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Good morning Heather,

I forgot to mention that the application is now available in the NRC ADAMS system the # is ML113140518, I have attached a copy for your convenience. I have not seen anything further on notice for hearing opportunity.

Have a great day.

Jean

U.S. Nuclear Regulatory Commission
Office of Federal and State Materials and
Environmental Management Programs
Environmental Project Manager

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ACRONYMS AND ABBREVIATIONS

ACI	American Concrete Institute
ALARA	As Low As Reasonably Achievable
AMA	Aging Management Activities
AMP	Aging Management Program
AMR	Aging Management Review
amsl	above mean sea level
CC	Criticality Control (Intended Function)
CFR	Code of Federal Regulations
CLB	Current Licensing Basis
CRMP	Cultural Resource Management Plan
DOE	U.S. Department of Energy
EPRI	Electric Power Research Institute
ER	1990 ISFSI Environmental Report
FWS	U.S. Fish and Wildlife Service
GEIS	Generic Environmental Impact Statement for the License Renewal of Nuclear Power Plants
GWd/MTU	Gigawatt-Days per Metric Ton Uranium
HT	Heat Transfer (Intended Function)
ISFSI	Independent Spent Fuel Storage Installation
ISG	Interim Staff Guidance
kgU/each	kilograms uranium per assembly
kW	Kilowatts
MDNR	Minnesota Department of Natural Resources
MPUC	Minnesota Public Utilities Commission
mph	miles per hour
mrem	millirem
MSHPO	Minnesota State Historic Preservation Office
MTU	metric tons of uranium
MWD/MTU	Megawatt-Days per Metric Ton of Uranium
N/A	Not Applicable
NEPA	National Environmental Policy Act
NMC	Nuclear Management Company
NMSS	NRC Office Nuclear Material Safety and Safeguards
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NSPM	Northern States Power Company - Minnesota
OE	Operating Experience
PB	Pressure Boundary (Intended Function)
PI ISFSI	Prairie Island Independent Spent Fuel Storage Installation
PIIC	Prairie Island Indian Community
PINGP	Prairie Island Nuclear Generating Plant
PINGP ER	2008 Applicant's Environmental Report – Operating License Renewal Stage for PINGP
psi	pounds per square inch
PWR	Pressurized Water Reactor
Ref.	Reference

REMP	Radiological Environmental Monitoring Program
SAR	Safety Analysis Report
SEIS	Generic Environmental Impact Statement for the License Renewal of Nuclear Power Plants, Supplement 39; Regarding Prairie Island Nuclear Generating Plant, Units 1 and 2, Final Report
SFA	Spent Fuel Assembly
SH	Radiation Shielding (Intended Function)
SHPO	State Historic Preservation Office
SS	Structural Support (Intended Function)
SSC	Structure, System, and Component
Supplemental ER	2011 ISFSI Supplement to Applicant's Environmental Report
TLAA	Time-Limited Aging Analysis
TLD	Thermoluminescent Dosimeter
TN	Transnuclear Incorporated
U-235	Uranium-235
USAR	Updated Safety Analysis Report
USC	United States Code
USCB	United States Census Bureau

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1.0 GENERAL INFORMATION

Northern States Power Company, a Minnesota corporation, d/b/a Xcel Energy (hereafter "NSPM") has prepared this application for renewal of the site-specific license for the Independent Spent Fuel Storage Installation (ISFSI) located at the Prairie Island Nuclear Generating Plant (PINGP). This application supports license renewal for an additional 40-year period beyond the end of the current license term of Materials License Number SNM-2506 (Docket No. 72-10). The original 20-year license will expire on October 31, 2013. This application is submitted two years prior to expiration of the license, in accordance with 10 Code of Federal Regulations (CFR) 72.42(b) and includes the general, technical, and environmental supporting information required by applicable portions of Subpart B of 10 CFR Part 72.

The information contained in this section includes:

1. Information on the organization of the application (Section 1.1),
2. A general description of the Prairie Island ISFSI facility (Section 1.2),
3. The administrative information required by 10 CFR 72.22 (Section 1.3),
4. Summary of the financial assurance for decommissioning (Section 1.4),
5. Summary of abbreviations and intended function code definitions (Section 1.5), and
6. A list of the references for Section 1.0, General Information (Section 1.6).

1.1 Application Format and Content

The application format and content are based on 10 CFR Part 72 (Reference 1.6.1) and the guidance contained in NUREG-1927, "Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance"(Reference 1.6.2). NSPM's application is also consistent with the pilot site-specific ISFSI license renewal application submitted by Virginia Electric and Power Company for the Surry Power Station site-specific ISFSI (Reference 1.6.3), and the subsequent applications submitted by Progress Energy for the Robinson Nuclear Plant site-specific ISFSI license renewal (Reference 1.6.4) and the Duke Energy license renewal submittal for the Oconee Nuclear Station site-specific ISFSI (Reference 1.6.5). The format and content include:

1. General Information - Section 1.0 has been expanded beyond the requirements of 10 CFR 72.22 to provide (1) information on the format and content of the application, (2) a general facility description, (3) financial assurance for decommissioning, and (4) a summary of abbreviations and intended function code definitions used in the application.
2. Scoping Evaluations - Section 2.0 provides the scoping evaluations for the ISFSI structures, systems, and components (SSC).
3. Aging Management Review - Section 3.0 includes the methodology and results of the aging management reviews (AMR) performed for site-specific ISFSI SSCs that are in-scope of license renewal.

4. Appendices:

Appendix A:	Aging Management Program
Appendix B:	Time-Limited Aging Analyses
Appendix C:	Safety Analysis Report Supplement and Changes
Appendix D:	Technical Specification Changes
Appendix E:	Environmental Report Supplement
Appendix F:	Additional Information (training and qualifications)

1.2 Facility Description

The PINGP site encompasses about 578 acres and is located within the city limits of Red Wing, Minnesota, in Goodhue County. NSPM owns most of the land in the site in fee. NSPM owns and operates two nuclear units on site.

The Prairie Island Site-Specific ISFSI is located within PINGP's owner-controlled area. The Prairie Island ISFSI uses the Transnuclear (TN) TN-40 and TN-40HT bolted cask design systems to provide for the vertical dry storage of spent fuel assemblies (SFA). Two seismically qualified concrete pads provide for two parallel rows of 12 casks per row on each pad. The fence surrounding the ISFSI protected area is within the PINGP site boundary and exclusion area. The controlled area, which is required by 10 CFR 72.106 to be established around the ISFSI, corresponds to the site exclusion area boundary. The earthen berm surrounding the ISFSI provides radiological shielding. A complete description of the Prairie Island Site-Specific ISFSI is provided in the Prairie Island Independent Spent Fuel Storage Installation Safety Analysis Report (ISFSI SAR) (Reference 1.6.6).

The PINGP Unit No.1 and Unit No. 2 reactors are operated under separate licenses, DPR-42 (Unit 1) and DPR-60 (Unit 2), issued pursuant to the provisions of 10 CFR 50 and are, therefore, not addressed in this application. However, the cessation of the Part 50 license would not obviate meeting the ISFSI licensing requirements for programs such as the Radiation Protection program, Quality Assurance program, and fuel retrievability.

1.3 Information Required by 10 CFR 72.22

1.3.1 Name of Applicant

Northern States Power Company - Minnesota d/b/a Xcel Energy

1.3.2 Address of Applicant

Northern States Power Company - Minnesota
414 Nicollet Mall
Minneapolis, Minnesota 55401-1993

1.3.3 Address of the Prairie Island ISFSI

Prairie Island Nuclear Generating Plant
1717 Wakonade Drive East
Welch, Minnesota 55089-9642

1.3.4 Description of Business or Occupation of Applicant

NSPM is a utility principally involved in the generation, purchase, transmission, distribution and sale of electricity. NSPM is a wholly owned utility operating company subsidiary of Xcel Energy, Inc. ("Xcel Energy"). Xcel Energy, a Minnesota corporation, is a major U.S. electric and natural gas company that operates in eight Western and Midwestern states and provides a comprehensive portfolio of energy-related products and services to approximately 3.4 million electricity customers and 1.9 million natural gas customers.

1.3.5 Organization and Management of Applicant

The Prairie Island ISFSI is owned by NSPM. The company's general office and principal place of business is located in Minnesota.

The Company is not owned, controlled or dominated by an alien, a foreign corporation, or a foreign government. The Company makes this application on its own behalf and is not acting as an agent or representative of any other person.

Directors and Executive Officers of Applicant

The business address, names, titles, and citizenship of the current directors and executive officers of NSPM are as follows:

Address: Northern States Power Company - Minnesota
414 Nicollet Mall
Minneapolis, Minnesota 55401-1993

Name	Position	Citizenship
Benjamin G.S. Fowke, III	Chairman and Director	US
Judy M. Poferl	President and Chief Executive Officer (also Director)	US
Teresa S. Madden	Senior Vice President and Chief Financial Officer (also Director)	US
Scott M. Wilensky	Senior Vice President and General Counsel	US
Marvin E. McDaniel, Jr.	Senior Vice President	US
Kent T. Larson	Senior Vice President	US
Dennis L. Koehl	Senior Vice President and Chief Nuclear Officer	US
David M. Sparby	Senior Vice President (also Director)	US
George E. Tyson II	Vice President and Treasurer	US
Jeffrey S. Savage	Vice President and Controller	US
Cathy J. Hart	Vice President and Secretary	US

The business addresses, names, titles, and citizenship of NSPM senior nuclear leadership are as follows:

Address: Northern States Power Company - Minnesota
414 Nicollet Mall
Minneapolis, Minnesota 55401-1993

Name	Position	Citizenship
Dennis L. Koehl	Chief Nuclear Officer	US
James E. Molden	Vice President of Engineering, Nuclear Regulatory Compliance and Licensing	US

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

Name	Position	Citizenship
Mark A. Schimmel	Site Vice President, Prairie Island Nuclear Generating Plant	US

1.3.6 Financial Qualifications of NSPM

NSPM will remain financially qualified to carry out the operation and decommissioning of the ISFSI during the period of the renewed material license as required by 10 CFR 72.22(e).

Data, including corporate annual reports, to support the conclusion that NSPM is financially qualified to operate the ISFSI may be accessed at the following website:

http://phx.corporate-ir.net/phoenix.zhtml?c=89458&p=irol-reportsAnnual

1.4 Financial Assurance for Decommissioning (10 CFR 72.30)

A decommissioning funding plan for the ISFSI was submitted to the Nuclear Regulatory Commission (NRC) in its original application for a materials license on August 31, 1990. The basic elements of the plan, i.e., shipping of the fuel to an off-site repository and decontamination and disposal of the dry storage casks remain unchanged. The actual activities at the time of decommissioning will be dependent upon the regulations and practices in effect at that time. Discussion of decommissioning of the Prairie Island ISFSI is contained in Section 4.6 and Section A4.6 of the ISFSI SAR (Reference 1.6.6).

