This value is the volumetric average temperature at the hottest cross section.
† This value is the volumetric average temperature at the hottest cross section plus 18 °F to bound the effects of storage pad on the cask view factor. See Section A3.3.2.2.4 for discussion.
‡ Neutron shield resin is assumed to be burnt and decomposed during the fire.
** This value is taken from Table A3.3-15.

TABLE A3.3-38
TEMPERATURES FOR BURIED CASK ACCIDENT CONDITIONS WITH LOWER POISON PLATE CONDUCTIVITY

	Design Basis Model *Buried Cask Accident* (Table A3.3-7)		Lower Conductivity *Model* Buried Cask Accident		
Component	Maximum Temperature (°F)	Time (hr)	Maximum Temperature (°F)	Time (hr)	Temperature Limit (°F)
Fuel Cladding	1058	93	907	93	1058
Fuel Compartment	1024	93	890	93	---
Basket Rails	889	93	759	93	---
Cask Inner Shell *	774	93	650	93	---
Shield Shell *	769	93	646	93	---
Radial Resin †	300	1.85	299	1.85	300
Cask Outer Shell †	779	93	637	93	---
Average Cavity Gas ($\overline{T}_{cavity}$)	925 **	93	735	93	---

* This value is the volumetric average temperature at the hottest cross section.

† This value is the volumetric average temperature at the hottest cross section plus 18 °F to bound the effects of storage pad on the cask view factor. See Section A3.3.2.2.4 for discussion.

** This value is taken from Table A3.3-15.

TABLE A3.3-39
TEMPERATURES FOR VACUUM DRYING OPERATIONS WITH LOWER POISON PLATE CONDUCTIVITY

		Design Basis Model Vacuum Dry (Table A3.3-14)	Lower Conductivity Model Vacuum Drying	
Component	Time (hr)	Maximum Temperature (°F)	Maximum Temperature (°F)	Temperature Limit (°F)
Fuel Cladding	34	731	713	752
Fuel Compartment	34	692	671	---
Basket Rails	34	541	517	---
Cask Inner Shell	34	235	227	---
Shield Shell	34	232	224	---
Radial Resin	34	219	212	300
Top Resin	34	<235 **	<227 **	300
Lid Seal	34	<235 **	<227 **	536
Vent and Port Seal	34	<235 **	<227 **	536

** This temperature is bounded by maximum temperature of the cask inner shell.

ENCLOSURE 3

Summary Description of

Computer Files in Enclosure 5

1 page follows

Summary Description of Computer Files in Enclosure 5

(All files are Proprietary)

Disk ID No. (size)	Discipline	System/Component	File Series (topics)	Number of files
Enclosure 5 Portable Hard Drive (78.0 GB, Total used disk space)	**Thermal**	**TN-40HT Cask**	TN40HT_FA_0413_R1 - **Directory**	
			TN40HT_FA_413_R1 – **Folder** Fire Accident, Transient RUN ID (TN40HT_FA_413_R1)	43
			TN40HT_BA_413_R1 – **Folder** Buried Cask Accident, Transient RUN ID (TN40HT_BA_413_R1)	17
			TN40HT_VA1_413_R1-**Folder** Vacuum Drying Condition, Transient RUN ID (TN40HT_VA1_413_R1)	48

ENCLOSURE 4

PROPRIETARY AFFIDAVIT PURSUANT TO 10 CFR 2.390

The enclosed affidavit was provided in Transnuclear, Inc, letter TN E-37082, and refers to "Enclosure 3" to that letter. Enclosure 3 to TN E-37082 is the portable hard drive included as Enclosure 5 to this NSPM letter.

2 pages follow

AFFIDAVIT PURSUANT
TO 10 CFR 2.390

Transnuclear, Inc.)
State of Maryland) SS.
County of Howard)

I, Paul Triska, depose and say that I am a Vice President of Transnuclear, Inc., duly authorized to execute this affidavit, and have reviewed or caused to have reviewed the information that is identified as proprietary and referenced in the paragraph immediately below. I am submitting this affidavit in conformance with the provisions of 10 CFR 2.390 of the Commission's regulations for withholding this information.

The information for which proprietary treatment is sought is contained in Enclosure 3 as listed below:

- Enclosure 3 – Electronic copy of computational files

These documents have been appropriately designated as proprietary.

I have personal knowledge of the criteria and procedures utilized by Transnuclear, Inc., in designating information as a trade secret, privileged or as confidential commercial or financial information.

Pursuant to the provisions of paragraph (b) (4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure, included in the above referenced document, should be withheld.

1) The information sought to be withheld from public disclosure involves computational files related to Transnuclear, Inc.'s analysis supporting Xcel Energy-PINGS ISFSI for License Amendment Request, which are owned and have been held in confidence by Transnuclear, Inc.

2) The information is of a type customarily held in confidence by Transnuclear, Inc., and not customarily disclosed to the public. Transnuclear, Inc. has a rational basis for determining the types of information customarily held in confidence by it.

3) Public disclosure of the information is likely to cause substantial harm to the competitive position of Transnuclear, Inc., because the information is related to the design of storage systems, the application of which provides a competitive economic advantage. The availability of such information to competitors would enable them to modify their product to better compete with Transnuclear, Inc., take marketing or other actions to improve their product's position or impair the position of Transnuclear, Inc.'s product, and avoid developing similar data and analyses in support of their processes, methods or apparatus.

Further the deponent sayeth not.

Paul Triska
Vice President, Transnuclear, Inc.

Subscribed and sworn to me before this 20th day of November, 2013.

Notary Public

My Commission Expires 11 / 17 / 2014

Patricia Hoch
Notary Public
Howard County, MD
My Commission Expires Nov. 17, 2014

ENCLOSURE 5 IS A PORTABLE HARD DRIVE

WITH THE FOLLOWING LABEL:

WITHHOLD FROM PUBLIC
DISCLOSURE UNDER 10 CFR 2.390

Proprietary

Transnuclear, Inc.

Enclosure 5 to L-PI-13-106

Computer input and output files that
were used in the thermal analysis of
the TN-40HT cask design