~~ENCLOSURE 3 CONTAINS PROPRIETARY INFORMATION~~
~~WITHHOLD FROM PUBLIC DISCLOSURE IN ACCORDANCE WITH 10 CFR 2.390~~

Xcel Energy®

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

L-PI-16-009
10 CFR 72.70

March 7, 2016

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

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

Updated Safety Analysis Report (SAR) for Prairie Island ISFSI

Pursuant to 10 CFR 72.70(c)(2) and Prairie Island Independent Spent Fuel Storage Installation (ISFSI) Renewed Materials License Condition 19, Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM") hereby submits an update to the Prairie Island ISFSI Safety Analysis Report (SAR). The last update was submitted November 13, 2015 (ADAMS Accession Number ML15335A078).

Enclosure 1 to this letter contains the affidavit, pursuant to the requirements of 10 CFR 2.390(b)(1)(iii), regarding the trade secret information contained in Enclosure 3.

Enclosure 2, Information Regarding Changes to the ISFSI SAR, identifies changes based on the Renewed License and changes made under the provisions of 10 CFR 72.48 and other regulations.

Enclosure 3, Updated Prairie Island Independent Spent Fuel Storage installation (ISFSI) Safety Analysis Report (SAR) - Proprietary, is a CD-ROM containing the proprietary version of the Prairie Island ISFSI SAR Revision 17 in its entirety. Enclosure 3 contains proprietary information as defined by 10 CFR 2.390. The affidavit in Enclosure 1 sets forth the basis on which the information in Enclosure 3 may be withheld from public disclosure by the NRC and addresses with specificity the considerations listed in 10 CFR 2.390(b)(4). Accordingly, NSPM respectfully requests that the AREVA-Transnuclear proprietary information in Enclosure 3 be withheld from public disclosure in accordance with 10 CFR 2.390(a)4, as authorized by 10 CFR 9.17(a)4. Correspondence with respect to the copyright or proprietary aspects of the AREVA-Transnuclear information in Enclosure 3 or the supporting AREVA affidavit in Enclosure

NMSS20
NMSS26

1 should be addressed to Mr. Paul Triska, Vice President, AREVA Inc., 7135 Minstrel Way, Suite 300, Columbia, MD 21045.

NSPM requests that the proprietary version of the Prairie Island ISFSI SAR Revision 16 be destroyed or marked superseded.

Enclosure 4, Updated Prairie Island Independent Spent Fuel Storage installation (ISFSI) Safety Analysis Report (SAR) - Non-Proprietary, is a CD-ROM containing the non-proprietary version of the Prairie Island ISFSI SAR Revision 17 in its entirety. The non-proprietary version of the Prairie Island ISFSI SAR may be disclosed to the public. NSPM requests that the non-proprietary version of the Prairie Island ISFSI SAR Revision16 be destroyed or marked superseded.

If there are any questions or if additional information is needed, please contact Glenn Adams at 612-330-6777.

Summary of Commitments

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

I certify that the ISFSI SAR information presented herein accurately presents changes made since the previous submittal up through December 9, 2015 (i.e., the date of issuance of the Prairie Island ISFSI Renewed Materials License).

T A Conboy

Thomas A. Conboy
Director Site Operations, Prairie Island Nuclear Generating Plant
Northern States Power Company – Minnesota

Enclosures (4)

cc: Administrator, Region III, USNRC
Director, Division of Spent Fuel Management, USNRC
NMSS Project Manager, Prairie Island ISFSI, USNRC
NRR Project Manager, Prairie Island Nuclear Generating Plant, USNRC
Resident Inspector, Prairie Island Nuclear Generating Plant, USNRC

ENCLOSURE 1

AFFIDAVIT PURSUANT TO 10 CFR 2.390

2 pages follow

AFFIDAVIT PURSUANT
TO 10 CFR 2.390

AREVA Inc.)
State of Maryland) SS.
County of Howard)

I, Paul Triska, depose and say that I am a Vice President of AREVA Inc., duly authorized to execute this affidavit, and have reviewed or caused to have reviewed the information which 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 the Prairie Island Independent Spent Fuel Storage Installation (ISFSI) Safety Analysis Report (SAR), (Docket Number: 72-10, License Number: SNM-2506), Revision 17, as listed below:

1. SAR Appendix 3A
2. SAR Appendix 7B
3. Portions of SAR Section A1.5, SAR Drawings TN40HT-72 series, as follows:
    - TN40HT-72-1, Rev 8
    - TN40HT-72-2, Rev 4
    - TN40HT-72-3, Rev 3
    - TN40HT-72-4, Rev 1
    - TN40HT-72-5, Rev 2
    - TN40HT-72-6, Rev 3
    - TN40HT-72-7, Rev 4
    - TN40HT-72-9, Rev 0
    - TN40HT-72-21, Rev 6
    - TN40HT-72-22, Rev 5
4. Portions of SAR Section A3.3.2.2.8
5. SAR Appendix A3A
6. Portions of SAR Section A4.2.3.8, plus Tables A4.2-25 and -26 and Figures A4.2-5 through -12
7. Portions of SAR Section A4B.1.5.6
8. Figure A4B.1-1
9. Portions of SAR Appendix A7B.

These documents have been appropriately designated as proprietary.

I have personal knowledge of the criteria and procedures utilized by AREVA 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 are portions of certain TN-40 and TN-40HT spent fuel storage cask design drawings and analyses, as included in the Prairie Island ISFSI SAR, which are owned and have been held in confidence by AREVA Inc.

2) The information is of a type customarily held in confidence by AREVA Inc. and not customarily disclosed to the public. AREVA 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 AREVA Inc. because the information consists of descriptions of the design and analysis of dry spent fuel storage systems, the application of which provide a competitive economic advantage. The availability of such information to competitors would enable them to modify their product to better compete with AREVA Inc., take marketing or other actions to improve their product's position or impair the position of AREVA Inc.'s product, and avoid developing similar data and analyses in support of their processes, methods or apparatus.

Further the deponent sayeth not.

Paul W Triska

Paul Triska
Vice President, AREVA Inc.

Subscribed and sworn before me this 2nd day of March, 2016.

Ron Jones

Notary Public

My Commission Expires 10/19/19

RONDA JONES
NOTARY PUBLIC STATE OF MARYLAND
My Commission Expires October 16, 2019

ENCLOSURE 2

INFORMATION REGARDING CHANGES TO THE ISFSI SAR

The following table identifies changes made to the Independent Spent Fuel Storage Installation (ISFSI) Safety Analysis Report (SAR) in Revision 17. These changes were prompted by three different activities (each identified by a unique "ISFSI SAR Input No."). Note that each change is annotated by a revision bar with the respective ISFSI SAR Input No. in the margin of the SAR. ISFSI SAR Input Nos. may be searched on the ISFSI SAR CD-ROM to locate each change.

ISFSI SAR Input No.	Revised Section(s)	Basis	Description
1441968	2 A7.5	10 CFR 50.54(q) Screening FT-2013-50	Revise off-site radiological dose information based on new population values in the ten-mile Emergency Planning Zone (EPZ) as documented in the 2012 Evacuation Time Estimate (ETE) study.
1505824	2.2	10 CFR 72.48 Evaluation 1126 Rev. 0	Include description of the explosion hazard created by the new natural gas supply line and the associated safety evaluation.
1505901	1 3 4 5 9 A3 A4 A7A A9	Renewed License, License Condition 19	Incorporate SAR markups submitted with the License Renewal Application, including revised descriptions of licensed life, and a new section on Aging Management.
1514258	A1	AREVA affidavit dated 3/2/2016	Redact one proprietary figure in accordance with the AREVA affidavit.
1514587	1 3.3 A1	AREVA affidavit dated 3/2/2016	Correct proprietary markings on figures, and unredacted one figure in the Non-Proprietary Addendum.

Summaries of evaluations prepared under the provisions of 10 CFR 72.48 are submitted separately.

ENCLOSURE 4

UPDATED PRAIRIE ISLAND INDEPENDENT SPENT FUEL STORAGE

INSTALLATION (ISFSI) SAFETY ANALYSIS REPORT (SAR)

NON-PROPRIETARY

Updating Instructions:

A complete copy of the non-proprietary version of the Prairie Island ISFSI SAR Revision 17 is included on the enclosed CD-ROM labelled as follows:

"Prairie Island
Nuclear Generating Plant – Units 1 & 2
Issue Date: March 2016 Copy# _____

Volume 1 - ISFSI SAR – Non-Proprietary Rev 17
Volume 2 - ISFSI SAR – Non-Proprietary Rev 17"

Contact Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM"), at 612-330-6777 if you require additional assistance.

The enclosed proprietary version of the Prairie Island ISFSI SAR Revision 17 contains the following files:

File Name	Size (kilobytes)	Disclosure Status
ISFSI SAR NON-PROP.pdf	**20,347**	**NON-PROPRIETARY**
ISFSI SAR ADDENDUM NON-PROP.pdf	**11,982**	**NON-PROPRIETARY**

1 CD-ROM enclosed

TIPCK02

To : NRC DOC CONTROL DESK COPY #383
Facility : PI Department :
Address : ONE WHITE FLINT NORTH
11555 ROCKVILLE PIKE
ROCKVILLE, MD 20852-2738

From : C-DOC CNTRL-PI Attention:
Address : 1717 WAKONADE DR EAST

City : WELCH State: MN Postal Code: 55089
Country : UNITED STATES
Email :
Contact :

Date/Time : 03/08/2016 04:38 Transmittal Group Id: 0000032970
Trans No. : 000301768 Title: SUPERSEDS ISFSI T.S. (REV. 9)
Total Items: 00001

PASSPORT DOCUMENT

TRANSMITTAL

Page: 1

Item	Facility	Type	Sub	Document Number	Sheet	Doc Status	Revision	Doc Date	Copy #	Media	Cpys
0001	PI	LIC	TECH	ISFSI TECH SPECS - RL		ISSUED	000		383	HC	01

If a document was not received or is no longer required check the response below and return to sender.

☐ Documents noted above not received (identify those not received).

☐ I no longer require distribution of these documents (identify those no longer required).