Decommissioning costs for the ISFSI were estimated to be a small fraction of the decommissioning costs of the operating nuclear units. A recent estimate of the cost for decontamination and removal of the ISFSI was submitted to the NRC on March 28, 2011 (Reference 1.6.7). The decommissioning funding status reports for the existing operating plants, including the ISFSI, are provided to the NRC every two years per 10 CFR 50.75(f)(1).

1.5 Abbreviations and Intended Function Code Definitions

1.5.1 Abbreviations

The acronyms and abbreviations that pertain to the administrative and technical information in this application, as well as Appendices A through F, are listed prior to the Table of Contents.

1.5.2 Intended Function Code Definitions

This section contains the meanings for the subcomponent intended function represented by the abbreviations used in subsequent sections of this application, including Table 2.4-2 through Table 2.4-4. Subcomponent intended functions are the specific functions that support the intended function of the structure and component of which they are a part.

Intended Function Code	Definition
CC	Provides criticality control of spent fuel
HT	Provides heat transfer
PB	Directly or indirectly maintains the cask pressure boundary (confinement)
SH	Provides radiation shielding
SS	Provides structural support and/or functional support, missile shielding, and/or retrievability of important to safety equipment (structural integrity)

1.6 References (Section 1.0, General Information)

1.6.1 10 CFR 72, *Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste*, Code of Federal Regulations, U.S. NRC.

1.6.2 NUREG-1927, *Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance*, March 2011.

1.6.3 Letter from D.A. Christian, Virginia Electric and Power Company to D.A. Cool (NRC), *Surry Independent Spent Fuel Storage Installation License Renewal Application*, dated April 29, 2002, ADAMS Accession Number ML021290068.

1.6.4 Letter from J.F. Lucas, Progress Energy to Document Control Desk (NRC), *Request for Renewal of Independent Spent Fuel Storage Installation License*, dated February 27, 2004, ADAMS Accession Number ML040690774.

1.6.5 Letter from D.A. Baxter, Duke Energy to Document Control Desk (NRC), *Site Specific Independent Spent Fuel Storage Installation (ISFSI) License Renewal Application*, dated January 30, 2008, ADAMS Accession Number ML081280084.

1.6.6 *Prairie Island Independent Spent Fuel Storage Installation Safety Analysis Report* (ISFSI SAR), Revision 14.

1.6.7 Letter from J.E. Molden, NSPM to Document Control Desk (NRC), *Decommissioning Funding Status Reports*, dated March 28, 2011, ADAMS Accession Number ML110871121.

2.0 SCOPING EVALUATIONS

2.1 Introduction

The Prairie Island ISFSI license renewal process and methodology follows the guidance contained in NUREG-1927, "Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance" (Reference 2.5.1). The 10 CFR Part 72 license renewal process, as described in NUREG-1927, follows the principle that the basis for renewal of the license depends on "the continuation of the existing licensing basis throughout the period of extended operation and on the maintenance of the intended functions of the SSCs important to safety" (Reference 2.5.1). Based on these principles, license renewal is not intended to impose requirements beyond those reflected in the current licensing basis (CLB). Therefore, the CLB for the Prairie Island ISFSI will be carried forward through the period of extended operation.

The scoping process involves identification of the SSCs of the ISFSI and their subcomponents that are within the scope of license renewal, and thus require evaluation for the effects of aging. A description of the scoping process is provided in Section 2.2, Scoping Methodology, and the results are provided in Section 2.4, Scoping Evaluation Results.

2.2 Scoping Methodology

The first step in the license renewal process involves the identification of the in-scope ISFSI SSCs. The scoping criteria used for this scoping evaluation were expanded from those contained in NUREG-1927. The criteria used in NUREG-1927 are based upon the "Important To Safety" Quality Assurance classification system. The TN-40HT dry storage casks are classified as "Important to Safety" in accordance with the criteria of 10 CFR 72.3 (Section A4.5 of Reference 2.5.2). However, as described in the Prairie Island ISFSI SAR, the original ISFSI SSCs, including the TN-40 dry storage casks, are classified as "Safety Related" or "Non-Safety Related" (Section 4.5 of Reference 2.5.2). Due to the differences in classification between the TN-40HT and TN-40 SSCs, the criteria in NUREG-1927 were expanded to include SSCs classified as Safety Related or Non-Safety Related. ISFSI SSCs are considered in-scope if their safety function(s) meet either of the following scoping criteria:

Criterion 1

The SSC is classified as Important To Safety (or Safety Related) as it is relied on to do one of the following:

a. Maintain the conditions required by the regulations and license to store spent fuel safely.

b. Prevent damage to the spent fuel cask during handling and storage.

c. Provide reasonable assurance that spent fuel can be received, handled, packaged, stored, and retrieved without undue risk to the health and safety of the public.

These SSCs ensure that important to safety functions are met for: (1) criticality, (2) shielding, (3) confinement, (4) heat transfer, (5) structural integrity, and (6) retrievability.

Criterion 2

The SSC is classified as not Important To Safety (or Non-Safety Related) but, according to the licensing basis, its failure could prevent fulfillment of a function that is important to safety, or its failure as a support SSC could prevent fulfillment of a function that is important to safety.

The ISFSI SSCs that meet the Scoping Criteria are presented in Section 2.4, Scoping Evaluation Results.

A basic premise of the license renewal scoping process is that the CLB identifies SSCs and their safety functions. Thus, the CLB is reviewed to determine those SSCs with safety functions that meet either Scoping Criterion 1 or 2, as defined above. The following documents comprise the CLB for the Prairie Island ISFSI:

- Prairie Island ISFSI Safety Analysis Report (SAR) (Reference 2.5.2)
- Materials License No. SNM - 2506 (Reference 2.5.3)
- Technical Specifications (Reference 2.5.3, Appendix A)
- Docketed Licensing Correspondence

The Prairie Island ISFSI SAR provides a description of the ISFSI, ISFSI SSCs and their functions, including safety classifications as established by the safety analyses. The Technical Specifications govern the safety of the receipt, possession, and storage of irradiated nuclear fuel at the ISFSI, and the transfer of such irradiated fuel to and from PINGP Units 1 and 2 and the ISFSI. Additionally, the Safety Evaluation Report (Reference 2.5.4), which summarizes the results of the NRC Staff's safety review of the original licensing, and the Safety Evaluation Reports associated with subsequent amendments were used in the license renewal scoping process.

The in-scope SSCs are further reviewed to identify and describe the subcomponents that support the SSC safety function. Subcomponents that perform or support any one of the identified intended functions in a passive manner, without moving parts or a change in configuration or properties, are determined to require an aging management review.

Those subcomponents that either do not support an intended function, or perform an intended function by a change in configuration or properties (active), are excluded from further evaluation in the aging management review with supporting justification.

A general description of the subcomponents of the in-scope SSCs that are evaluated to determine if they have an intended function is in Section 2.3, Description of Subcomponents. The primary source for the description of the subcomponents and the intended functions of the spent fuel assemblies is the Prairie Island Updated Safety Analysis Report (Reference 2.5.5). Section 2.4,

Scoping Evaluation Results, contains the results of the review of the intended functions for the in-scope SSCs subcomponents.

2.3 Description of Subcomponents

2.3.1 Description of Casks

The following subcomponents of the TN-40 and TN-40HT casks are described in this section:

- Cask Body (including neutron shielding)
- Fuel Basket
- Cask Lid
- Cask Seals

Cask Body (including neutron shielding)

The TN-40 and TN-40HT containment vessel is comprised of an inner shell, which is a welded carbon steel cylinder with an integrally-welded carbon steel bottom; a welded flange forging; a flanged and bolted carbon steel lid; and vent and drain port seals, covers and bolts. The inner shell and bottom are surrounded by a carbon steel gamma shield. Radial neutron shielding is provided by borated polyester resin enclosed in aluminum, which surrounds the exterior of the cask gamma shield. The outer shell of the cask is carbon steel. Additional neutron shielding is provided by a disc of polypropylene encased in carbon steel, and bolted to the cask lid.

The inner and bottom containment surfaces have a sprayed metallic coating of zinc/aluminum for corrosion protection. The cask external surfaces are painted for ease of decontamination. The cask sealing surfaces are clad with stainless steel for corrosion protection.

Carbon steel trunnions are provided at the cask upper and lower ends to permit cask movement and transport. A protective cover fits over the top of the cask to provide weather protection. The protective cover is sealed with an elastomer O-ring.

Fuel Basket

The fuel basket structure is an assembly of stainless steel cells joined by a fusion welding process and separated by aluminum and neutron absorbing plates which form a sandwich panel. The fuel basket structure is designed to hold 40 fuel assemblies.

Cask Lid

The lid is fabricated of carbon steel and secured to the cask body with bolts. The sealing arrangement consists of double metallic O-ring seals. Two penetrations are provided in the lid for cask venting and draining evolutions. One additional penetration is provided for the overpressure system. The overpressure system is designed to maintain helium pressure between the cask lid seals and cask lid penetration seals at a pressure greater than the pressure in the cask and the ambient atmospheric pressure. Pressurization of monitored seal interspaces

provides a continuous positive inward and outward pressure gradient which guards against a release of the cavity gas to the environment and the admission of air to the cavity. An overpressure system consisting of a tank, tubing, fill valve, and pressure sensors, maintains pressure between the seals. The overpressure tank is mounted on top of the cask under the protective cover.

Cask Seals

The cask lid is equipped with double metallic O-ring seals. There are three access ports in the cask lid; 1) Drain Port, 2) Vent Port, and 3) Overpressure Port. Each of the three access ports is provided with a bolted stainless steel cover, which is equipped with metallic O-ring seals. The vent and drain port covers have two O-rings, while the overpressure port cover has only one O-ring. For ease of operation, the drain and vent ports are equipped with a quick-disconnect valve.

The Helicoflex metallic face O-ring seals of the lid and lid penetrations possess long-term stability and have high corrosion resistance over the entire storage period. These high performance seals are comprised of two metal linings formed around a helically-wound spring. The sealing principle is based on plastically deforming the seal's outer lining. Permanent contact of the lining against the sealing surface is ensured by the outward force exerted by the helically-wound spring.

The combined cover-seal pressure monitoring system always meets or exceeds the requirement of a double barrier closure which guarantees tight, permanent containment.

2.3.2 Description of Spent Fuel Assemblies

Each cask contains 40 Pressurized Water Reactor (PWR) spent fuel assemblies which, at the time of loading, had a maximum heat generation limit of less than 0.675 kilowatt per assembly for fuel stored in a TN-40 cask, and 0.800 kilowatts per assembly for fuel stored in a TN-40HT cask. The maximum average burnup is 45 Gigawatt-Days per Metric Ton Uranium (GWd/MTU) for fuel stored in a TN-40 cask and 60 GWd/MTU for fuel stored in a TN-40HT cask.

The following subcomponents of the spent fuel assemblies are described in this section and are applicable to fuel stored in the TN-40 and TN-40HT casks:

- Fuel Rods (including cladding and end plugs)
- Guide Tubes
- Grid Assemblies
- Upper Nozzle
- Bottom Nozzle

Fuel Rods (including cladding and end plugs)

The fuel rods consist of enriched UO_2 pellets inserted into the cladding tubes. Plug-type end caps are seal welded to each end. The cladding and end plugs confine the fuel pellets and fission gases. Each rod is pressurized with helium during fabrication.

Guide Tubes
The guide tubes are welded to the grid spacers, and mechanically attached and secured to the upper and bottom nozzles. The guide tubes provide channels for control rods and fuel inserts. They provide the structural support for the fuel assembly.

Grid Assembly
The grid assemblies, which are attached to the guide tubes, provide support for the fuel cladding tubes, positioning them in a square array maintaining the designed rod pitch.

Bottom Nozzle
The bottom nozzle is connected to the guide tubes and provides a base to support the fuel assembly.

Upper Nozzle
The upper nozzle provides a means to lift the entire fuel assembly. The upper nozzle is attached to the guide tubes as described above.

Excluded Spent Fuel Assembly Subcomponents
In addition to the above Spent Fuel Assembly subcomponents, the following subcomponents are not described because they do not support or impact the intended function(s) of a Spent Fuel Assembly:

- Fuel assembly inserts (e.g., Burnable Poison Rod Assemblies or Thimble Plug Devices)
- Fuel pellets and other fuel rod internals (fuel rod spring)
- Instrument tube
- Nozzle spring set

2.3.3 Description of Concrete Pads

The ISFSI contains two reinforced concrete pads that provide for two parallel rows of 12 casks per row on each pad. Each pad is 36 inches thick and is seismically qualified. The concrete storage pads provide structural support for the storage casks and are classified as Safety Related (Section 4.5.5 of Reference 2.5.2). The concrete is designed for a nominal compressive strength of 3,000 psi at 28 days.

2.3.4 Description of Earthen Berm

The ISFSI is surrounded by a 17 foot high (above the elevation of the concrete pads) earthen berm, except for the access road opening. The berm is designed for radiation shielding but also visually screens the facility from plant exclusion area boundaries.

The berm surrounding the site is constructed of earth fill material. To limit the site area and amount of required fill, a slope of one horizontal to one vertical is used for the berm. The berm is reinforced with geofabric. Erosion control material and natural vegetation give the berm a natural appearance.

2.4 Scoping Evaluation Results

The SSCs comprising the ISFSI are identified in Table 2.4-1. Those SSCs meeting Scoping Criterion 1 or 2 are identified in the table as being within the scope of license renewal.

As indicated in Table 2.4-1, only the dry storage casks, spent fuel assemblies stored in the casks, concrete pads, and earthen berm are determined to be within the scope of license renewal and require further review. The intended functions performed by the individual subcomponents of these in-scope SSCs which require an aging management review are identified in Table 2.4-2, Table 2.4-3, and Table 2.4-4. The tables also identify subcomponents that do not support the SSC intended function and are not subject to an aging management review.

2.5 References (Section 2.0, Scoping Evaluations)

2.5.1 NUREG-1927, *Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance*, March 2011.

2.5.2 *Prairie Island Independent Spent Fuel Storage Installation Safety Analysis Report* (ISFSI SAR), Revision 14.

2.5.3 *Prairie Island Independent Spent Fuel Storage Installation, Materials License No. SNM-2506,* Northern States Power Company, Amendment 7, dated August 20, 2010.

2.5.4 *Safety Evaluation Report for the Northern States Power Company Prairie Island Independent Spent Fuel Storage Installation*, NRC, Docket No. 72-10, October 1993.

2.5.5 *Prairie Island Updated Safety Analysis Report* (USAR), Revision 31.

Table 2.4-1 - SSCs Within Scope of License Renewal

Structures/Components	Criterion 1*	Criterion 2**	In-Scope
Dry Storage Casks	Y	N/A	Y
Spent Fuel Assemblies	Y	N/A	Y
Reinforced Concrete Pads	Y	N/A	Y
Earthen Berm	N	Y	Y
ISFSI Pressure Monitoring System	N	N	N
Lighting	N	N	N
Security Fence and Gates	N	N	N
Transporter and Supporting Equipment	N	N	N

*Criterion 1

The SSC is classified as Important To Safety (or Safety Related) as it is relied on to do one of the following:

a. Maintain the conditions required by the regulations and license to store spent fuel safely.

b. Prevent damage to the spent fuel cask during handling and storage.

c. Provide reasonable assurance that spent fuel can be received, handled, packaged, stored, and retrieved without undue risk to the health and safety of the public.

**Criterion 2

The SSC is classified as not Important To Safety (or Non-Safety Related) but, according to the licensing basis, its failure could prevent fulfillment of a function that is important to safety, or its failure as a support SSC could prevent fulfillment of a function that is important to safety.

Table 2.4-2 - Intended Functions of Cask Subcomponents

Dry Storage Casks	Intended Function				
Subcomponent	**CC**	**HT**	**PB**	**SH**	**SS**
Shell		X	X	X	X
Lid		X	X	X	X
Inner Containment		X	X	X	X
Bottom		X	X	X	X
Bottom Inner Containment		X	X	X	X
Upper Trunnion					X
Lower Trunnion					X
Shield Plate				X	
Outer Shell				X	X
Protective Cover	None				
Top Neutron Shield				X	
Top Neutron Shield Enclosure					X
Top Neutron Shield Bolts					X
Radial Neutron Shield				X	
Radial Neutron Shield Box		X			X
Lid Bolts			X		X
Protective Cover Bolt	None				
Lid Seal (O-ring)			X		

Table 2.4-2 - Intended Functions of Cask Subcomponents (Continued)

Dry Storage Casks	Intended Function				
Subcomponent	**CC**	**HT**	**PB**	**SH**	**SS**
Protective Cover Seal (O-ring)	**None**				
Overpressure Port Cover	**None**				
Overpressure Port Cover Seal (O- ring)	**None**				
Overpressure Tank, Isolation Valves and Tubing	**None**				
Vent Port Covers			**X**		
Drain Port Covers			**X**		
Drain and Vent Port Cover Bolts			**X**		**X**
Drain and Vent Port Cover Seals (O-ring)			**X**		
Vent and Drain Quick Disconnects	**None**				
Overpressure Port Cover Bolts	**None**				
Lid Alignment Pins	**None**				
Basket Rails		**X**			**X**
Fuel Compartment	**X**	**X**			**X**
Aluminum Plate		**X**			
Poison Plate	**X**	**X**			
Containment Flange			**X**		**X**

Table 2.4-3 - Intended Functions of Spent Fuel Assembly Subcomponents

Spent Fuel Assemblies	Intended Function				
Subcomponent	CC	HT	PB	SH	SS
Fuel Assembly Insert	None				
Fuel Pellet	None				
Fuel Rod Spring	None				
Fuel Cladding	X	X	X		X
Fuel Cladding End Plug	X	X	X		X
Guide Tube					X
Grid Assembly, Mid Fuel Assembly	X	X			X
Grid Assembly, Top & Bottom	X	X			X
Instrument Tube	None				
Bottom Nozzle					X
Upper Nozzle					X
Nozzle Spring Set	None				

Table 2.4-4 - Intended Functions of Concrete Pads and Earthen Berm

Structures	Intended Function				
	CC	HT	PB	SH	SS
Dry Fuel Storage Cask Pads					X
Earthen Berm				X	

3.0 AGING MANAGEMENT REVIEWS

3.1 Aging Management Review Methodology

The purpose of the AMR is to assess the SSCs determined to be within the scope of renewal. The AMR addresses aging effects/mechanisms that could adversely affect the ability of the SSCs to perform their intended functions during the period of extended operation. The AMR process involves the following three major steps:

1. Identification of materials and environments.
2. Identification of aging effects/mechanisms requiring management.
3. Determination of the activities/programs required to manage the effects/mechanisms of aging.

Each of these steps is discussed in Sections 3.1.1 through 3.1.3, respectively. Also, the Operating Experience (OE) review for confirmation of the AMR process and the document sources used in the process are discussed in Sections 3.1.4 and 3.1.5, respectively.

The results of the AMR for the subcomponents of the SSCs that are within the scope of license renewal are provided in the following sections:

- Section 3.2, Aging Management Review Results - Casks
- Section 3.3, Aging Management Review Results - Spent Fuel Assemblies
- Section 3.4, Aging Management Review Results - Concrete Pads
- Section 3.5, Aging Management Review Results - Earthen Berm

Corresponding tables that summarize the AMR for subcomponents of these SSCs are located at the end of Section 3.0, Aging Management Reviews.

3.1.1 Identification of Materials and Environments

The first step of the AMR process involves the identification of the materials of construction and the environments to which these materials are exposed for the subcomponents that require an AMR.

The materials of construction were identified through a review of pertinent design and/or design basis documents, which are addressed in Section 3.1.5. A summary of the materials of construction is provided in Section 3.2.1 for the Cask subcomponents, Section 3.3.1 for the Spent Fuel Assembly subcomponents, Section 3.4.1 for the Concrete Pads, and Section 3.5.1 for the Earthen Berm. The materials of construction are also reflected in the corresponding AMR summary tables (Tables 3.2-1, 3.3-1, 3.4-1, and 3.5-1).

The environment(s) to which subcomponents are exposed plays a critical role in the determination of potential aging effects and mechanisms. A review of plant documentation, discussed in Section 3.1.5, was performed to quantify the environmental conditions to which the SSCs are normally exposed. Descriptions of the internal and external environments, which have been used in the AMR, are

included in Sections 3.2.2, 3.3.2, 3.4.2, and 3.5.2, and are reflected in the corresponding AMR summary tables.