Date: ____________________ Signature: ______________________________

PRAIRIE ISLAND INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)
RENEWED LICENSE - TECHNICAL SPECIFICATIONS
UPDATING INSTRUCTIONS
Renewed License

Front Matter Preceding the Technical Specifications

REMOVE			INSERT	
Page	**Amendment/ Date**	**Document Type**	**Page**	**Amendment/ Date**
First Page Unnumbered	Amendment 9	**NRC letter of Findings**	First Page Unnumbered	Renewed License
Second Page Unnumbered	4/10/15	**NRC letter of Findings**	Second Page Unnumbered	12/9/15
1 of 4	9	**License NRC Form 588**	1 of 7	None
2 of 4	9	**License NRC Form 588**	2 of 7	None
3 of 4	9	**License NRC Form 588**	3 of 7	None
4 of 4	9	**License NRC Form 588**	4 of 7	None
			5 of 7	None
			6 of 7	None
			7 of 7	None
RoR-1	7/24/2015	**Record of Revisions**	RoR-1	3/8/2016
A	7/24/2015	**Current Page List**	A	3/8/16
B	7/24/2015	**Current Page List**	B	3/8/16
i	8/20/10	**Table of Contents**	i	3/8/16

Renewed License Appendix A - Technical Specifications (TS)

REMOVE			INSERT	
Page	**Amendment/ Revision**	**Section/Chapter**	**Page**	**Amendment/ Revision**
All (65 pgs)	Various	**TS**	All (65 pgs)	Renewed License

NORTHERN STATES POWER COMPANY

DOCKET NO. 72-10

PRAIRIE ISLAND INDEPENDENT SPENT FUEL STORAGE INSTALLATION

RENEWED MATERIALS LICENSE NO. SNM-2506

Renewed License No. SNM-2506

1. The U.S. Nuclear Regulatory Commission (Commission), having previously made the findings set forth in License No. SNM-2506 issued on October 19, 1993, has now found that:

   A. The application to renew License No. SNM-2506 filed by Northern States Power Company (NSPM) complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in Chapter 1 of title 10 of the *Code of Federal Regulations* (10 CFR);

   B. Actions have been identified and have been or will be taken for (i) managing the effects of aging during the period of extended operation on the functionality of structures and components within the scope of license renewal, and (ii) time-limited aging analyses, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis;

   C. There is reasonable assurance that (i) the activities authorized by this renewed license can be conducted without endangering the health and safety of the public, and (ii) such activities will be conducted in compliance with the Commission's regulations;

   D. The renewal of this license will not be inimical to the common defense and security; and

   E. After weighing the environmental, economical, technical, and other benefits of the facility against environmental and other costs, and considering available alternatives, the renewal of this license is in accordance with 10 CFR Part 51 and 10 CFR Part 72 and all applicable requirements have been satisfied.

2. This renewed license is effective as of the date of its issuance and shall expire at midnight on October 31, 2053.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

/RA/

Steve Ruffin, Acting Chief
Spent Fuel Licensing Branch
Division of Spent Fuel Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: Renewed License

Date of Issuance: December 09, 2015

LICENSE FOR INDEPENDENT STORAGE OF SPENT NUCLEAR FUEL AND HIGH-LEVEL RADIOACTIVE WASTE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, *Code of Federal Regulations*, Chapter 1, Part 72, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, and possess the power reactor spent fuel and other radioactive materials associated with spent fuel storage designated below; to use such material for the purpose(s) and at the place(s) designated below; and to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified herein.

Licensee	
1. Northern States Power Company, a Minnesota corporation (NSPM) [1]	3. License No. SNM-2506 Amendment No.
2. 414 Nicollet Mall Minneapolis, Minnesota, 55401-1927	4. Expiration Date October 31, 2053 5. Docket or Reference No. 72-10

6. Byproduct, Source, and/or Special Nuclear Material	7. Chemical or Physical Form	8. Maximum Amount That Licensee May Possess at Any One Time Under This License
A. Spent fuel assemblies from Prairie Island Nuclear Generating Plant (PINGP), using natural water for cooling and enriched not greater than 3.85 (TN-40) and not greater than 5.00 (TN-40HT) percent U-235, and associated radioactive materials related to receipt, storage and transfer of the fuel assemblies	A. As UO_2 clad with zirconium or zirconium alloys	A. 715.29 TeU of spent fuel assemblies
B. Irradiated fuel assembly inserts from the PINGP. An insert may be a burnable poison rod assembly (BPRA) or a thimble plug device (TPD).	B SS 304 structure, Inconel 718 spring, and borated pyrex glass.	B. One BPRA or TPD per spent fuel assembly.

1 Northern States Power Company was incorporated in Minnesota as a wholly owned subsidiary of Xcel Energy Inc., effective August 18, 2000. This license reflects the Commission's consent per 10 CFR Part 72, Section 72.50, to the license transfer approved by Order dated May 12, 2000.

9. Authorized Use: For use in accordance with the conditions in this license and the Technical Specifications contained in Appendix A. The basis for this license was submitted in the Safety Analysis Report dated August 31, 1990, and supplements dated October 29, 1990; April 2, June 5, October 9

and 31, November 15, December 11, 20, and 23, 1991; January 17, February 6, 10, and 12, March 2 and 5, April 3, 22, and 23, July 10, August 12, 13, and 14, 1992; October 2, 1995; August 31, October 29 and November 24, 1999; and February 2, March 14, October 16, 2000; and February 12, 2001; March 28, June 26, and August 29, 2008; June 26, and September 28, 2009; January 18, May 4, and July 27, 2010; October 20, 2011; July 17, and December 5, 2013; May 23, and September 3, 2014; and October 12, 2015 and as further supplemented and amended in accordance with 10 CFR 72.70 and 10 CFR 72.48.

The material identified in 6 and 7 above is authorized for receipt, possession, storage, and transfer.

10. Authorized Place of Use: The licensed material is to be received, possessed, transferred, and stored at the Prairie Island ISFSI located on the PINGP site in Goodhue County, Minnesota.

11. This site is described in Chapter 2 of the Technical Specifications and safety analysis report (TS/SAR) for the Prairie Island ISFSI.

12. The Technical Specifications contained in Appendix A attached hereto are incorporated into the license. NSPM shall operate the installation in accordance with the Technical Specifications in Appendix A.

13. NSPM shall fully implement and maintain in effect all provisions of the ISFSI physical security, guard training and qualification, and safeguards contingency plans previously approved by the Commission and all amendments made pursuant to the authority of 10 CFR 72.56, 72.44(e), and 72.186. The plans, which contain safeguards information protected under 10 CFR 73.21, are entitled: "Prairie Island Nuclear Generating Plant Independent Spent Fuel Storage Installation Physical Security Plan," Revision 0, submitted by letter dated March 10, 1992; "Prairie Island Nuclear Generating Plant Independent Spent Fuel Storage Installation Security Force Training and Qualification Plan," Revision 0, submitted by letter dated March 10, 1992; and "Prairie Island Nuclear Generating Plant Independent Spent Fuel Storage Installation Safeguards Contingency Plan," Revision 0, submitted by letter dated March 10, 1992.

14. The Technical Specifications for Environmental Protection contained in Appendix A attached hereto are incorporated into the license.

Specifications required pursuant to 10 CFR 72.44(d), stating limits on the release of radioactive materials for compliance with limits of 10 CFR Part 20 and "as low as is reasonably achievable objective" for effluents are not applicable. Spent fuel storage cask external surface contamination within the limits of Technical Specification 3.2.1 ensures that the offsite dose will be inconsequential. In addition, there are no normal or off-normal releases or effluents expected from the double-sealed storage casks of the ISFSI.

Specifications required pursuant to 10 CFR 72.44(d)(1), for operating procedures, for control of effluents, and for the maintenance and use of equipment in radioactive waste treatment systems, to meet the requirements of 10 CFR 72.104 are not applicable. There are, by the design of the sealed storage casks at the ISFSI, no effluent releases. Also, cask loading and unloading operations and waste treatment will occur at the PINGP, under the specifications of its operating licenses.

15. No spent nuclear fuel shall be allowed to be loaded until such time as the following preoperational license conditions are satisfied:

A. A training exercise (Dry Run) of all spent fuel storage cask loading and handling activities shall be held, which shall include, but not be limited to, those listed, and which need not be performed in the order listed:

a. Moving cask in and out of spent fuel pool area

b. Loading fuel assembly (using dummy assembly)

c. Cask drying, sealing, and cover gas backfilling operations

d. Moving cask to, and placing it on, the storage pad

e. Returning the cask to the auxiliary building

f. Unloading the cask

g. Decontaminating the cask

h. All dry-run activities shall be done using written procedures

i. The activities listed above shall be performed or modified and performed to show that each activity can be successfully executed before actual fuel loading.

B. The PINGP Emergency Plan shall be reviewed and modified, as required, to include the ISFSI.

C. A training module shall be developed for the PINGP Training Program, establishing an ISFSI Training and Certification Program that will include the following:

a. Cask Design (overview)

b. ISFSI Facility Design (overview)

c. ISFSI Safety Analysis (overview)

d. Fuel loading and cask handling procedures and off-normal procedures

e. ISFSI License (overview).

D. The PINGP Radiation Protection Procedures shall be reviewed and modified, as required, to include the ISFSI.

E. The PINGP Administrative Procedures shall be reviewed and modified, as required, to include the ISFSI.

F. A procedure shall be developed and implemented for the documentation of the characterizations performed to select spent fuel to be stored in the casks. Such procedure shall include independent verification of fuel assembly selection by an individual other than the original individual making the selection.

G. A procedure shall be developed and implemented for two independent determinations (two samples analyzed by different individuals) of the boron concentration in the water used to fill the cask cavity for fuel loading and unloading activities.

H. Written procedures shall be implemented to describe actions to be taken during operation, off-normal, and emergency conditions.

16. The design, construction, and operation of the ISFSI shall be accomplished in accordance with the U.S. Nuclear Regulatory Commission Regulations specified in Title 10 of the U.S. Code of Federal Regulations. All commitments to the applicable NRC regulatory guides and to engineering and construction codes shall be carried out.

17. Fuel and cask movement and handling activities that are to be performed in the PINGP Auxiliary Building will be governed by the requirements of the PINGP Facility Operating Licenses (DRP-42 and -60) and associated Technical Specifications.

18. The TN-40HT confinement boundary base material and associated welds shall be helium leak tested at the fabricator in accordance with ANSI N 14.5 to "leaktight" criteria. The TN-40 confinement boundary base material and associated welds shall be helium leak tested at the fabricator in accordance with ANSI N14.5 to "leaktight" criteria, if fabricated after the date of Amendment No. 7 approval.

19. Within 90 days after issuance of the license, NSPM shall submit an updated SAR to the Commission and continue to update the SAR pursuant to the requirements in 10 CFR 72.70(b) and (c).

The updated SAR shall include Appendix C, Rev. 1, "Safety Analysis Report Supplement and Changes" [Agencywide Document Access and Management System (ADAMS) Accession Number ML14247A316] as documented in the Supplement to the License Renewal Application (hereinafter referred to as Appendix C). The licensee may make changes to the SAR, including changes to Appendix C, Rev. 1, consistent with 10 CFR 72.48(c).

20. NSPM shall create, update, or revise procedures for implementing the activities in the Aging Management Programs (AMPs) summarized in Appendix C within 90 days of the renewed license issuance.

NSPM shall maintain procedures that implement the AMPs throughout the term of this license.

Each procedure for implementing the AMPs shall contain a reference to the specific AMP provision the procedure is intended to implement. The reference shall be maintained if procedures are modified.

Within 240 days of issuance of the renewed license, NSPM shall confirm, in a letter to the NRC (submitted pursuant to 10 CFR 72.4), that: (a) the procedures for implementation of the activities as described in the AMPs summarized in Appendix C, Rev. 1 are in place, (b) the procedures will be

maintained for the term of this license, and (c) appropriate references to the AMPs are provided in the procedures.