3.1.2 Identification of Aging Effects Requiring Management

The second step in the AMR process involves the identification of the aging effects/mechanisms requiring management. Aging effects/mechanisms requiring management during the period of extended operation are those that could cause a loss of component intended function(s). If the relevant conditions do not exist at the Prairie Island ISFSI for the aging effect to occur, then no aging management is required.

Potential aging effects/mechanisms, presented in terms of material and environment combinations, have been evaluated and those aging effects/mechanisms requiring management determined. Both potential aging effects/mechanisms that may occur, as well as aging effects/mechanisms that have actually occurred based upon industry and Prairie Island operating experience, were addressed. The evaluation was applied to subcomponents, regardless of form (i.e., cask body, cover, lid, guide tube, etc.).

As described above, the environments considered in this evaluation are the environments that the subcomponents normally experience. Environmental stressors that are conditions not normally experienced (such as extreme cold), or that may be caused by a design/fabrication condition, are considered event-driven and are not age related. Such event-driven situations would be evaluated and corrective actions, if any, implemented at the time of the event.

Aging effects are the manifestation of aging mechanisms. In order to effectively manage an aging effect, it is necessary to determine the aging mechanisms that are potentially at work for a given material and environment combination. Therefore, the AMR process identifies both the aging effects and the associated aging mechanisms which cause them. Various aging mechanisms are only applicable at certain conditions, such as high temperature or moisture, for example. Each identified aging mechanism was characterized by a set of applicable conditions that must be met for the mechanism to occur. Given this evaluation process, each subcomponent that was subjected to AMR was evaluated to determine if the potential aging effects/mechanisms were credible considering the various material/environment combinations.

The potential aging effects/mechanisms that were considered for the casks, concrete pads, and earthen berm were primarily based on analysis tools and reports provided by Electric Power Research Institute (EPRI) reports, Prairie Island specific operating experience, and industry operating experience.

The potential aging effects/mechanisms that were considered for the SFAs were primarily based on Interim Staff Guidance (ISG) 11 (Reference 3.7.2) and the EPRI Dry Cask Storage Characterization Project (Reference 3.7.3).

A summary of the aging effects/mechanisms requiring management for the casks, SFAs, concrete pads, and earthen berm is provided in Section 3.2.3,

3.3.3, 3.4.3, and 3.5.3 respectively. Appendix B provides the identification and evaluation of Time-Limited Aging Analyses (TLAA) associated with the casks.

3.1.3 Determination of the Activities Required to Manage the Effects of Aging

The final step in the AMR process involves the determination of the aging management activities or the aging management program to be credited or developed for managing the effects/mechanisms of aging. The existing ISFSI programs and/or activities were credited for the management of aging effects/mechanisms that could cause a loss of component intended function during the period of extended operation.

As indicated in Section 3.3.3, and reflected in the corresponding AMR summary table (Table 3.3-1), there are no aging effects/mechanisms requiring management during the period of extended operation for the subcomponents of the SFAs. The aging management programs for the casks, concrete pads, and earthen berm are described in Sections 3.2.4, 3.4.4, and 3.5.4, respectively, and are listed in the corresponding AMR summary tables (Tables 3.2-1, 3.4-1, and 3.5-1).

The demonstration of the effectiveness of the aging management programs that were selected for the casks, concrete pads, and earthen berm, is discussed in Appendix A, Aging Management Program.

3.1.4 Operating Experience Review for Process Confirmation

As described in Section 3.1.2, Identification of Aging Effects Requiring Management, potential aging effects and mechanisms were evaluated based on industry and plant operating experience, as well as various metallurgical literary references relating specific materials and environments to aging effects and mechanisms. In addition, site-specific operating experience for another NSPM site (Monticello Nuclear Generating Plant) was also evaluated. The evaluations were based on the premise that similar materials in similar environments experience similar aging effects. The evaluations also consider applied and residual stresses that may impact applicable aging mechanisms (i.e., stress corrosion cracking of stainless steels). However, applied thermal stresses are not a significant factor in the determination of applicable aging effects and were considered in the initial licensing of the cask designs. The thermal analysis predicted stresses based on maximum heat load, which occurs following the initial loading of fuel into the cask. Cask thermal stresses are a function of cask design and decrease with time due to decreasing fuel clad temperature. Additionally, the stainless steel overlay area of the cask flange is applied following a weld procedure that limits preheat and interpass temperatures to a level such that sensitization of the stainless steel is prevented. Therefore, thermal stresses are not considered in the determination of applicable aging effects or mechanisms. The operating experience evaluations were primarily conducted to identify any aging effects and mechanisms not previously identified in the aging effects evaluation.

No anomalies have been identified for the earthen berm, and no anomalies of any consequence have been identified for the reinforced concrete pads.

A discussion of operating experience, as it pertains to the effectiveness of the Aging Management Program (AMP) credited for the ISFSI, is also contained in Appendix A, Aging Management Program.

3.1.4.1 Cask Degradation

The Prairie Island ISFSI has been in operation since May of 1995. Visual inspections of the in-service casks to date have identified only minor cases of coating degradation which are corrected by touching-up of the existing coating material. There has been no evidence of loss of material under the degraded coating.

Trending of the in-service dry fuel storage cask interseal helium pressures has revealed no issues with the seals or age related issues with the pressure monitoring system leak-tight integrity on any of the 29 in-service casks. However, there have been instances during extreme cold weather conditions when a low pressure alarm was received requiring the pressure monitoring system to be charged and the fittings tightened. These event-driven issues were a function of extreme temperature conditions and not age-related.

EPRI Report 1002882, “Dry Cask Storage Characterization Project - Final Report” (Reference 3.7.3), indicated the possibility of corrosion of the stainless steel fasteners for the rear breech plate which is located on the bottom of the CASTOR V/21 casks. Although NSPM does not utilize the CASTOR V/21 cask design, the concern was addressed as part of the baseline inspection discussed later in this section.

Virginia Electric and Power Company (Dominion) identified in the Surry ISFSI License Renewal Application (Reference 3.7.6) corrosion of their Transnuclear TN-32 lid bolts and outer metallic lid seals. Dominion stated that the corrosion of the lid bolts and outer metallic seal (aluminum-jacketed) was the result of external water intrusion in the vicinity of the bolts and seal. It was determined that the Conax connector seal for the electrical connector in the cask protective cover was leaking due to improper installation of the connector. This degradation was a function of improper installation and not age-related. However, as a result of this experience, the vendor, Transnuclear (TN), issued an Information Bulletin (Reference 3.7.7) on these findings. The TN Information Bulletin informed all TN storage cask users of two issues that occurred at Dominion’s Surry Power Station involving the TN-32 storage casks.

TN stated that the Surry site location may have exacerbated the corrosion of the lid bolts and outer metallic lid seals due to the brackish environment and the presence of chlorides in water from precipitation or humidity which would accelerate a galvanic reaction. Although the Prairie Island ISFSI site is not located in an area that is exposed to a brackish environment, NSPM has conservatively included loss of material due to galvanic corrosion for aluminum as a potential aging mechanism in the ISFSI Atmosphere/Weather environment.

A second issue discussed in the TN bulletin was that some lid bolts on three of the Surry casks did not have the same torque value that was applied prior to placement of the casks at the ISFSI. Lid bolts could be removed by hand on two casks. However, in all cases there was no evidence that the lid metallic O-rings lost their seal due to the reduced bolt torque. A majority of the hand-tight bolts were identified at locations that are tightened early in the "star" torquing sequence. Evaluations by TN confirmed that the lid seals would remain compressed and containment would be maintained. Consensus was that a change in bolt torquing sequence methodology should be taken to mitigate the possibility of thermal expansion causing the bolting problems. Additionally, TN recommended a lubricant (Neolube or Loc-Tite N-5000) be applied to the bolts. Additional information on this subject may be found in the TN Information Bulletin.

These recommendations have been addressed at PINGP and are incorporated in the applicable PINGP Maintenance Procedures for loading the casks. Similar operating experience was also identified with the TN-68 casks utilized at the Peach Bottom Atomic Power Station (Reference 3.7.8) and was evaluated.

Based on the above OE issues and the guidance in Appendix E of NUREG-1927, NSPM performed additional visual inspections of the normally inaccessible external surfaces of a lead in-service cask. NUREG-1927 Appendix E states, "A staff-accepted way to verify canister condition at an independent spent fuel storage installation is by remote visual inspection of one or more canisters ('lead canisters'). A lead canister is selected on the basis of longest time in service, or hottest thermal load, and/or other parameters that contribute to degradation" (Reference 3.7.9). Following this guidance, NSPM selected Cask TN-40 01 (Cask 01) as the lead cask because it had the longest in-service time of 16 years. The baseline inspection included inspection of the bottom of the cask (cask area in direct contact with the concrete pad) and underneath the protective cover. Due to industry OE concerning the area underneath the protective covers (water intrusion and bolt torque issues), this portion of the baseline inspection was expanded to include the inspection of a second in-service cask. As a result, Cask TN-40 13 (Cask 13) was also selected for inspection of the area underneath the protective cover.

The results of the cask bottom inspection revealed that approximately 25% of the protective coating on the bottom of Cask 01 exhibited loss of adhesion (peeling). In areas with loss of adhesion, the base metal did not exhibit any degradation that would affect the cask's intended function. The majority of the base metal was clean, however some corrosion and corrosion product stains were observed, mainly in areas where the epoxy coating itself was cracking. In those areas, the base metal did not have measurable loss of material. Additionally, the concrete under the cask exhibited no visual signs of degradation. Therefore, the evaluation of the condition concluded that no corrective action was necessary.

With the protective cover removed, inspection of the area underneath the cover of Cask 01 was performed. During this inspection, no subcomponents within the scope of License Renewal exhibited any evidence of degradation. The

observable area of the lid and lid bolt heads had no indication of corrosion. A coating of rust was found on the cask flange at the protective cover interface. This rust coating originated on the carbon steel protective cover, was deposited on the cask flange, and was easily removed. The removal of this coating revealed no degradation to the stainless steel overlay surface of the cask flange and no corrosion between the lid and flange in the main lid seal area. The neutron shield bolts were removed, inspected, and observed to have no indication of corrosion with the N-5000 lubricant still intact on the threads. The neutron shield protective coating exhibited no signs of corrosion and all additional areas of the outer shell and lower trunnions also exhibited no signs of corrosion.

The protective cover was found to have uniform corrosion on the flange sealing surface outside (external side) of the O-ring seal. There was minor corrosion around the protective cover bolt holes where the bolt heads had broken the epoxy coating due to friction upon installation. The underside of the protective cover dome had no signs of degradation. The protective cover O-ring seal remained in acceptable condition with the exterior coating on the protective cover exhibiting checking on approximately 15% to 20% of the surface area.

Inspection of the area underneath the protective cover of Cask 13 was also performed with the protective cover removed. During this inspection, no subcomponents within the scope of License Renewal exhibited any evidence of degradation. The observable area of the lid and lid bolt heads had no indication of corrosion. The stainless steel flange overlay had only small stains where rust from the protective cover was deposited. The stains were removed and there was no indication of corrosion on the observable area of the flange and no corrosion was observed between the lid and flange near the main lid seal area. The neutron shield bolts were removed and inspected with no indication of corrosion and also had the N-5000 lubricant still intact on the threads. The neutron shield had two rust stains on the protective coating directly below the access cover with one stain approximately six inches in diameter and the other approximately two inches in diameter. The protective cover was found to have corrosion on the interior. The corrosion appears to have started at the interior face of the access cover opening where the stainless steel overpressure system piping welded to the access plate made contact with the protective cover. The protective cover dome had evidence of corrosion in the area where it connected to the access plate. The access plate itself had corrosion on the entire interior surface excluding the area that was covered by the rubber gasket. However, none of these subcomponents exhibiting corrosion are within the scope of License Renewal.

The inspections performed for Cask 01 and Cask 13 with the protective covers removed were performed on those subcomponents not normally accessible and included the protective covers, access plates, neutron shields, neutron shield bolts, lid bolts, etc. Additionally, the torque values for the lid bolts were verified to address the previous industry OE discussed above. No issues were identified with regard to any degradation of any of the subcomponents within the scope of License Renewal that would affect their intended function(s). Furthermore, the

as-found lid bolt torque value met the original 1995 as-left torque value of 930 foot-pounds.

During the baseline inspections of Casks 01 and 13, the accessible areas of the casks were also inspected. The upper trunnions of Cask 01 exhibited some corrosion product stains on the top of the trunnion shaft. There was no indication of corrosion on all other areas inspected on Cask 01 and Cask 13.

These reviews confirm that the Prairie Island ISFSI Inspection and Monitoring Activities Program is effective in monitoring and detecting degradation before any loss of intended function and that any potential aging effect will be identified, evaluated, and managed effectively, ensuring that these structures and components will remain capable of performing their intended functions during the period of extended operation.

3.1.4.2 Fuel Assembly Degradation

The conditions and findings of the Dry Cask Storage Characterization Project conducted by EPRI are considered to be representative of the conditions and materials inside a dry fuel storage cask at the Prairie Island ISFSI, as described in Section 3.3.3. This Project evaluated the condition of fuel rods following approximately 15 years of dry storage and found no evidence of significant degradation of the cask (including internal basket and fuel assemblies), no signs of air ingress into the container or signs of cladding failure, no evidence of major crud spallation from the fuel rod surfaces, and that all materials inside the cask, including the assemblies, appeared as they did at initial loading.

Detailed examination of the fuel rods following these 15 years of dry storage showed that the fuel was suitable for extended storage. No deleterious effects such as fission gas release, cladding creep, cladding hydride reorientation, or cladding property degradation was observed.

The results of the conditions and findings of the Dry Cask Storage Characterization Project conducted by EPRI confirm that these subcomponents will remain capable of performing their intended functions during the period of extended operation.

3.1.4.3 Summary of Operating Experience

The review of operating experience identified a number of incidents related to dry fuel storage. Although many of these were event-driven and most were not age-related, for those that did involve credible aging effects and aging mechanisms, evaluations were conducted to assess PINGP's potential susceptibility. These evaluations indicated that the aging effects and aging mechanisms that were identified are bounded by the Aging Management Reviews that were performed at PINGP for those structures and components identified as within the scope of License Renewal.

This review did not identify any aging effects or aging mechanisms beyond those previously identified as a result of the process described in Section 3.1.2. Additionally, the appropriateness of the assigned Aging Management Activities

was confirmed as part of this operating experience review and that the ISFSI will remain capable of performing its intended functions during the period of extended operation.

3.1.5 Documentation Sources Used for the Aging Management Review Process

The following documents were the primary sources for determination of the materials and environmental conditions for SSCs identified as in-scope for license renewal:

- Prairie Island ISFSI Safety Analysis Report (Reference 3.7.4)
- Prairie Island Updated Safety Analysis Report (Reference 3.7.5)

Other plant documents such as drawings, technical reports, vendor manuals, procedures were consulted, as appropriate, to further clarify materials and environmental conditions.

Lastly, industry topical reports, reference books, and standards were consulted as appropriate for description and evaluation of aging effects/mechanisms as discussed in Section 3.1.2.

3.2 Aging Management Review Results - Casks

This section provides the results of the AMR for the casks that were identified in Section 2.4, Scoping Evaluation Results, as being subject to AMR.

A summary of the results of the AMR for the casks is provided in Table 3.2-1, AMR Results for Casks. The table provides the following information related to each subcomponent determined to be within the scope of license renewal: (1) the intended function(s), (2) the material group, (3) the environment, (4) the aging effect(s) requiring management, (5) the aging mechanism(s), and (6) the specific aging management activities that manage those aging effects/mechanisms.

A description of the cask subcomponents which support an intended function is provided in Section 2.3.1, and a summary of the materials and environments for the casks is provided in Section 3.2.1 and Section 3.2.2, respectively. Sections 3.2.3 and 3.2.4 provide a discussion of the aging effects/mechanisms requiring management for the subject cask subcomponents and any aging management activities used to manage the effects/mechanisms of aging, respectively.

3.2.1 Materials Evaluated

The materials of construction for cask subcomponents that are subject to AMR include stainless steel, carbon steel, nickel-based alloys, aluminum, polypropylene, borated polyester, and borated compounds. The material group of individual subcomponents is identified in Table 3.2-1.

3.2.2 Environments

The environments that affect the subcomponents of each cask, both externally and internally, are those that are normally experienced and are described below:

External
Based on climatological data in Figure 2.3-1A of Reference 3.7.5, the external environment for the casks ranges in air temperature from -35°F to 100°F. The outdoor Atmosphere/Weather environment includes humidity, precipitation, ultraviolet radiation, ozone, and wind.

The potential off-gases of the enclosed neutron shields are included in the Air/Gas environment used in the AMR.

Internal
The casks are filled with helium gas. Additionally, trace amounts of other gases such as nitrogen, oxygen, argon and fission product gasses may be present. These gases have collectively been grouped in the Air/Gas environment used in the AMR.

The maximum cask internal pressure and average gas temperature were determined to be 17.5 psig and 456°F. These values correspond to storage conditions for the TN-40HT casks and bound the corresponding values for the TN-40 casks. The gas temperature and corresponding pressure decrease over time as the decay heat of the fuel decreases.

The maximum operating temperatures for various subcomponents of the cask are found in Table 3.3-1 and Table A3.3-3 of Reference 3.7.4 for the TN-40 and TN-40HT casks, respectively.

After 25 years of storage, the fast neutron fluence inside a TN-40HT cask is on the order of 10^{14} n/cm^2. Extrapolating this value to the end of the period of extended operation shows that it is below the neutron embrittlement threshold value of 10^{17} n/cm^2.

3.2.3 Aging Effects Requiring Management

This section describes the aging effects/mechanisms that could, if left unmanaged, cause degradation of cask subcomponents and result in loss of intended function(s) during the period of extended operation. The AMR results for individual cask subcomponents are reflected in Table 3.2-1. Based on the material and environment combinations, and consideration of the conditions during the period of extended operation, the following aging effects and associated mechanism(s) were determined to require management:

- Loss of Material due to crevice corrosion – External aluminum, carbon steel and stainless steel surfaces of the cask,
- Loss of Material due to galvanic corrosion – External Carbon steel and aluminum surfaces of the cask that are in contact with stainless steel,
- Loss of Material due to general corrosion – External carbon steel surfaces of the cask, and
- Loss of Material due to pitting corrosion – External aluminum, carbon steel and stainless steel surfaces of the cask.

3.2.4 Aging Management Activities

The ISFSI Inspection and Monitoring Activities Program manages the aging effect of loss of material for the subcomponents of the casks identified in Table 3.2-1.

A description of this aging management activity is provided in Appendix A along with the demonstration that the identified aging effect will be effectively managed for the period of extended operation.

3.2.5 AMR Conclusion

The ISFSI Inspection and Monitoring Activities Program provides reasonable assurance that the cask's aging effects/mechanisms will be managed effectively such that the subcomponents will continue to perform their intended function(s) during the period of extended operation.

3.3 Aging Management Review Results – Spent Fuel Assemblies

This section provides the results of the AMR for the SFAs that were identified in Section 2.4, Scoping Evaluation Results, as being subject to AMR.

A summary of the results of the AMR for the SFAs is provided in Table 3.3-1, AMR Results for Spent Fuel Assemblies. The table provides the following information related to each subcomponent determined to be within the scope of license renewal: (1) the intended function(s), (2) the material group, (3) the environment, (4) the aging effect(s) requiring management, (5) the aging mechanism(s), and (6) the specific aging management activities that manage those aging effects/mechanisms.

A description of the SFA subcomponents which support an intended function is provided in Section 2.3.2, and a summary of the materials and environments for the SFAs is provided in Section 3.3.1 and Section 3.3.2, respectively. Sections 3.3.3 and 3.3.4 provide a discussion of the aging effects/mechanisms requiring management for the subject SFA subcomponents and any aging management activities used to manage the effects/mechanisms of aging, respectively.

3.3.1 Materials Evaluated

The materials of construction for the SFA subcomponents that are subject to AMR are zirconium-based alloy, stainless steel, and nickel-based alloy. The material group of individual SFA subcomponents is identified in Table 3.3-1.

3.3.2 Environments

The environments that affect the subcomponents of each SFA, both externally and internally, are those that are normally experienced and are described below:

External

The external environment seen by the SFAs is the same internal environment of the cask. In addition to the helium within the cask, trace amounts of other gases such as nitrogen, oxygen, argon and fission product gasses may be present. These gases have collectively been grouped in the Air/Gas environment used in the AMR.

Additionally, residual boric acid may coat the SFAs surfaces since they were exposed to a borated water environment in the spent fuel pool prior to storage. Any boric acid residue remaining on the SFAs will have no deleterious effects/mechanisms due to the absence of water and the materials of construction for the SFAs.

Following initial cask loading, the maximum fuel cladding temperature was calculated to be 642°F for fuel in a TN-40 cask and 680°F for fuel in a TN-40HT cask. Fuel cladding temperature will then decrease over time while in storage.