21. NSPM shall not remove (a) any structure, system or component (SSC) or subcomponent, or (b) any aging mechanism or aging effect, as detailed in Table 9.8-1 in Appendix C [ADAMS Accession Number ML14247A316], from the scope of the AMPs.

22. With respect to the aging management activities for the concrete pads, as described in the "ISFSI Inspection and Monitoring Program" in Appendix A, Rev. 2, in the Supplement to the License Renewal Application [ADAMS Accession Number ML15285A007]:

    (a) The licensee shall perform visual inspections of all accessible concrete pad areas at intervals not less than those specified in ACI 349.3R-96.

    (b) The licensee shall evaluate the findings from all visual inspections against the three-tier acceptance criteria defined in ACI 349.3R-96.

    (c) The licensee shall obtain groundwater chemistry samples representative of the ISFSI below-grade pad environment at intervals not to exceed six months. The licensee shall characterize these groundwater chemistry samples to monitor for an aggressive below-grade environment, as defined in ASME Code Section XI Subsection IWL (2013).

23. With respect to the aging management activities for the dry storage (in-service) casks, as described in the "ISFSI Inspection and Monitoring Program" in Appendix A, Rev. 2, in the Supplement to the License Renewal Application [ADAMS Accession Number ML15285A007]:

    (a) The licensee shall perform visual inspections of accessible exterior surfaces of the dry storage (in-service) casks at intervals not to exceed every quarter.

    (b) The licensee shall perform visual inspections of the cask bottom and areas underneath the weather protective cover at intervals not to exceed 20 years, for a minimum of one (1) cask.

    (c) The licensee shall inspect, at a minimum, for signs of corrosion, damage, and debris accumulation on the cask exterior surfaces during all visual inspections identified in License Condition 23.

    (d) The licensee shall initiate a corrective action if any observable indication of corrosion is identified during any of the visual inspections in License Condition 23.

24. With respect to the aging management activities for the polymer-based neutron shields of the dry storage (in-service) casks as described in the "ISFSI Inspection and Monitoring Program" in Appendix A, Rev. 2, in the Supplement to the License Renewal Application [ADAMS Accession Number ML15285A007]:

(a) Within 90 days of the issuance of the renewed license, NSPM shall establish baseline values for dose rate trending analyses to be used in detecting any potential loss of intended function of the neutron shield.

(b) Thereafter, NSPM shall continue to perform dose rate surveys for each loaded cask at an interval not to exceed three months, as is consistent with the aging management program "ISFSI Inspection and Monitoring Program."

(c) NSPM shall compare the measured dose rate data with the established baseline values to detect any increase in neutron dose rates. Upon detecting any unexpected upward trend in the measured neutron dose rates, NSPM shall place the non-compliant cask into their corrective actions program to evaluate the cause for loss of intended function and determine whether a similar problem could occur within other casks.

25. With respect to the aging management activities for the earthen berm, as described in the "ISFSI Inspection and Monitoring Program" in Appendix A, Rev. 2, in the Supplement to the License Renewal Application [ADAMS Accession Number ML15285A007]:

(a) NSPM shall perform visual inspections of all accessible areas of the earthen berm at intervals not to exceed every five years.

(b) NSPM shall inspect, at a minimum, for loss of material, loss of form, and slope instability.

26. NSPM shall submit the evaluations related to high burnup fuel performance specified in the toll gates in the "High Burnup Fuel Aging Management Program" in Appendix A, Rev. 2, of the Supplement to the License Renewal Application (ML15285A007) to serve as confirmation that the high burnup fuel continues to meet the requirements in 10 CFR 72.122(h), "Confinement barriers and systems" and 72.122(l), "Retrievability".

a. The first evaluation shall be provided in a letter to the NRC (submitted pursuant to 10 CFR 72.4) by April 4, 2028 (see Section A3.5 Toll Gate 1).

b. An additional evaluation shall be provided in a letter to the NRC (submitted pursuant to 10 CFR 72.4) by April 4, 2038 (see Section A3.5 Toll Gate 2).

27. This renewed license is effective as of the date of issuance shown below.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

/RA/
Steve Ruffin, Acting Chief
Spent Fuel Licensing Branch
Division of Spent Fuel Management
Office of Nuclear Material Safety
and Safeguards
Washington, DC 20555

LICENSE FOR INDEPENDENT STORAGE OF SPENT NUCLEAR FUEL AND HIGH-LEVEL RADIOACTIVE WASTE
SUPPLEMENTARY SHEET

Date of Issuance: October 19, 1993
Renewed License: Dated December 09, 2015
Attachment: Technical Specifications

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
INDEPENDENT SPENT FUEL STORAGE INSTALLATION
RECORD OF REVISIONS
TECHNICAL SPECIFICATION CHANGES AND LICENSE AMENDMENTS

NSP Revision (REV) No.	Date of Issue	License Amendment No.	Remarks
ORIGINAL	10/19/93	-	License Issued
1	3/17/94	1	Correction to Page 1 of License
2	2/1/96	2	Change to p. 6-1
3	8/7/00	3	Change to p. 6-1
4	8/18/00	4	License reissue only
5	2/12/01	5	Change to Sec. 3/4
5*	5/1/08	Correction to Amendment 5	Correction to page 1 of License, per NRC letter dated February 7, 2008
6	9/22/08	6	Transfer of operating authority
7	8/20/10	7	Reformatted and Inclusion of TN-40HT design
8	3/10/14	8	Revised absorber and aluminum plate minimum allowed thermal conductance
9	7/24/15	9	Revise Surveillance Requirements in TS 3.1.2
RENEWED	12/9/15	Renewed License	Added License Conditions 19-26, no material change to Technical Specifications

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
INDEPENDENT SPENT FUEL STORAGE INSTALLATION
TECHNICAL SPECIFICATION CURRENT PAGE LIST

LICENSE SNM-2506

PAGE	AMENDMENT
NRC Findings & issuance (1st page)	Renewed License
NRC Findings & issuance (2nd page)	Renewed License
1	Renewed License
2	Renewed License
3	Renewed License
4	Renewed License
5	Renewed License
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1.0 USE AND APPLICATION

1.1 Definitions

---NOTE---

The defined terms of this section appear in capitalized type and are applicable throughout these Technical Specifications and Bases.

Term	Definition
ACTIONS	ACTIONS shall be that part of a Specification that prescribes Required Actions to be taken under designated Conditions within specified Completion Times.
CHANNEL OPERATIONAL TEST (COT)	A COT shall be the injection of a simulated or actual signal into the channel as close to the sensor output as practicable to verify the operability of required alarm functions. The COT shall include adjustments, as necessary, of the required alarm setpoint so that the setpoint is within the required range and accuracy.
DAMAGED FUEL ASSEMBLY	In TN-40 casks, a DAMAGED FUEL ASSEMBLY is a spent nuclear fuel assembly that: a. is a partial fuel assembly, that is, a fuel assembly from which fuel pins are missing unless dummy fuel pins are used to displace an amount of water equal to that displaced by the original pins; or b. has known or suspected to have structural defects or gross cladding failures (other than pinhole leaks) sufficiently severe to adversely affect fuel handling and transfer capability. In TN-40HT casks, a DAMAGED FUEL ASSEMBLY is a spent nuclear fuel assembly that: a. has visible deformation of the rods in the spent nuclear fuel assembly. Note: This is not referring to the uniform bowing that occurs in the reactor. This refers to bowing that significantly opens up the lattice spacing;

1.1 Definitions (continued)

DAMAGED FUEL ASSEMBLY (continued)	b. has individual fuel rods missing from the assembly. Note: The assembly is not a DAMAGED FUEL ASSEMBLY if a dummy rod that displaces a volume equal to, or greater than, the original fuel rod, is placed in the empty rod location;
	c. has missing, displaced, or damaged structural components such that radiological and/or criticality safety is adversely affected (e.g., significantly changed rod pitch);
	d. has missing, displaced, or damaged structural components such that the assembly cannot be handled by normal means (i.e., crane and grapple);
	e. has reactor operating records (or other records) indicating that the spent nuclear fuel assembly contains cladding breaches; or
	f. is no longer in the form of an intact fuel bundle (e.g., consists of, or contains, debris such as loose fuel pellets or rod segments).
LOADING OPERATIONS	LOADING OPERATIONS include all licensed activities on a cask while it is being loaded with fuel assemblies. LOADING OPERATIONS begin when the first fuel assembly is placed in the cask and end when the cask is supported by the transporter.
STORAGE OPERATIONS	STORAGE OPERATIONS include all licensed activities that are performed at the Independent Spent Fuel Storage Installation (ISFSI) while a cask containing one or more spent fuel assemblies is sitting on a storage pad within the ISFSI.
TRANSPORT OPERATIONS	TRANSPORT OPERATIONS include all licensed activities performed on a cask loaded with one or more spent fuel assemblies when it is being moved to or from the ISFSI. TRANSPORT OPERATIONS begin when the cask is first suspended from the transporter and end when the cask is at its destination and no longer supported by the transporter.

1.1 Definitions (continued)

UNLOADING OPERATIONS	UNLOADING OPERATIONS include all licensed activities on a cask while fuel assemblies are being unloaded. UNLOADING OPERATIONS begin when the cask is no longer supported by the transporter and end when the last fuel assembly is removed from the cask.

1.0 USE AND APPLICATION

1.2 Logical Connectors

PURPOSE

The purpose of this section is to explain the meaning of logical connectors.

Logical connectors are used in Technical Specifications (TS) to discriminate between, and yet connect, discrete Conditions, Required Actions, Completion Times, Surveillances, and Frequencies. The only logical connectors that appear in TS are AND and OR. The physical arrangement of these connectors constitutes logical conventions with specific meanings.

BACKGROUND

Several levels of logic may be used to state Required Actions. These levels are identified by the placement (or nesting) of the logical connectors and by the number assigned to each Required Action. The first level of logic is identified by the first digit of the number assigned to a Required Action and the placement of the logical connector in the first level of nesting (i.e., left justified with the number of the Required Action). The successive levels of logic are identified by additional digits of the Required Action number and by successive indentations of the logical connectors.

When logical connectors are used to state a Condition, Completion Time, Surveillance, or Frequency, only the first level of logic is used, and the logical connector is left justified with the statement of the Condition, Completion Time, Surveillance, or Frequency.

1.2 Logical Connectors (continued)

EXAMPLES

The following examples illustrate the use of logical connectors.

EXAMPLE 1.2-1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO not met.	A.1 Verify . . . AND A.2 Restore . . .	

In this example the logical connector AND is used to indicate that when in Condition A, both Required Actions A.1 and A.2 must be completed.

1.2 Logical Connectors

EXAMPLES (continued)

EXAMPLE 1.2-2

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO not met.	A.1 Stop . . . OR A.2.1 Verify . . . AND A.2.2.1 Reduce . . . OR A.2.2.2 Perform . . . OR A.3 Remove . . .	

This example represents a more complicated use of logical connectors. Required Actions A.1, A.2, and A.3 are alternative choices, only one of which must be performed as indicated by the use of the logical connector OR and the left justified placement. Any one of these three Actions may be chosen. If A.2 is chosen, then both A.2.1 and A.2.2 must be performed as indicated by the logical connector AND. Required Action A.2.2 is met by performing A.2.2.1 or A.2.2.2. The indented position of the logical connector OR indicates that A.2.2.1 and A.2.2.2 are alternative choices, only one of which must be performed.

1.0 USE AND APPLICATION

1.3 Completion Times

PURPOSE	The purpose of this section is to establish the Completion Time convention and to provide guidance for its use.
BACKGROUND	Limiting Conditions for Operation (LCOs) specify minimum requirements for ensuring safe operation of the cask. The ACTIONS associated with an LCO state Conditions that typically describe the ways in which the requirements of the LCO can fail to be met. Specified with each stated Condition are Required Action(s) and Completion Time(s).
DESCRIPTION	The Completion Time is the amount of time allowed for completing a Required Action. It is referenced to the time of discovery of a situation (e.g., inoperable equipment or variable not within limits) that requires entering an ACTIONS Condition unless otherwise specified, providing the cask is in a specified condition stated in the Applicability of the LCO. Required Actions must be completed prior to the expiration of the specified Completion Time. An ACTIONS Condition remains in effect and the Required Actions apply until the Condition no longer exists or the cask is not within the LCO Applicability. Once a Condition has been entered, subsequent subsystems, components, or variables expressed in the Condition, discovered to be not within limits, will <u>not</u> result in separate entry into the Conditions unless specifically stated. The Required Actions of the Condition continue to apply to each additional failure, with Completion Times based on initial entry into the Condition.

1.3 Completion Times (continued)

EXAMPLES

The following examples illustrate the use of Completion Times with different types of Conditions and changing Conditions.

EXAMPLE 1.3-1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time not met.	B.1 Perform Required Action B.1.	12 hours
	AND	
	B.2 Perform Required Action B.2.	36 hours

Condition B has two Required Actions. Each Required Action has its own separate Completion Time. Each Completion Time is referenced to the time that Condition B is entered.

The Required Actions of Condition B are to complete Required Action B.1 within 12 hours AND to complete Required Action B.2 within 36 hours. A total of 12 hours is allowed for completing Required Action B.1 and a total of 36 hours (not 48 hours) is allowed for completing Required Action B.2 from the time that Condition B was entered. If Required Action B.1 is completed within 6 hours, the time allowed for completing Required Action B.2 is the next 30 hours because the total time allowed for completing Required Action B.2 is 36 hours.

1.3 Completion Times

EXAMPLES (continued)

EXAMPLE 1.3-2

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One system not within limit.	A.1 Restore system to within limit.	7 days
B. Required Action and associated Completion Time not met.	B.1 Perform Action B.1. AND B.2 Perform Action B.2.	12 hours 36 hours

When a system is determined to not meet the LCO, Condition A is entered. If the system is not restored to within the LCO limit within 7 days, Condition B is also entered and the Completion Time clocks for Required Actions B.1 and B.2 start. If the system is restored after Condition B is entered, Condition A and B are exited, and therefore, the Required Actions of Condition B may be terminated.

EXAMPLE 1.3-3

Example 1.3-3 is not applicable to the ISFSI.

EXAMPLE 1.3-4

Example 1.3-4 is not applicable to the ISFSI.

1.3 Completion Times

EXAMPLES (continued)

EXAMPLE 1.3-5

ACTIONS

-------------------------------NOTE-------------------------------
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO not met.	A.1 Perform Action A.1.	4 hours
B. Required Action and associated Completion Time not met.	B.1 Perform Action B.1. AND B.2 Perform Action B.2.	12 hours 36 hours

The Note above the ACTIONS Table is a method of modifying how the Completion Time is tracked. If this method of modifying how the Completion Time is tracked was applicable only to a specific Condition, the Note would appear in that Condition rather than at the top of the ACTIONS Table.

The Note allows Condition A to be entered separately for each cask, and Completion Times tracked on a per cask basis. When a cask does not meet the LCO, Condition A is entered and its Completion Time starts. If subsequent casks are determined not to meet the LCO, Condition A is entered for each cask and separate Completion Times start and are tracked for each cask.

1.3 Completion Times

EXAMPLES (continued)	<u>EXAMPLE 1.3-6</u> Example 1.3-6 is not applicable to the ISFSI. <u>EXAMPLE 1.3-7</u> Example 1.3-7 is not applicable to the ISFSI
IMMEDIATE COMPLETION TIME	When "Immediately" is used as a Completion Time, the Required Action should be pursued without delay and in a controlled manner.

1.0 USE AND APPLICATION

1.4 Frequency

PURPOSE

The purpose of this section is to define the proper use and application of Frequency requirements.

DESCRIPTION

Each Surveillance Requirement (SR) has a specified Frequency in which the Surveillance must be met in order to meet the associated Limiting Condition for Operation (LCO). An understanding of the correct application of the specified Frequency is necessary for compliance with the SR.

The "specified Frequency" is referred to throughout this section and each of the Specifications of Section 3.0, Surveillance Requirement (SR) Applicability. The "specified Frequency" consists of the requirements of the Frequency column of each SR as well as certain Notes in the Surveillance column that modifies performance requirements.

Sometimes special situations dictate when the requirements of a Surveillance are to be met. They are "otherwise stated" conditions allowed by SR 3.0.1. They may be stated as clarifying Notes in the Surveillance, as part of the Surveillance, or both.

Situations where a Surveillance could be required (i.e., its Frequency could expire), but where it is not possible or not desired that it be performed until sometime after the associated LCO is within its Applicability, represent potential SR 3.0.4 conflicts. To avoid these conflicts, the SR (i.e., the Surveillance or the Frequency) is stated such that it is only "required" when it can be and should be performed. With an SR satisfied, SR 3.0.4 imposes no restriction.

The use of "met" or "performed" in these instances conveys specific meanings. A Surveillance is "met" only when the acceptance criteria are satisfied. Known failure of the requirements of a Surveillance,

1.4 Frequency

DESCRIPTION (continued)

even without a Surveillance specifically being "performed," constitutes a Surveillance not "met." "Performance" refers only to the requirement to specifically determine the ability to meet the acceptance criteria

Some Surveillances contain notes that modify the frequency of performance or the conditions during which the acceptance criteria must be satisfied. For these Surveillances, the Applicability-entry restrictions of SR 3.0.4 may not apply. Such a Surveillance is not required to be performed prior to entering the specified condition in the Applicability of the associated LCO if any of the following three conditions are satisfied.

a. The Surveillance is not required to be met in the specified condition to be entered; or

b. The Surveillance is required to be met in the specified condition to be entered, but has been performed within the specified Frequency (i.e., it is current) and is known not to be failed; or

c. The Surveillance is required to be met, but not performed, in the specified condition to be entered, and is known not to be failed.

Examples 1.4-3 and 1.4-6 discuss these special situations.

1.4 Frequency (continued)

EXAMPLES

The following examples illustrate the various ways that Frequencies are specified.

EXAMPLE 1.4-1

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
Verify pressure within limit.	12 hours

Example 1.4-1 contains the type of SR most often encountered in the Technical Specifications (TS). The Frequency specifies an interval (12 hours) during which the associated Surveillance must be performed at least one time. Performance of the Surveillance initiates the subsequent interval. Although the Frequency is stated as 12 hours, an extension of the time interval to 1.25 times the stated Frequency is allowed by SR 3.0.2 for operational flexibility. The measurement of this interval continues at all times, even when the SR is not required to be met per SR 3.0.1 (such as when the equipment is determined to not meet the LCO, a variable is outside specified limits, or the facility is outside the Applicability of the LCO). If the interval specified by SR 3.0.2 is exceeded while the facility is in a condition specified in the Applicability of the LCO, and the performance of the Surveillance is not otherwise modified (refer to Example 1.4-3), then SR 3.0.3 becomes applicable.

If the interval as specified by SR 3.0.2 is exceeded while the facility is not in a condition specified in the Applicability of the LCO for which performance of the SR is required, the Surveillance must be performed within the Frequency requirements of SR 3.0.2 prior to entry into the specified condition. Failure to do so would result in a violation of SR 3.0.4.

1.4 Frequency

EXAMPLES (continued)

EXAMPLE 1.4-2

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
Verify flow is within limits.	Once within 12 hours prior to starting activity AND 24 hours thereafter

Example 1.4-2 has two Frequencies. The first is a one time performance Frequency, and the second is of the type shown in Example 1.4-1. The logical connector "AND" indicates that both Frequency requirements must be met. Each time the example activity is to be performed, the Surveillance must be performed within 12 hours prior to starting the activity.

The use of "once" indicates a single performance will satisfy the specified Frequency (assuming no other Frequencies are connected by "AND"). This type of Frequency does not qualify for the 25% extension allowed by SR 3.0.2.

"Thereafter" indicates future performances must be established per SR 3.0.2, but only after a specified condition is first met (i.e., the "once" performance in this example). If the specified activity is canceled or not performed, the measurement of both intervals stops. New intervals start upon preparing to restart the specified activity.

1.4 Frequency

EXAMPLES (continued)

EXAMPLE 1.4-3

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
---NOTE--- Not required to be performed until 24 hours after first completion of SR 3.1.5.2. ------ Verify cask interseal helium pressure $\geq$ 30 psig.	24 hours

The interval continues, whether or not SR 3.1.5.2 has been performed.

As the Note modifies the required performance of the Surveillance, it is construed to be part of the "specified Frequency." Should the 24 hour interval be exceeded prior to the completion of SR 3.1.5.2, this Note allows 24 hours after SR 3.1.5.2 to perform the Surveillance. The Surveillance is still considered to be performed within the "specified Frequency." Therefore, if the Surveillance were not performed within the 24 hour (plus the extension allowed by SR 3.0.2) interval, but SR 3.1.5.2 has not been completed, it would not constitute a failure of the SR or failure to meet the LCO. Also, no violation of SR 3.0.4 occurs when entering STORAGE OPERATIONS (the assumed Applicability of the associated LCO), even with the 24 hour Frequency not met.

Once SR 3.1.5.2 has been completed, 24 hours would be allowed for completing the Surveillance. If the Surveillance were not performed within this 24 hour interval, there would then be a failure to perform a Surveillance within the specified Frequency, and the provisions of SR 3.0.3 would apply.

1.4 Frequency

EXAMPLES (continued)

EXAMPLE 1.4-4

Example 1.4-4 is not applicable to the ISFSI.

EXAMPLE 1.4-5

Example 1.4-5 is not applicable to the ISFSI.