Internal

The fuel cladding and guide tubes are the only two fuel assembly subcomponents that have internal environments. The fuel rods were initially pressurized with helium during manufacturing. For purposes of this evaluation, the fuel rod internal environment is assumed to be a combination of the original helium fill gas and fission products produced during reactor operation. The guide tubes are open on the end and have the same Air/Gas internal and external environment.

3.3.3 Aging Effects Requiring Management

This section identifies the possible aging effects/mechanisms of storage on SFAs and the bases for concluding that there are no aging effects/mechanisms that require management. Relevant EPRI and NRC documents were used to identify the possible aging effects/mechanisms.

Cladding Considerations for the Transportation and Storage of Spent Fuel

The NRC developed ISG-11 (Reference 3.7.2) to define the acceptance criteria needed to provide reasonable assurance that commercial spent fuel is maintained in the configuration that is analyzed in the licensee's safety analysis report for spent fuel storage. ISG-11 broadened the NRC's technical basis for storage of SFAs with average burnups exceeding 45 GWd/MTU. At fuel burnups exceeding 45 GWd/MTU, the buildup of hydrogen in the cladding and wall thinning due to corrosion are a concern. ISG-11 emphasizes the need to limit the formation of radial hydrides, which can occur when high-burnup cladding (high hydrogen content) experiences a high tensile stress. Therefore, ISG-11 establishes the limits for the peak cladding temperature (peak tensile stress) and the number of thermal cycles to prevent high tensile stress conditions from occurring. ISG-11 states that maintaining peak cladding temperature less than 400°C (752°F) will limit cladding hoop stress and limit the amount of soluble hydrogen available to form the radial hydrides.

ISG-11 also discusses the applicability of the peak cladding temperature limits to storage of SFAs with burnups less than 45 GWd/MTU. ISG-11 states, "Based on staff's evaluation, it is expected that fuel assemblies with burnups less than 45 GWd/MTU are not likely to have a significant amount of hydride reorientation due to limited hydride content. Further, most of the low-burnup fuel has hoop stresses below 90 Mega-Pascal. Even if hydride reorientation occurred during storage, the network of reoriented hydrides is not expected to be extensive

enough in low-burnup fuel to cause fuel rod failures." Thus, storage of SFAs with burnups of less than 45 GWd/MTU is not considered susceptible to radial hydride formation.

Dry Cask Storage Characterization Project

In the mid-1980s, the Department of Energy sponsored the Dry Cask Storage Characterization Project to evaluate the thermal performance of a Castor dry storage cask system (Reference 3.7.3). Fuel from the Surry station (a pressurized water reactor) was placed in the Castor dry storage cask system and exposed to six thermal cycles (referred to as "benchmark testing"); the two hottest cycles reached fuel temperatures of 415°C and 398°C. After the last thermal test, the cask was stored on a concrete pad for about 15 years.

As part of an EPRI and NRC program to evaluate dry storage facility license renewal, fuel from this cask was then removed and examined. The fuel assembly was a Westinghouse 15x15 assembly with an assembly averaged burnup of 35.7 GWd/MTU. The fuel was 3.11% enriched and 95% dense. The cladding was cold-worked/stress-annealed Zircaloy-4.

Detailed examination showed that the fuel was suitable for extended storage. No deleterious effects such as fission gas release, cladding creep, cladding hydride reorientation, or cladding property degradation was observed.

The main conclusions of the report are:

1. The rods experienced very little thermal creep during benchmark testing and storage. Little additional creep would be expected for additional storage duration because of the low temperature.
2. No additional fission gas appears to have been released. This means further pressurization of the cask is not expected.
3. No evidence of hydrogen pickup or hydride reorientation was observed. A small amount of axial migration of hydrogen to cooler sections might have occurred.
4. Little or no cladding annealing occurred during either the benchmark testing or long-term storage.
5. Creep tests on post-storage samples showed residual creep strains exceeding 1% with the 400°C sample exceeding 6%. The cladding retains significant creep ductility.

Conclusions

SFAs with burnup of less than 45 GWd/MTU are not impacted by radial hydride formation (Reference 3.7.2). The results of the Dry Cask Storage Characterization Project (Reference 3.7.3) support the conclusion that the condition of SFAs will not degrade under extended storage. The maximum assembly average burnup for a SFA stored in a TN-40 cask is 45 GWd/MTU (per ISFSI Technical Specification Functional and Operating Limit 2.2, Reference 3.7.1). Thus, the SFAs in the TN-40 casks are not impacted by radial hydride formation.

For SFAs with burnup greater than 45 GWd/MTU, the likelihood of this degradation mechanism occurring is minimized by limiting peak cladding temperature to less than 752°F. The maximum assembly average burnup for a SFA stored in a TN-40HT cask is 60 GWd/MTU (per ISFSI Technical Specification Functional and Operating Limit 2.3, Reference 3.7.1). Table A3.3-3 of the ISFSI SAR shows that the maximum calculated cladding temperature for storage conditions for SFAs to be stored in a TN-40HT cask is 680°F. This value is below the 752°F limit. As a result, Reference 3.7.2 is considered to adequately bound conditions associated with the higher burnup limit of 60 GWd/MTU for the TN-40HT casks. Thus, the SFAs in the TN-40HT casks are not impacted by radial hydride formation.

Based on this information, there are no aging effects/mechanisms that require management for SFAs stored in the inert environment in a cask.

3.3.4 Aging Management Activities

There are no aging effects/mechanisms requiring management for the SFAs. Therefore, no aging management program or activities are credited during the period of extended operation for SFA subcomponents.

3.3.5 AMR Conclusion

There are no aging effects/mechanisms requiring management during the period of extended operation for the SFAs subcomponents.

Therefore, the intended function(s) of the SFAs will be maintained for the period of extended operation.

3.4 Aging Management Review Results – Concrete Pads

This section provides the results of the AMR for the concrete pads that were identified in Section 2.4, Scoping Evaluation Results, as being subject to AMR.

A summary of the results of the AMR for the concrete pads is provided in Table 3.4-1, AMR Results for Concrete Pads. The table provides the following information related to the concrete pads: (1) the intended function, (2) the material group, (3) the environment, (4) the aging effect(s) requiring management, (5) the aging mechanism(s), and (6) the specific aging management activities that manage those aging effects/mechanisms.

A description of the concrete pads and their intended function is provided in Section 2.3.3, and a summary of the material and environments for the concrete pads is provided in Section 3.4.1 and Section 3.4.2, respectively. Sections 3.4.3 and 3.4.4 provide a discussion of the aging effects/mechanisms requiring management for the concrete pads and any aging management activities used to manage the effects/mechanisms of aging, respectively.

3.4.1 Materials Evaluated

The material of construction for the concrete pads that is subject to AMR is reinforced concrete.

3.4.2 Environments

The environments that affect the concrete pads are those that are normally experienced and are described below:

External

Based on climatological data in Figure 2.3-1A of Reference 3.7.5, the external environment for the concrete pads ranges in air temperature from -35°F to 100°F. The outdoor Atmosphere/Weather environment includes humidity, precipitation, ultraviolet radiation, ozone, and wind.

A portion of the concrete pads are located below grade and are exposed to a Soil (Buried) environment.

Internal

There are no internal environments associated with the concrete pads.

3.4.3 Aging Effects Requiring Management

This section describes the aging effects/mechanisms that could, if left unmanaged, cause degradation of concrete pads and result in loss of intended function(s) during the period of extended operation. The AMR results for the concrete pads are reflected in Table 3.4-1. Based on the materials and environment combinations, and consideration of the conditions during the period of extended operation, the following aging effects and associated mechanism(s) were determined to require management:

- Change in Material Properties due to leaching of calcium hydroxide ($Ca(OH)_2$) for the Atmosphere/Weather and Soil (Buried) environment,
- Cracking due to freeze-thaw and reaction with aggregates for the Atmosphere/Weather environment,
- Cracking due to reaction with aggregates and settlement for the Soil (Buried) environment, and
- Loss of Material due to freeze-thaw for the Atmosphere/Weather environment.

3.4.4 Aging Management Activities

The ISFSI Inspection and Monitoring Activities Program manages the aging effects of change in material properties, cracking, and loss of material for the concrete pads.

A description of this aging management activity is provided in Appendix A along with the demonstration that the identified aging effects will be effectively managed for the period of extended operation.

3.4.5 AMR Conclusion

The ISFSI Inspection and Monitoring Activities Program provides reasonable assurance that the concrete pads' aging effects/mechanisms will be managed effectively such that they will continue to perform their intended function during the period of extended operation.

3.5 Aging Management Review Results – Earthen Berm

This section provides the results of the AMR for the earthen berm that was identified in Section 2.4, Scoping Evaluation Results, as being subject to AMR.

A summary of the results of the AMR for the earthen berm is provided in Table 3.5-1, AMR Results for Earthen Berm. The table provides the following information related to the earthen berm: (1) the intended function, (2) the material group, (3) the environment, (4) the aging effect(s) requiring management, (5) the aging mechanism(s), and (6) the specific aging management activities that manage those aging effects/mechanisms.

A description of the earthen berm and its intended function is provided in Section 2.3.4, and a summary of the material and environment for the earthen berm is provided in Section 3.5.1 and Section 3.5.2, respectively. Sections 3.5.3 and 3.5.4 provide a discussion of the aging effects/mechanisms requiring management for the earthen berm and any aging management activities used to manage the effects/mechanisms of aging, respectively.

3.5.1 Materials Evaluated

The material of construction for the earthen berm that is subject to AMR is soil.

3.5.2 Environments

The environment that affects the earthen berm that is normally experienced is described below:

External

Based on climatological data in Figure 2.3-1A of Reference 3.7.5, the external environment for the earthen berm ranges in air temperature from -35°F to 100°F. The outdoor Atmosphere/Weather environment includes humidity, precipitation, ultraviolet radiation, ozone, and wind.

Internal

There are no internal environments associated with the earthen berm.

3.5.3 Aging Effects Requiring Management

This section describes the aging effects/mechanisms that could, if left unmanaged, cause degradation of the earthen berm and result in loss of intended function(s) during the period of extended operation. The AMR results for the earthen berm are reflected in Table 3.5-1. Based on the materials and environment combinations, and consideration of the conditions during the period of extended operation, the following aging effects and associated mechanism(s) were determined to require management:

- Change in Material Properties due to desiccation,
- Loss of Form due to settlement and frost action, and
- Loss of Material due to erosion.