EXAMPLE 1.4-6

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
-------------------------NOTE--------------------- Not required to be met prior to the specified Frequency. -- Verify the cask helium leak rate is $\leq$ 1.0 E-5 atm-cc/sec.	Once prior to TRANSPORT OPERATIONS

Example 1.4-6 specifies that the requirements of this Surveillance do not have to be met until required by the specified Frequency i.e., TRANSPORT OPERATIONS (the assumed Applicability of the associated LCO is LOADING OPERATIONS). The interval measurement for the Frequency of this Surveillance continues at all times, as described in Example 1.4-1. However, the Note constitutes an "otherwise stated" exception to the Applicability of this Surveillance. Therefore, until required by the specified Frequency, there is neither failure of the SR nor failure to meet the LCO per SR 3.0.1. Therefore, no violation of SR 3.0.4 occurs when entering the Applicability of the associated LCO, e.g., entering LOADING OPERATIONS.

2.0 FUNCTIONAL AND OPERATING LIMITS

2.1 Fuel Characteristics for Fuel Stored in a TN-40 or TN-40HT Cask

a. Fuel shall be unconsolidated assemblies;

b. Fuel shall be irradiated at the Prairie Island Nuclear Generating Plant Units 1 or 2;

c. Fuel shall be limited to fuel types:

   i. Westinghouse 14X14 Standard,
   ii. Exxon 14X14 Standard (includes high burnup standard),
   iii. Exxon 14X14 TOPROD, and
   iv. Westinghouse 14X14 OFA (including VANTAGE+);

d. Fuel may include burnable poison rod assemblies (BPRAs) provided:

   i. the BPRA has cooled for $\geq$ 18 years,
   ii. the cask average cumulative burnup of the fuel assembly(s) where the BPRA(s) resided during reactor operation shall be $\leq$ 30,000 MWd/MTU;

e. Fuel may include thimble plug devices (TPDs) provided:

   i. the TPD has cooled for a minimum of 16 years,
   ii. the cask average cumulative burnup of the fuel assembly(s) where the TPD(s) resided during reactor operation shall be $\leq$ 125,000 MWd/MTU;

f. The combined weight of a fuel assembly and any BPRA or TPD shall be < 1330 lbs;

g. The combined weight of all fuel assemblies, BPRAs, and TPDs stored in a single cask shall be < 52,000 lbs;

h. The number of assemblies stored shall be $\leq$ 40; and

i. The fuel shall not be a DAMAGED FUEL ASSEMBLY.

2.0 FUNCTIONAL AND OPERATING LIMITS (continued)

2.2 Additional Fuel Characteristics for Fuel Stored in a TN-40 Cask

a. The initial enrichment shall be ≤ 3.85 weight percent U-235;

b. The assembly average burnup shall be ≤ 45,000 MWd/MTU;

c. The cooling time prior to loading shall be ≥10 years; and

d. The maximum combined heat load of an assembly and any associated BPRA or TPD shall be < 675 Watts.

2.3 Additional Fuel Characteristics for Fuel Stored in a TN-40HT Cask

a. The initial enrichment shall be ≤ 5.0 weight percent U-235;

b. The assembly average burnup shall be:

Initial percent U-235 (%)	Assembly Average Burnup (MWd/MTU)
Average Enrichment < 3.4	≤ 44,000
3.4 ≤ Average Enrichment ≤ 5.0	≤ 60,000

c. The cooling time prior to loading shall be ≥ 12 years;

d. The combined heat load of an assembly and any associated BPRA or TPD shall be ≤ 800 Watts. The following formula shall be used to determine the heat load of an assembly:

2.0 FUNCTIONAL AND OPERATING LIMITS

2.3 Additional Fuel Characteristics for Fuel Stored in a TN-40HT Cask (continued)

$$\text{Heat load} = F * e^{\left(-0.309*\left(1-\frac{12}{C}\right)*\left(\frac{C}{B}\right)^{0.431}*\left(\frac{E}{B}\right)^{-0.374}\right)}$$

Where :

$$F = 18.76 + (11.27 * B) + (6.506 * E) + (0.163 * B^2) + (-1.826 * B * E) + (6.617 * E^2)$$

B is the assembly average burnup in GWd/MTU
E is initial average enrichment in wt. % U-235
C is cooling time in years

2.4 Functional and Operating Limits Violations

If any Functional and Operating Limit of 2.1, 2.2, or 2.3 is violated, the following actions shall be completed.

2.4.1 The affected fuel assemblies shall be removed from the cask;

2.4.2 Within 24 hours, notify the NRC Operations Center; and

2.4.3 Within 30 days, submit a special report which describes the cause of the violation and the actions taken to restore compliance and prevent recurrence.

3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

LCO 3.0.1 LCOs shall be met during specified conditions in the Applicability, except as provided in LCO 3.0.2.

LCO 3.0.2 Upon discovery of a failure to meet an LCO, the Required Actions of the associated Conditions shall be met, except as provided in LCO 3.0.5.

If the LCO is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Action(s) is not required unless otherwise stated.

LCO 3.0.3 When an LCO is not met and the associated ACTIONS are not met, or an associated ACTION is not provided, within 4 hours actions shall be initiated to:

a. implement appropriate compensatory actions as needed;

b. verify that the cask is not in an unanalyzed condition or that a required safety function is not compromised; and

c. within 24 hours, obtain Shift Manager approval of the compensatory actions and plan for exiting LCO 3.0.3.

Where corrective measures are completed that permit operation in accordance with the LCO or ACTIONS, completion of the actions required by LCO 3.0.3 is not required.

3.0 LCO APPLICABILITY (continued)

LCO 3.0.4

When an LCO is not met, entry into a specified condition in the Applicability shall only be made:

a. when the associated ACTIONS to be entered permit continued operation in the specified condition in the Applicability for an unlimited period of time;

b. after performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering the specified condition in the Applicability, and establishment of risk management actions, if appropriate; exceptions to this Specification are stated in the individual Specifications, or

c. when an allowance is stated in the individual value, parameter, or other Specification.

This Specification shall not prevent changes in specified conditions in the Applicability that are required to comply with ACTIONS or that are related to the unloading of a cask.

LCO 3.0.5

Equipment removed from service or not in service in compliance with ACTIONS may be returned to service under administrative control solely to perform testing required to demonstrate it meets the LCO or that other equipment meets the LCO. This is an exception to LCO 3.0.2 for the system returned to service under administrative control to perform the testing required to demonstrate that the LCO is met.

3.0 LCO APPLICABILITY (continued)

LCO 3.0.6	Not applicable to the ISFSI.
LCO 3.0.7	Not applicable to the ISFSI.
LCO 3.0.8	Not applicable to the ISFSI.
LCO 3.0.9	Not applicable to the ISFSI.

3.0 SURVEILLANCE REQUIREMENT (SR) APPLICABILITY

SR 3.0.1

SRs shall be met during the specified conditions in the Applicability for individual LCOs, unless otherwise stated in the SR. Failure to meet a Surveillance, whether such failure is experienced during the performance of the Surveillance or between performances of the Surveillance, shall be failure to meet the LCO. Failure to perform a Surveillance within the specified Frequency shall be failure to meet the LCO except as provided in SR 3.0.3. Surveillances do not have to be performed on inoperable equipment or variables outside specified limits.

SR 3.0.2

The specified Frequency for each SR is met if the Surveillance is performed within 1.25 times the interval specified in the Frequency, as measured from the previous performance or as measured from the time a specified condition of the Frequency is met.

For Frequencies specified as "once," the above interval extension does not apply.

If a Completion Time requires periodic performance on a "once per . . ." basis, the above Frequency extension applies to each performance after the initial performance.

Exceptions to this Specification are stated in the individual Specifications.

3.0 SR APPLICABILITY (continued)

SR 3.0.3	If it is discovered that a Surveillance was not performed within its specified Frequency, then compliance with the requirement to declare the LCO not met may be delayed, from the time of discovery, up to 24 hours or up to the limit of the specified Frequency, whichever is greater. This delay period is permitted to allow performance of the Surveillance. A risk evaluation shall be performed for any Surveillance delayed greater than 24 hours and the risk impact shall be managed. If the Surveillance is not performed within the delay period, the LCO must immediately be declared not met, and the applicable Condition(s) must be entered. When the Surveillance is performed within the delay period and the Surveillance is not met, the LCO must immediately be declared not met, and the applicable Condition(s) must be entered.
SR 3.0.4	Entry into a specified condition in the Applicability of an LCO shall only be made when the LCO's Surveillances have been met within their specified Frequency, except as provided by SR 3.0.3. When an LCO is not met due to Surveillances not having been met, entry into a specified condition in the Applicability shall only be made in accordance with LCO 3.0.4. This provision shall not prevent entry into specified conditions in the Applicability that are required to comply with ACTIONS or that are related to the unloading of a cask.

3.1 CASK INTEGRITY

3.1.1 Cask Cavity Vacuum Drying

LCO 3.1.1 The cask cavity vacuum drying pressure shall be below the limit.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Cask cavity vacuum drying pressure limit not met.	A.1 Return cask to pool and reflood.	7 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.1.1	-------------------------NOTE-------------------------- Not required to be met prior to the specified Frequency. --- Verify that the equilibrium cask cavity vacuum drying pressure is brought to ≤ 10 mbar absolute for ≥ 30 minutes after isolation from the vacuum drying system.	Once prior to helium backfill (SR 3.1.2.2)

3.1 CASK INTEGRITY

3.1.2 Cask Helium Backfill Pressure

LCO 3.1.2 The cask cavity shall be backfilled with helium to within the limits.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

--NOTE--
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Cask initial helium backfill pressure limit not met.	---------------NOTE--------------- Action A.1 applies until a gas other than helium is introduced into the cask for subsequent operations or the helium is removed for the performance of SR 3.1.1.1. -------------------------------------	
	A.1 Initiate action to establish a helium environment in the cask.	Immediately
	<u>AND</u>	
	A.2 Establish cask cavity backfill pressure within limits.	Prior to leak testing (SR 3.1.3.1)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action A.1 and associated Completion Time not met.	B.1 Return cask to pool and reflood.	7 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.2.1	-------------------------NOTE------------------------- Not required to be met prior to the specified Frequency. -- Verify that a helium environment has been established in the cask cavity.	Once within 34 hours after commencing cask draining
SR 3.1.2.2	-------------------------NOTE------------------------- Not required to be met prior to the specified Frequency. -- Verify that the cask cavity pressure is $\leq$ 14 mbar absolute.	Once prior to pressurization (SR 3.1.2.3)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.1.2.3	---NOTE--- Not required to be met prior to the specified Frequency. ------ Verify that the cask cavity helium pressure is $\geq$ 1345 mbar absolute and $\leq$ 1445 mbar absolute.	 Once prior leak testing (SR 3.1.3.1)

3.1 CASK INTEGRITY

3.1.3 Cask Helium Leak Rate

LCO 3.1.3 The combined helium leak rate for all seals shall be less than the limit.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Cask helium leak rate not met.	A.1 Establish cask helium leak rate within limit.	7 days
B. Required Action A.1 and associated Completion Time not met.	B.1 Return cask to spent fuel pool and reflood.	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.3.1	--------------------------NOTE--------------------------- Not required to be met prior to the specified Frequency. -- Verify the cask helium leak rate is $\leq$ 1.0 E-5 atm-cc/sec.	Once prior to TRANSPORT OPERATIONS

3.1 CASK INTEGRITY

3.1.4 Cask Safety Status

LCO 3.1.4 The cask exterior surfaces shall be free of damage, deterioration, and debris.