3.5.4 Aging Management Activities

The ISFSI Inspection and Monitoring Activities Program manages the aging effects of change in material properties, loss of form, and loss of material for the earthen berm.

A description of this aging management activity is provided in Appendix A along with the demonstration that the identified aging effect will be effectively managed for the period of extended operation.

3.5.5 AMR Conclusion

The ISFSI Inspection and Monitoring Activities Program provides reasonable assurance that the earthen berm aging effects/mechanisms will be managed effectively such that it will continue to perform its intended function during the period of extended operation.

3.6 Retrievability

Section 3.2 above describes the AMR for the casks. The results of that review along with the aging management activities described in Appendix A provide reasonable assurance that NSPM will be capable of moving the casks to an appropriate location for disassembly and unloading of the SFAs. Section 3.3 describes the AMR performed for the SFAs and concludes that there are no aging effects/mechanisms requiring management during the period of extended operation. Thus, the SFAs will be capable of being unloaded by normal means.

Based on the AMR results of the SFAs and the AMA of the casks, there is reasonable assurance that the SFAs will be retrievable by normal means during the period of extended operation.

3.7 References (Section 3.0, Aging Management Reviews)

3.7.1 *Prairie Island Independent Spent Fuel Storage Installation, Materials License No. SNM-2506, Appendix A, Technical Specifications,* Northern States Power Company, Amendment 7, dated August 20, 2010.

3.7.2 NRC Interim Staff Guidance 11, *Cladding Considerations for the Transportation and Storage of Spent Fuel*, Revision 3, November 17, 2003.

3.7.3 EPRI Report 1002882, *Dry Cask Storage Characterization Project, Final Report*, September 2002.

3.7.4 *Prairie Island Independent Spent Fuel Storage Installation Safety Analysis Report* (ISFSI SAR), Revision 14.

3.7.5 *Prairie Island Updated Safety Analysis Report* (USAR), Revision 31.

3.7.6 Letter from D.A. Christian, Virginia Electric and Power Company to D.A. Cool (NRC), *Surry Independent Spent Fuel Storage Installation License Renewal Application*, dated April 29, 2002, ADAMS Accession Number ML021290068.

3.7.7 Transnuclear Information Bulletin, April 2001.

3.7.8 Letter from Garey L. Stathes, Exelon Generation Company to Director Spent Fuel Project Office (NRC), *Submittal of Independent Spent Fuel Storage Installation (ISFSI) Cask Event Report*, dated December 01, 2010, ADAMS Accession Number ML110060275.

3.7.9 NUREG-1927, *Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance*, March 2011.

Table 3.2-1
AMR Results for Casks

Subcomponent	Intended Function	Material	Environment[4]	Aging Effect	Aging Mechanism	Aging Management Activities
Shell	HT, PB, SH, SS	Carbon Steel	(I) Air/Gas	None	N/A	N/A
			(E) Air/Gas	None	N/A	N/A
			(E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					General Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program
Lid	HT, PB, SH, SS	Carbon Steel	(I) Air/Gas	None	N/A	N/A
			(E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					Galvanic Corrosion	ISFSI Inspection and Monitoring Activities Program
					General Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program
Inner Containment	HT, PB, SH, SS	Nickel-Based Alloys	(I) Air/Gas	None	N/A	N/A
			(E) Air/Gas	None	N/A	N/A
Bottom	HT, PB, SH, SS	Carbon Steel	(I) Air/Gas	None	N/A	N/A
			(E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					General Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program
Bottom Inner Containment	HT, PB, SH, SS	Nickel-Based Alloys	(I) Air/Gas	None	N/A	N/A
			(E) Air/Gas	None	N/A	N/A

Table 3.2-1
AMR Results for Casks (Continued)

Subcomponent	Intended Function	Material	Environment[4]	Aging Effect	Aging Mechanism	Aging Management Activities
Upper Trunnion	SS	Carbon Steel	(E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
Lower Trunnion					General Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program
Shield Plate	SH	Carbon Steel	(I) Air/Gas	None	N/A	N/A
			(E) Air/Gas	None	N/A	N/A
Outer shell	SH, SS	Carbon Steel	(I) Air/Gas	None	N/A	N/A
			(E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					General Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program
Top Neutron Shield	SH	Polypropylene	(E) Air/Gas	None	N/A	N/A
Top Neutron Shield Enclosure[1]	SS	Carbon Steel	(I) Air/Gas	None	N/A	N/A
			(E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					General Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program
Top Neutron Shield Bolts	SS	Carbon Steel	(E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					General Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program

Table 3.2-1
AMR Results for Casks (Continued)

Subcomponent	Intended Function	Material	Environment[4]	Aging Effect	Aging Mechanism	Aging Management Activities
Radial Neutron Shield	SH	Borated Polyester	(E) Air/Gas	None	N/A	N/A
Radial Neutron Shield Box[2]	HT, SS	Aluminum	(I) Air/Gas	None	N/A	N/A
			(E) Air/Gas	None	N/A	N/A
Lid Bolts	PB, SS	Carbon Steel	(E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					Galvanic Corrosion	ISFSI Inspection and Monitoring Activities Program
					General Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program
Lid Seal (O-ring)	PB	Aluminum	(I) Air/Gas	None	N/A	N/A
			(E) Atmosphere/ Weather (outer)	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					Galvanic Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program
Vent Port Covers	PB	Stainless Steel	(I) Air/Gas	None	N/A	N/A
			(E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program
Drain Port Covers	PB	Stainless Steel	(I) Air/Gas	None	N/A	N/A
			(E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program
Drain and Vent Port Cover Bolts	PB, SS	Carbon Steel	(E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					Galvanic Corrosion	ISFSI Inspection and Monitoring Activities Program
					General Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program

Table 3.2-1
AMR Results for Casks (Continued)

Subcomponent	Intended Function	Material	Environment[4]	Aging Effect	Aging Mechanism	Aging Management Activities
Drain and Vent Port Cover Seals (O-ring)	PB	Aluminum	(I) Air/Gas	None	N/A	N/A
			E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					Galvanic Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program
Basket Rails	HT, SS	Aluminum	(E) Air/Gas	None	N/A	N/A
Fuel Compartment	CC, HT, SS	Stainless Steel	(E) Air/Gas	None	N/A	N/A
Aluminum Plate[3]	HT	Aluminum	(I) Air/Gas	None	N/A	N/A
			(E) Air/Gas	None	N/A	N/A
Poison Plate	CC, HT	Borated Compounds	(E) Air/Gas	None	N/A	N/A
Containment Flange	PB, SS	Carbon Steel	(I) Air/Gas	None	N/A	N/A
			(E) Air/Gas	None	N/A	N/A
			(E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					Galvanic Corrosion	ISFSI Inspection and Monitoring Activities Program
					General Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program
		Stainless Steel	(E) Atmosphere/ Weather	Loss of Material	Crevice Corrosion	ISFSI Inspection and Monitoring Activities Program
					Pitting Corrosion	ISFSI Inspection and Monitoring Activities Program

[1] This is a Carbon Steel enclosure, plate or shell encasing Polypropylene.

[2] This is an Aluminum enclosure, plate or shell encasing Borated Polyester.

[3] This includes the Aluminum enclosure, plate or shell encasing Borated Compounds (i.e., Boral®, Aluminum Metal Matrix Composite [MMC] or Borated Aluminum).

[4] (I) refers to an internal environment and (E) refers to an external environment.

Table 3.3-1
AMR Results for Spent Fuel Assemblies

Subcomponent	Intended Function	Material	Environment[1]	Aging Effect	Aging Mechanism	Aging Management Activities
Fuel Cladding	CC, HT, PB, SS	Zirconium-Based Alloys	(I) Air/Gas	None	N/A	N/A
			(E) Air/Gas	None	N/A	N/A
Fuel Cladding End Plug	CC, HT, PB, SS	Zirconium-Based Alloys	(E) Air/Gas	None	N/A	N/A
Guide Tube	SS	Zirconium-Based Alloys	(I) Air/Gas	None	N/A	N/A
			(E) Air/Gas	None	N/A	N/A
Grid Assembly, Mid Fuel Assembly	CC, HT, SS	Zirconium-Based Alloys	(E) Air/Gas	None	N/A	N/A
Grid Assembly, Top & Bottom	CC, HT, SS	Nickel-Based Alloys	(E) Air/Gas	None	N/A	N/A
Bottom Nozzle	SS	Stainless Steel	(E) Air/Gas	None	N/A	N/A
Upper Nozzle	SS	Stainless Steel	(E) Air/Gas	None	N/A	N/A

[1] (I) refers to an internal environment and (E) refers to an external environment.

Table 3.4-1
AMR Results for Concrete Pads

Structure	Intended Function	Material	Environment[1]	Aging Effect	Aging Mechanism	Aging Management Activities
Dry Fuel Concrete pads	SS	Concrete (Reinforced)	(E) Atmosphere/ Weather	Change in Material Properties	Leaching of $Ca(OH)_2$	ISFSI Inspection and Monitoring Activities Program
				Cracking	Freeze-thaw	ISFSI Inspection and Monitoring Activities Program
					Reaction with Aggregates	ISFSI Inspection and Monitoring Activities Program
				Loss of Material	Freeze-thaw	ISFSI Inspection and Monitoring Activities Program
			(E) Soil (Buried)	Change in Material Properties	Leaching of $Ca(OH)_2$	ISFSI Inspection and Monitoring Activities Program
				Cracking	Reaction with Aggregates	ISFSI Inspection and Monitoring Activities Program
					Settlement	ISFSI Inspection and Monitoring Activities Program

[1] (E) refers to an external environment.

Table 3.5-1
AMR Results for Earthen Berm

Structure	Intended Function	Material	Environment[1]	Aging Effect	Aging Mechanism	Aging Management Activities
Earthen Berm	SH	Soil	(E) Atmosphere/ Weather	Change in Material Properties	Desiccation	ISFSI Inspection and Monitoring Activities Program
				Loss of Form	Settlement	ISFSI Inspection and Monitoring Activities Program
					Frost Action	ISFSI Inspection and Monitoring Activities Program
				Loss of Material	Erosion (Wind/Rain Impact)	ISFSI Inspection and Monitoring Activities Program

[1] (E) refers to an external environment.

APPENDIX A

AGING MANAGEMENT PROGRAM

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APPENDIX A: AGING MANAGEMENT PROGRAM

A1.0 Introduction

This appendix is a summary of the activities that manage the effects of aging for the Independent Spent Fuel Storage Installation (ISFSI) components that have been identified as being subject to Aging Management Review (AMR). The Aging Management Program (AMP) credited for the management of those aging effects and mechanisms identified for the Prairie Island ISFSI is the ISFSI Inspection and Monitoring Activities Program. This program is a subset of the Prairie Island Nuclear Generating Plant (PINGP) Structures Monitoring Program.