APPLICABILITY: STORAGE OPERATIONS.

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Significant damage, deterioration, or debris accumulation to cask surface.	A.1 Take appropriate action to return cask to proper operation.	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.4.1	Visually verify that there is no significant damage or deterioration of cask exterior surfaces.	92 days
SR 3.1.4.2	Visually verify that there is no significant accumulation of debris on cask exterior surfaces.	92 days

3.1 CASK INTEGRITY

3.1.5 Cask Interseal Pressure

LCO 3.1.5 Cask interseal pressure shall be maintained at a pressure greater than the limit.

APPLICABILITY: STORAGE OPERATIONS.

ACTIONS

--NOTE--
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Cask interseal pressure below limit.	A.1 Reestablish cask interseal pressure above limit.	7 days
B. Required Action A.1 and associated Completion Time not met.	B.1 Return cask to spent fuel pool and reflood.	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.5.1	-----NOTE----- Not required to be performed until 24 hours after first completion of SR 3.1.5.2. ---------- Verify cask interseal helium pressure ≥ 30 psig.	24 hours
SR 3.1.5.2	-----NOTE----- Not required to be met prior to the specified Frequency. ---------- Perform a CHANNEL OPERATIONAL TEST (COT) to verify proper functioning of pressure switch / transducer on cask overpressure system.	Once within 7 days of commencing STORAGE OPERATIONS AND Every 12 months thereafter

3.1 CASK INTEGRITY

3.1.6 Cask Maximum Surface Temperature

LCO 3.1.6 The cask surface temperature shall be less than the limit.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Cask surface temperature above limit.	A.1 Return cask to spent fuel pool and remove all fuel assemblies from the cask.	7 days
	AND	
	A.2 Submit report to NRC Region III office with a copy to Director, Office of Nuclear Material Safety and Safeguards.	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.6.1	-------------------------NOTE------------------------- Not required to be performed prior to the specified Frequency. ---	
	Verify outer surface temperature is ≤ 250°F.	Once at least 24 hours after commencing cask draining AND Prior to TRANSPORT OPERATIONS

3.2 CASK RADIATION PROTECTION

3.2.1 Cask Surface Contamination

LCO 3.2.1 Removable contamination on the cask exterior surface shall be less than the limits.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Removable contamination on the cask exterior surface exceed a limit.	A.1 Decontaminate cask surfaces to below required levels.	Prior to TRANSPORT OPERATIONS

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.1.1	-------------------------NOTE-------------------------- Not required to be met prior to the specified Frequency. --- Verify that the removable contamination on the exterior surface of the cask are: a. < 1000 dpm / 100 cm^2 (0.2 Bq / cm^2) from beta and gamma sources; and b. < 20 dpm / 100 cm^2 (0.003 Bq / cm^2) from alpha sources.	Once prior to TRANSPORT OPERATIONS

3.2 CASK RADIATION PROTECTION

3.2.2 Cask Dose Rates

LCO 3.2.2 Dose rates on the cask exterior surfaces shall be less than the limits.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Dose rates on the cask exterior surface exceed a limit.	A.1 Perform specific analysis demonstrating compliance with 10 CFR Part 20, and 10 CFR Part 72 radiation protection requirements.	Prior to TRANSPORT OPERATIONS

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.2.1	------------------NOTE------------------ Not required to be performed prior to the specified Frequency. -- Verify that dose rates on the exterior surface of the cask are[1]: a. ≤ 45 mrem/hr gamma and ≤ 10 mrem/hr neutron at center of top protective cover; b. ≤ 80 mrem/hr gamma and ≤ 190 mrem/hr neutron between cask flange and side neutron shield; c. ≤ 40 mrem/hr gamma and ≤ 35 mrem/hr neutron at mid-height of side neutron shield; and d. ≤ 85 mrem/hr gamma and ≤ 930 mrem/hr neutron between cask bottom and side neutron shield.	Once prior to TRANSPORT OPERATIONS

[1] Dose rates on the external surface of the cask may not bound localized dose rates due to streaming. Therefore, appropriate measures should be implemented to ensure exposures are consistent with good ALARA practices.

3.3 CASK CRITICALITY CONTROL

3.3.1 Dissolved Boron Concentration

LCO 3.3.1 The dissolved boron concentration of the water in the spent fuel pool and the water added to the cavity of a cask shall be greater than the limit.

APPLICABILITY: LOADING OPERATIONS and UNLOADING OPERATIONS.

ACTIONS

--NOTE--

Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Dissolved boron concentration limit not met.	A.1 Initiate actions to suspend loading of fuel assemblies into cask.	Immediately
	<u>AND</u>	
	A.2 Remove all fuel assemblies from cask.	24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.1.1	Verify dissolved boron concentration limit in spent fuel pool water and water to be added to the cask cavity is ≥ 2450 ppm.	Once within 4 hours prior to LOADING OPERATIONS
SR 3.3.1.2	---NOTE--- Not required to be met prior to the specified Frequency. --- Verify dissolved boron concentration limit in spent fuel pool water and water to be added to the cask cavity is ≥ 2450 ppm.	Once within 4 hours prior to flooding cask for UNLOADING OPERATIONS

3.4 CASK FUEL LOADING CONTROL

3.4.1 Fuel Stored in a cask

LCO 3.4.1 Fuel stored in a cask shall meet the functional and operating limits specified in Specification 2.1 through 2.3.

APPLICABILITY: LOADING OPERATIONS.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each cask.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Requirements of LCO not met.	A.1 Initiate action to remove the affected fuel assembly(s) from the cask.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	------------------NOTE------------------ Not required to be performed prior to the specified Frequency. --- Verify by administrative means that each fuel assembly and fuel assembly insert (BPRA or TPD) satisfies the requirements in Specification 2.1 through 2.3.	Once prior to inserting into cask
SR 3.4.1.2	------------------NOTE------------------ Not required to be performed prior to the specified Frequency. --- Verify the identity of each fuel assembly and fuel assembly insert (BPRA or TPD).	Once prior to inserting into cask <u>AND</u> Once prior to closure of cask

4.0 DESIGN FEATURES

4.1 Design Drawings

The Prairie Island ISFSI design approval was based on use of the TN-40 and TN-40HT storage casks and review of specific design drawings, some of which have been deemed appropriate for inclusion in the Prairie Island ISFSI Safety Evaluation Report (SER). Drawings listed in Section 1.2 of the Prairie Island ISFSI SER have been reviewed and approved by NRC. These drawings may be revised under the provisions of 10 CFR 72.48, as appropriate.

4.2 Maximum Cask Lifting Height

The casks have been evaluated for drops up to 18 inches. All lifts of a loaded cask greater than 18 inches must be performed with a single-failure-proof system.

4.3 Neutron Poison Loading in the TN-40HT Casks

The minimum areal boron-10 density of the neutron poison plates shall meet that specified in Table 4.3-1. This will ensure that the poison loading is consistent with that assumed in the criticality analysis.

4.3.1 TN-40HT Neutron Absorber Requirements

The neutron absorber used for criticality control in the TN-40HT basket may consist any of the following types of material: (a) Boron-aluminum alloy (borated aluminum), (b) Boron carbide / aluminum metal matrix composite (MMC), or (c) Boral®. The TN-40HT safety analyses do not rely upon the tensile strength of these materials. The radiation and temperature environment in the cask is not sufficiently severe to damage these metallic/ceramic materials. To assure performance of the neutron absorber's design function only visual inspections, thermal conductivity testing, and the presence / uniformity of boron-10 (B10) need to be verified with testing requirements specific to each material. References to metal matrix composites throughout Section 4.3 are not intended to refer to borated aluminum or Boral®.

4.3.1 TN-40HT Neutron Absorber Requirements (continued)

a. Boron Aluminum Alloy (Borated Aluminum)

Description - The material is produced by direct chill (DC) or permanent mold casting with boron precipitating primarily as a uniform fine dispersion of discrete aluminum diboride (AlB_2) or Titanium diboride (TiB_2) particles in the matrix of aluminum or aluminum alloy (other boron compounds, such as AlB12, can also occur). For extruded products, the TiB_2 form of the alloy shall be used. For rolled products, the AlB_2, the TiB_2, or a hybrid may be used. Boron is added to the aluminum in the quantity necessary to provide the specified minimum B10 areal density in the final product. The boron may have the natural isotopic distribution or may be enriched in B10. The criticality calculations take credit for 90% of the minimum specified B10 areal density of borated aluminum. The basis for this credit is the B10 areal density acceptance testing, which shall be as specified in Section 4.3.2.c.

Requirements - The boron content in the aluminum or aluminum alloy shall not exceed 5% by weight. The neutron absorbers shall be 100% visually inspected in accordance with the inspection requirements described in Section 4.3.2.a. The thermal conductivity of the material shall be tested in accordance with the testing requirements in Section 4.3.2.b. The minimum B10 areal density specified in Table 4.3-1 shall be confirmed via neutron transmission testing as described in Section 4.3.2.c.

b. Boron Carbide / Aluminum Metal Matrix Composites (MMC)

Description – The material is a composite of fine boron carbide particles in an aluminum or aluminum alloy matrix. The material shall be produced by either direct chill casting, permanent mold casting, powder metallurgy, or thermal spray techniques. It is a low-porosity product, with a metallurgically bonded matrix. The criticality calculations take credit for 90% of the minimum specified B10 areal density of MMCs. The basis for this credit is the B10 areal density acceptance testing, which is specified in Section 4.3.2.c.

Requirements – For non-clad MMC products, the boron carbide content shall not exceed 40% by volume. The boron carbide content for MMCs with an integral aluminum cladding shall not exceed 50% by volume. Non-clad

4.3.1 TN-40HT Neutron Absorber Requirements (continued)

MMC products shall have a density greater than 98% of theoretical density, with no more than 0.5 volume % interconnected porosity. For MMC with an integral cladding, the final density of the core shall be greater than 97% of theoretical density, with no more than 0.5 volume % interconnected porosity of the core and cladding as a unit of the final product. Boron carbide particles for the products considered here shall have an average size of 40 microns or less, although the actual specification may be by mesh size, rather than by average particle size. No more than 10% of the particles shall be over 60 microns. The neutron absorbers shall be 100% visually inspected in accordance with the inspection requirements described in Section 4.3.2.a. The thermal conductivity of the material shall be tested in accordance with the testing requirements in Section 4.3.2.b. The minimum B10 areal density specified in Table 4.3-1 shall be confirmed via neutron transmission testing as described in Section 4.3.2.c. The MMCs material shall be qualified in accordance with the requirements specified in Section 4.3.3, and shall subsequently be subject to the process controls specified in SAR Section A9.7.6.

c. Boral®

<u>Description</u> - This material consists of a core of aluminum and boron carbide powders between two outer layers of aluminum, mechanically bonded by hot-rolling an "ingot" consisting of an aluminum box filled with blended boron carbide and aluminum powders. The core, which is exposed at the edges of the sheet, is slightly porous. Before rolling, at least 80% by weight of the B_4C particles in Boral® shall be smaller than 200 microns. The criticality calculations take credit for 75% of the minimum specified B10 areal density of Boral®.

<u>Requirements</u> - The nominal boron carbide content shall be limited to 65% (+ 2% tolerance limit) of the core by weight. The neutron absorbers shall be 100% visually inspected in accordance with the inspection requirements described in Section 4.3.2.a. The thermal conductivity of the material shall be tested in accordance with the testing requirements in Section 4.3.2.b. The minimum B10 areal density specified in Table 4.3-1 shall be confirmed via chemical analysis and by certification of the B10 isotopic fraction for the

4.3.1 TN-40HT Neutron Absorber Requirements (continued)

boron carbide powder, or by neutron transmission testing described in Section 4.3.2.c. Areal density testing shall be performed on a coupon taken from the sheet produced from each ingot. If the measured areal density is below that specified, all the material produced from that ingot will be either rejected, or accepted only on the basis of alternate verification of B10 areal density for each of the final pieces produced from that ingot.

4.3.2 TN-40HT Neutron Absorbers Acceptance Testing

a. Visual Inspections Of Neutron Absorbers

For borated aluminum and MMCs, visual inspections shall follow the recommendations in Aluminum Standards and Data, Chapter 4 "Quality Control, Visual Inspection of Aluminum Mill Products and Castings". Local or cosmetic conditions such as scratches, nicks, die lines, inclusions, abrasion, isolated pores, or discoloration are acceptable. Widespread blisters, rough surface, or cracking shall be treated as non-conforming. Inspection of MMCs with an integral aluminum cladding shall also include verification that the matrix is not exposed through the faces of the aluminum cladding and that solid aluminum is not present at the edges. For Boral®, visual inspection shall verify that there are no cracks through the cladding, exposed core on the face of the sheet, or solid aluminum at the edge of the sheet.

b. Thermal Conductivity Testing Of Neutron Absorbers

Testing shall conform to ASTM E1225, ASTM E1461, or equivalent method, performed at room temperature on coupons taken from the rolled or extruded production material. Previous testing of borated aluminum and metal matrix composite, Table 4.3-2, shows that thermal conductivity increases slightly with temperature. Initial sampling shall be one test per lot, defined by the heat or ingot, and may be reduced if the first five tests meet the specified minimum thermal conductivity. If a thermal conductivity test result is below the specified minimum, at least four additional tests shall be performed on the material from that lot. If the mean value of those tests, including the original test, falls below the specified minimum the associated lot shall be rejected. After twenty five tests of a single type of material, with the same aluminum alloy matrix, the same boron content, and the same primary boron

4.3.2 TN-40HT Neutron Absorbers Acceptance Testing (continued)

phase, e.g., B_4C, TiB_2, or AlB_2, if the mean value of all the test results less two standard deviations meets the specified thermal conductivity, no further testing of that material is required. This exemption may also be applied to the same type of material if the matrix of the material changes to a more thermally conductive alloy (e.g., from 6000 to 1000 series aluminum), or if the boron content is reduced without changing the boron phase. The thermal analysis in SAR Chapter A3.3.2.2 considers a dual plate basket construction base model with 0.125" thick neutron absorber with a 0.312" thick aluminum 1100 plate. This model gives the bounding values for the maximum component temperatures. Either a dual plate basket construction or an alternate single plate (borated aluminum or MMC) construction basket may be utilized. For the dual plate construction, the specified thickness of the neutron absorber may vary, and the thermal conductivity acceptance criterion for the neutron absorber will be based on the nominal thickness specified. In either construction type, to maintain the thermal performance of the basket, the minimum thermal conductivity shall be such that the total thermal conductance (sum of conductivity * thickness) of the neutron absorber and the aluminum 1100 plate shall at least equal the conductance assumed in the thermal analysis, 3.55 BTU/hr-deg F. Samples of the acceptance criteria for various neutron absorber thicknesses are highlighted in Table 4.3-3. The aluminum 1100 plate does not need to be tested for thermal conductivity; the material may be credited with the values published in the ASME Code Section II part D. The neutron absorber material need not be tested for thermal conductivity if the nominal thickness of the aluminum 1100 plate is 0.320 inch or greater.

c. Neutron Transmission Testing of Neutron Absorbers

Neutron Transmission acceptance testing procedures shall be subject to approval by Transnuclear. Test coupons shall be removed from the rolled or extruded production material at locations that are systematically or probabilistically distributed throughout the lot. Test coupons shall not exhibit physical defects that would not be acceptable in the finished product, or that would preclude an accurate measurement of the coupon's physical thickness. A lot is defined as all the pieces produced from a single ingot or heat or from a group of billets from the same heat. If this definition results in a lot size too small to provide a meaningful statistical analysis of results, an

4.3.2 TN-40HT Neutron Absorbers Acceptance Testing (continued)

alternate larger lot definition may be used, so long as it results in accumulating material that is uniform for sampling purposes. The sampling rate for neutron transmission measurements shall be such that there is at least one neutron transmission measurement for each 2000 square inches of final product in each lot. The B10 areal density is measured using a collimated thermal neutron beam of up to 1.1 inch diameter. The neutron transmission through the test coupons is converted to B10 areal density by comparison with transmission through calibrated standards. These standards are composed of a homogeneous boron compound without other significant neutron absorbers. For example, boron carbide, zirconium diboride or titanium diboride sheets are acceptable standards. These standards are paired with aluminum shims sized to match the effect of neutron scattering by aluminum in the test coupons. Uniform but non-homogeneous materials such as metal matrix composites may be used for standards, provided that testing shows them to provide neutron attenuation equivalent to a homogeneous standard. Standards will be calibrated, traceable to nationally recognized standards, or by attenuation of a monoenergetic neutron beam correlated to the known cross section of boron 10 at that energy. Alternatively, digital image analysis may be used to compare neutron radioscopic images of the test coupon to images of the standards. The area of image analysis shall be up to 0.75 sq. inch. The minimum areal density specified shall be verified for each lot at the 95% probability, 95% confidence level or better. If a goodness-of-fit test demonstrates that the sample comes from a normal population, the one-sided tolerance limit for a normal distribution may be used for this purpose. Otherwise, a non-parametric (distribution-free) method of determining the one-sided tolerance limit may be used. Demonstration of the one-sided tolerance limit shall be evaluated for acceptance in accordance with Transnuclear's Quality Assurance (QA) procedures. The following illustrates one acceptable method and is intended to be utilized as an example. The acceptance criterion for individual plates is determined from a statistical analysis of the test results for their lot. The B10 areal densities determined by neutron transmission are converted to volume density, i.e., the B10 areal density is divided by the thickness at the location of the neutron transmission measurement or the maximum thickness of the coupon. The lower tolerance limit of B10 volume density is then determined as the mean value of B10 volume density for the sample less K times the

4.3.2 TN-40HT Neutron Absorbers Acceptance Testing (continued)

standard deviation, where K is the one-sided tolerance limit factor with 95% probability and 95% confidence. Finally, the minimum specified value of B10 areal density is divided by the lower tolerance limit of B10 volume density to arrive at the minimum plate thickness which provides the specified B10 areal density. Any plate which is thinner than the statistically derived minimum thickness or the minimum design thickness, whichever is greater, shall be treated as non-conforming, with the following exception. Local depressions are acceptable, so long as they total no more than 0.5% of the area on any given plate, and the thickness at their location is not less than 90% of the minimum design thickness. Non-conforming material shall be evaluated for acceptance in accordance with Transnuclear's QA procedures.

4.3.3 TN-40HT Qualification Testing Of Metal Matrix Composites

a. Applicability And Scope

Prior to initial use in a spent fuel dry storage system, new MMCs shall be subjected to qualification testing that will verify that the product satisfies the design function. Key process controls shall be identified per SAR Section A9.7.6 so that the production material is equivalent to or better than the qualification test material. Changes to key processes shall be subject to qualification before use of such material in a spent fuel dry storage system. ASTM methods and practices are referenced below for guidance. Alternative methods may be used with the approval of Transnuclear.

b. Durability

There is no need to include accelerated radiation damage testing in the qualification. Metals and ceramics do not experience measurable changes in mechanical properties due to fast neutron fluences typical over the lifetime of spent fuel storage. Thermal damage and corrosion (hydrogen generation) testing shall be performed unless such tests on materials of the same chemical composition have already been performed and found acceptable. The following paragraphs illustrate two cases where such testing is not required. Thermal damage testing is not required for unclad MMCs consisting only of boron carbide in an aluminum 1100 matrix, because there is no reaction between aluminum and boron carbide below 842 °F, well

4.3.3 TN-40HT Qualification Testing Of Metal Matrix Composites (continued)

above the basket temperature under normal conditions of storage or transport. Corrosion testing is not required for MMCs (clad or unclad) consisting only of boron carbide in an aluminum 1100 matrix, because testing on one such material has already been performed by Transnuclear.

c. Delamination Testing Of Clad MMC

Clad MMCs shall be subjected to thermal damage testing following water immersion to ensure that delamination does not occur under normal conditions of storage. An example of such a test would be: (1) immerse a specimen at least 6 x 6 inches in water under pressure ≥30 psig for at least 24 hours, (2) Place the specimen in a vacuum furnace preheated to at least 300°F, and evacuate the furnace. Acceptance criterion: no blistering or delamination of the cladding.

d. Required Tests And Examinations To Demonstrate Mechanical Integrity

At least three samples, one each from approximately the two ends and middle of the test material production run shall be subjected to:

(1) room temperature tensile testing (ASTM- B557) demonstrating that the material has a 0.2% offset yield strength no less than 1.5 ksi; has an ultimate strength no less than 5.0 ksi; and has minimum elongation in two inches no less than 0.5%. As an alternative to the elongation requirement, ductility may be demonstrated by bend testing per ASTM E290. The radius of the pin or mandrel shall be no greater than three times the material thickness, and the material shall be bent at least 90 degrees without complete fracture.

(2) testing by ASTM-B311 to verify more than 98% theoretical density for non-clad MMCs and 97% for the matrix of clad MMCs. Testing or examination for interconnected porosity on the faces and edges of unclad MMC, and on the edges of clad MMC shall be performed by a method to be approved by Transnuclear. The maximum interconnect porosity is 0.5 volume %.

4.3.3 TN-40HT Qualification Testing Of Metal Matrix Composites (continued)

(3) and for at least one sample, for MMCs with an integral aluminum cladding, thermal durability testing demonstrating that after a minimum 24 hour soak in either pure or borated water, then insertion into a preheated oven at approximately 825°F for a minimum of 24 hours, the specimens are free of blisters and delamination and pass the mechanical testing requirements described in test (1) of this section.

e. Required Tests And Examinations To Demonstrate B10 Uniformity

Uniformity of the boron distribution shall be verified either by: (a) Neutron radioscopy or radiography (ASTM E94, E142, and E545) of material from the ends and middle of the test material production run, verifying no more than 10% difference between the minimum and maximum B10 areal density, or (b) Quantitative testing for the B10 areal density, B10 density, or the boron carbide weight fraction, on locations distributed over the test material production run, verifying that one standard deviation in the sample is less than 10% of the sample mean. Testing may be performed by a neutron transmission method similar to that specified in Section 4.3.2.c, or by chemical analysis for boron carbide content in the composite.

f. Approval of Procedures

Qualification procedures shall be subject to approval by Transnuclear.

4.4 Codes and Standards for the TN-40HT Casks

The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III, 2004 Edition including the 2006 Addenda (the Code), is the governing code for the TN-40HT cask, except that the material properties from later editions of Section II Part D may be used for design. The TN-40HT cask containment boundary is designed, fabricated and inspected in accordance with Subsection NB of the ASME Code to the maximum practical extent. Exceptions to the Code are listed in Table 4.4-1.

4.4 Codes and Standards for the TN-40HT Casks (continued)

The TN-40HT basket is designed, fabricated and inspected in accordance with Subsection NG of the ASME Code to the maximum practical extent. Exceptions to the Code are listed in Table 4.4-1.

The ASME Code requirements apply only to important to safety items.

Proposed alternatives to the Code, including exceptions allowed by Table 4.4-1 may be used when authorized by the Director of the Office of Nuclear Material Safety and Safeguards or Designee. Requests for exceptions shall demonstrate that:

1. The proposed alternatives would provide an acceptable level of quality and safety; or

2. Compliance with the specified requirements of the Code would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Requests for exceptions in accordance with this section shall be submitted in accordance with 10 CFR 72.4

TABLE 4.3-1
MINIMUM B10 AREAL CONTENT FOR TN-40HT FIXED POISON PLATES

Minimum Areal B10 Content for Boral® (mg/cm^2)	Minimum Areal B10 Content for B-Al[(a)] (mg/cm^2)
45.0	37.5

(a) B-Al = Metal Matrix Composites and Borated Aluminum Alloys.

TABLE 4.3-2
THERMAL CONDUCTIVITY FOR SAMPLE NEUTRON ABSORBERS

Temperature °C	Material			
	1	2	3	4
20	193	170	194	194
100	203	183	207	201
200	208	-	-	
250	-	201	218	206
300	211	204	220	203
314	-	-	-	202
342	-	-	-	202

Units: W/mK

Materials:
1) Boralyn® MMC, aluminum 1100 with 15% B_4C
2) Borated aluminum 1100, 2.5% boron as TiB_2
3) Borated aluminum 1100, 2.0% boron as TiB_2
4) Borated aluminum 1100, 4.3% boron as AlB_2

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.

TABLE 4.4-1
TN-40HT ASME CODE EXCEPTIONS
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Component	Reference ASME Code/Section	Code Requirement	Alternatives, Justification & Compensatory Measures
TN-40HT Cask, Basket	NB/NF/ NG-1100 NB/NF/ NG-2130 NB/NF/ NG-4121	Stamping and preparation of reports by the Certificate Holder, Use of ASME Certificate Holders	The TN-40HT cask is not stamped, nor is there a code design specification or stress report generated. A design criteria document is generated in accordance with Transnuclear's (TN) Quality Assurance (QA) Program and the design and analysis is performed under TN's QA Program. The cask may also be fabricated by other than N-stamp holders and materials may be supplied by other than ASME Certificate holders.
TN-40HT Cask, Basket	NCA	All	Not compliant with NCA. TN Quality Assurance requirements, which are based on 10 CFR72 Subpart G, are used in lieu of NCA-4000. Fabrication oversight is performed by TN personnel in lieu of an Authorized Nuclear Inspector.
Pressure Test of the Containment Boundary	NB-6000	Hydrostatic testing	The containment vessel is hydrostatically tested in accordance with the requirements of the ASME B&PV Code, Section III, Articles NB-6200 with the exception that some of the containment vessel may be installed in the shield shell during testing. The containment vessel is supported by the shield shell during all design and accident events.
Weld of Bottom Inner Plate to the Containment Shell	NB-5231	Full penetration corner welded joints require the fusion zone and the parent metal beneath the attachment surface to be UT'd after welding	The joint may be welded after the containment shell is shrink-fit into the shield shell. The geometry of the joint does not allow for UT inspection. In this case, the joint will be examined by RT and either PT or MT methods in accordance with ASME subsection NB requirements. If the containment shell is welded complete before shrink fitting, UT examination per NB-5231 will be performed.

TABLE 4.4-1
TN-40HT ASME CODE EXCEPTIONS
(Page 2 of 4)

Component	Reference ASME Code/Section	Code Requirement	Alternatives, Justification & Compensatory Measures
Containment Shell Rolling Qualification	NB-4213	The rolling process used to form the inner vessel should be qualified to determine that the required impact properties of NB-2300 are met after straining by taking test specimens from three different heats	If the plates are made from less than three heats, each heat will be tested to verify the impact properties.
Welds of the Bottom Shield to Shield Shell and Shield Shell to Shell Flange	NB-4243 and NB-5230	Category C weld joints in vessels and similar weld joints in other components shall be full penetration joints. These welds shall be examined by UT or RT and either PT or MT	Certain welds are partial penetration welds. As an alternative to the NDE requirements of NB-5230, for Category C welds, all of these closure welds are multi-layer welds that are progressive PT examined.
Containment Vessel	NB-7000	Vessels are required to have overpressure protection	No overpressure protection is provided. Function of containment vessel is to contain radioactive contents under normal and accident conditions. The containment vessel is designed to withstand maximum internal pressure considering 100% fuel rod failure and maximum accident temperatures.
Containment Vessel, Basket	NB-8000 NG-8000	Requirements for nameplates, stamping and reports per NCA-8000	The TN-40HT cask is to be marked and identified in accordance with 10 CFR 72 requirements. Code stamping is not required. QA data package to be in accordance with TN approved QA program.

TABLE 4.4-1
TN-40HT ASME CODE EXCEPTIONS
(Page 3 of 4)

Component	Reference ASME Code/Section	Code Requirement	Alternatives, Justification & Compensatory Measures
Weld of Shield Plate to Lid Outer Plate	NB-4335 NB-4620	Impact testing of weld and heat affected zone of lid to shield plate Post weld heat treatment	The lid shield plate is not in the component support path, and has no pressure-retaining function; it is a non-structural attachment, and NB jurisdiction does not apply to the plate or weld. The weld must conform to NB-4430.
Gamma Shielding and Trunnion	NB-1132 NF-1132	Attachments in the component support load path and not performing a pressure retaining function shall conform to Subsection NF	The gamma shield shell and trunnions are not fabricated completely in accordance with Subsection NF. The shield shell's primary function is not structural. The weld of the bottom shield plate to the shield shell is subject to multilevel PT or MT to prevent complete loss of the bottom shielding in an accident. Other shield shell weld (shield shell to the shell flange) failures would not lead to loss of shielding. The trunnions and trunnion welds are designed to load factors much higher than those of subsection NF, the trunnion weld is subject to root and final PT or MT, and the trunnions are tested to 1.5 times design load.
Basket Neutron Poison Material	NG-2000	Use of ASME Materials	The basket neutron poison material is not considered in the structural analysis of the basket. The material provides criticality control and adds a heat transfer path. The poison material is not a Code material.

TABLE 4.4-1
TN-40HT ASME CODE EXCEPTIONS
(Page 4 of 4)

Component	Reference ASME Code/Section	Code Requirement	Alternatives, Justification & Compensatory Measures
Basket	NG-3352	Table NG 3352-1 lists the permissible welded joints	The fusion welds between the stainless steel insert plates and the stainless fuel compartment tube are not included in Table NG-3352-1. The required minimum tested capacity of the welded connection (at each side of the tube) shall be 35 kips (at room temperature). The capacity shall be demonstrated by qualification and production testing. ASME Code Section IX does not provide tests for qualification of these types of welds. Therefore, these welds are qualified using Section IX to the degree applicable together with the testing described here. The welds will be visually inspected to confirm that they are located over the insert plates, in lieu of the visual acceptance criteria of NG-5260 which are not appropriate for this type of weld. A joint efficiency (quality) factor of 1.0 is utilized for the fuel compartment longitudinal seam welds. Table NG-3352-1 permits a joint efficiency (quality) factor of 0.5 to be used for full penetration weld examined by ASME Section V visual examination (VT). For the TN-40HT basket, the compartment seam weld is thin (0.188" thick) and the weld will be made in one pass. Both surfaces of weld (inside and outside) will be fully examined by VT and therefore a factor of 2 x 0.5=1.0 will be used in the analysis. This is justified as both surfaces of the single weld pass/layer will be fully examined, and the stainless steel material that comprises the fuel compartment tubes is very ductile.

5.0 ADMINISTRATIVE CONTROLS

5.1 General

The Prairie Island ISFSI is located on the Prairie Island Nuclear Generating Plant site and will be managed and operated by Northern States Power Company, a Minnesota corporation (NSPM), staff. The administrative controls shall be in accordance with the requirements of the Prairie Island Nuclear Generating Plant Facility Operating Licenses (DPR-42 and -60) and associated Technical Specifications, as appropriate.

5.2 Environmental Monitoring Program

The licensee shall include the Prairie Island ISFSI in the environmental monitoring program for the Prairie Island Nuclear Generating Plant. An environmental monitoring program is required pursuant to 10 CFR 72.44(d)(2). This program shall include the quarterly determination of ISFSI radiation levels from two (2) thermoluminescent dosimeters on the fence at each side of the ISFSI (8 total).

The licensee shall include the ISFSI in the environmental monitoring report for the Prairie Island Nuclear Generating Plant, and a copy shall be sent to the Director, Office of Nuclear Material Safety and Safeguards

5.3 Annual Environmental Report

An annual report, as required by 10 CFR 72.44(d)(3), shall be submitted to the NRC Region III, Office, with a copy to the Director, Office of Nuclear Material Safety and Safeguards, within 60 days after January 1 of each year. This report should specify the quantity of each of the principal radionuclides released to the environment in liquid and in gaseous effluents during the previous year of operation and such other information as may be required by the Commission to estimate maximum potential radiation dose commitment to the public resulting from effluent release.

5.0 ADMINISTRATIVE CONTROLS (continued)

5.4 Technical Specification Bases Control Program

This program provides a means for processing changes to the Bases of these Technical Specifications.

a. Changes to the Bases of these Technical Specifications shall be made under appropriate administrative controls and reviews;

b. Licensees may make changes to Bases without prior NRC approval provided the changes do not require either of the following;

   1. a change in the Technical Specifications incorporated in the license, or

   2. a change to the ISFSI SAR or Bases that requires NRC approval pursuant to 10 CFR 72.48;

c. The Bases Control Program shall contain provisions to ensure that the Bases are maintained consistent with the ISFSI SAR; and

d. Changes to the Bases implemented without prior NRC approval shall be provided to the NRC on a frequency consistent with the ISFSI SAR updates.

Proprietary Information Withheld Under 10 CFR 2.390.