The ISFSI Inspection and Monitoring Activities Program is discussed in Section A2.0. That section provides a description of the ISFSI Inspection and Monitoring Activities Program which includes an introduction, an evaluation in terms of the attributes or elements of an effective Aging Management Program, and a summary. The ten elements, which are part of the ISFSI Inspection and Monitoring Activities Program, are also described. The results of an evaluation of each PINGP program element as compared to each NUREG-1927, "Standard Review Plan for Renewal of Independent Spent Fuel Storage Installation Licenses and Dry Cask Storage System Certificates of Compliance" (Subsection 3.6, Aging Management Program) program element are provided to evidence consistency.

Section 3.0, Aging Management Reviews, provides tables that summarize the results of the AMRs. These tables identify the Aging Management Activity (AMA) credited for managing each aging effect and mechanism for each component or subcomponent listed in the AMR. The AMA manages the aging effects and mechanisms, or the relevant conditions that could lead to those aging effects and mechanisms, applicable to each structure or component and provides reasonable assurance that the integrity of the structure or component will be maintained under current licensing basis conditions during the period of extended operation.

A2.0 ISFSI Inspection and Monitoring Program

The Prairie Island ISFSI provides for long-term dry fuel interim storage for spent fuel assemblies until such time that the spent fuel assemblies may be shipped off-site for final disposition. The casks presently utilized at the Prairie Island ISFSI are the Transnuclear TN-40 and TN-40HT (both of which have a 40 fuel assembly capacity) and are designed for outdoor storage. Accordingly, the exterior materials are capable of withstanding the anticipated effects of "weathering" under normal conditions.

The purpose of the ISFSI Inspection and Monitoring Activities Program is to ensure that the structure's or component's intended function(s) is not degraded for the in-service casks, concrete pads or earthen berm.

A description of the ISFSI Aging Management Program is provided below using each attribute of an effective AMP as described in NUREG-1927 for the renewal of a site-specific Part 72 license.

A2.1 Scope of Program

A2.1.1 NUREG-1927 Program Element

NUREG-1927 Program Element 1, Scope of the Program, (Reference A4.1) states “The scope of the program should include the specific structures and components subject to an AMR.”

A2.1.2 PINGP Program Element

The ISFSI Inspection and Monitoring Activities Program requires periodic inspection activities that monitor the condition of structures and components within the scope of License Renewal as the method used to manage aging effects.

The aging effects managed by this program are included in Table A2.1-1. The aging effects/mechanisms applicable to each structure and component are dependent upon their associated material/environment combinations, design, and installation. Those structures and components that have been grouped together for aging management review (e.g., Carbon Steel in Atmosphere/Weather) have been evaluated and based upon the materials of construction, design, installation, and environments, will have the same aging effects.

The scope of the ISFSI Inspection and Monitoring Activities Program includes:

1) Visual inspection of the exterior of the in-service casks,
2) Monitoring of the interseal pressure of the in-service casks,
3) Radiation monitoring and associated surveillance activities of the in-service casks,
4) Visual inspection of the concrete pads,
5) Visual inspection of the earthen berm,
6) Visual inspection of an in-service cask bottom prior to the end of the current ISFSI license period,
7) Visual inspection under an in-service cask protective cover (surfaces normally not visible or accessible with the cover in-place) prior to the end of the current ISFSI license period,
8) Visual inspection of the cask bottom in the event an in-service cask is lifted in preparation for movement (inspections of opportunity),
9) Visual inspection under the protective cover (surfaces normally not visible or accessible with the cover in-place) of an in-service cask in the event the cover is removed for maintenance (inspections of opportunity), and
10) Visual inspection of the bottom and under the protective cover of the lead cask at least every 20 years.

A2.1.3 Comparison to NUREG-1927 Program Element

This PINGP program element is consistent with NUREG-1927, Element 1, Scope of the Program.

A2.2 Preventive Actions

A2.2.1 NUREG-1927 Program Element

NUREG-1927 Program Element 2, Preventive Actions, (Reference A4.1) states "Preventive actions should mitigate or prevent the applicable aging effects."

A2.2.2 PINGP Program Element

The ISFSI Inspection and Monitoring Activities Program consists of visual inspections, condition monitoring, and performance monitoring activities to detect degradation of structures and components before the loss of their intended function(s). No preventive or mitigating attributes are associated with these activities.

A2.2.3 Comparison to NUREG-1927 Program Element

This PINGP program element is consistent with NUREG-1927, Element 2, Preventive Actions.

A2.3 Parameters Monitored or Inspected

A2.3.1 NUREG-1927 Program Element

NUREG-1927 Program Element 3, Parameters Monitored or Inspected, (Reference A4.1) states "Parameters monitored or inspected should be linked to the effects of aging on the intended functions of the particular structure and component."

A2.3.2 PINGP Program Element

The parameters monitored by the ISFSI Inspection and Monitoring Activities Program are consistent with those identified in industry codes and standards including Electric Power Research Institute (EPRI) Report 1002950, "Aging Effects for Structures and Structural Components (Structural Tools)," EPRI Report 1010639, "Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools," EPRI Technical Report 1007933 "Aging Assessment Field Guide," and American Concrete Institute (ACI) report 349.3R, "Evaluation of Existing Nuclear Safety-Related Concrete Structures." The parameters included in the program ensure degraded conditions are identified and corrected by clearly defining degraded condition criteria and associated corrective action requirements to prevent the loss of intended function. Industry and plant specific operating experience (OE) are also reviewed to ensure that parameters inspected focus on conditions identified during these OE reviews. See Table A2.1-1 for a detailed list of aging effects and mechanisms for structures and components inspected or monitored as required by the ISFSI Inspection and Monitoring Activities Program.

The ISFSI Inspection and Monitoring Activities Program also contains provisions to inspect the concrete pads whenever inaccessible (buried) areas are excavated, exposed, or modified.

In-service casks inspections

The condition of the exterior of each in-service cask is inspected visually to ensure the intended functions of the cask exterior are not compromised. Visual inspections will look for signs of damage or deterioration of the cask exterior surfaces. Additionally, the inspections will identify debris accumulating on the cask exterior surfaces. Debris may create the potential for localized conditions to support the corrosion process. The aging effect that is monitored by these inspections is loss of material. The intended functions that are monitored for these subcomponents include:

- Provides heat transfer (HT)
- Maintains a pressure boundary (PB)
- Provides radiation shielding (SH)
- Provides structural/functional support (SS)

Interseal pressure monitoring

The pressure of the helium cover gas is monitored to verify the integrity of the seals of the in-service cask lid and that the intended function is not compromised. The aging effect that is monitored by these inspections is loss of material. The intended function that is monitored for this subcomponent is:

- Maintains a pressure boundary (PB)

Radiation surveys

Radiation surveys as well as continuous monitoring via thermoluminescent dosimeters (TLD) at the ISFSI site boundary are used to verify that the radiation levels remain within the specified limits and that the shielding materials in the in-service casks are intact and are effectively performing their intended function. Degradation in the effectiveness of the shielding material would be detected by a corresponding increase in radiation levels. The aging effect that is monitored by this monitoring is loss of material. The intended function that is monitored for this subcomponent is:

- Provides radiation shielding (SH)

Concrete pad inspections

A visual inspection of the accessible areas of the concrete pads is performed to determine that no deterioration has occurred and that the intended function is not compromised. The aging effects that are monitored by these inspections are change in material properties, cracking and loss of material. The intended function that is monitored for this subcomponent is:

- Provides structural/functional support (SS)

Earthen berm inspections
The earthen berm surrounding the ISFSI is visually inspected to determine that no deterioration has occurred and that the intended function is not compromised. The aging effects that are monitored by these inspections are change in material properties, loss of form and loss of material. The intended function that is monitored for this subcomponent is:

- Provides radiation shielding (SH)

Lead cask inspections
Additionally, a visual inspection of an in-service cask bottom ("lead cask") was performed in June 2011, prior to the end of the current ISFSI license period. This visual inspection was performed to primarily ensure that there was no unanticipated degradation and the intended functions were not compromised. This inspection looked for signs of deterioration in the normally inaccessible area underneath the cask to determine the general condition of the cask bottom. This inspection was considered representative of the total population of the in-service casks based on the service period involved, material, and environment. The aging effect that was monitored by these inspections was loss of material.

A visual inspection under two in-service cask protective covers was also performed in June 2011, prior to the end of the current ISFSI license period. This visual inspection was primarily performed to ensure that there was no unanticipated degradation and the intended functions were not compromised. This inspection looked for signs of deterioration in the normally inaccessible area underneath the protective covers. This inspection was considered representative of the total population of the in-service casks based on the service period involved, materials, and environment. The aging effect that was monitored by these inspections was loss of material.

A2.3.3 Comparison to NUREG-1927 Program Element

This PINGP program element is consistent with NUREG-1927, Element 3, Parameters Monitored or Inspected.

A2.4 Detection of Aging Effects

A2.4.1 NUREG-1927 Program Element

NUREG-1927 Program Element 4, Detection of Aging Effects, (Reference A4.1) states "Detection of aging effects should occur before there is a loss of any structure and component intended function. This includes aspects such as method or technique (i.e., visual, volumetric, surface inspection), frequency, sample size, data collection, and timing of new or one-time inspections to ensure timely detection of aging effects."

A2.4.2 PINGP Program Element

A condition examination is an acceptable method used to identify aging effects and is consistent with methods provided in industry codes and standards.

Additionally, the ISFSI Inspection and Monitoring Activities Program requires inspection personnel to be trained and technically qualified to perform these examinations. The personnel evaluating the structural examination results (concrete pads and earthen berm) are degreed engineers with one or more years of structural inspection experience. The personnel evaluating the cask examination results shall be qualified in accordance with PINGP site-specific requirements.

Quarterly visual inspections of the physical condition of the exterior surfaces of all in-service casks provide a means to detect degradation of these components due to potential loss of material and confirm that the intended functions are not compromised.

Pressure monitoring of all in-service casks is performed as a continuous process and checked daily for alarms. This provides a means to detect metallic O-ring seal degradation due to potential loss of material and confirm that the intended function is not compromised.

Radiation monitoring at the ISFSI boundary and quarterly radiation surveys of the casks provide a means to detect shielding material degradation of the in-service casks and confirm that the intended function is not compromised.

Visual inspections of the accessible areas of the concrete pads every five years provide a means to detect degradation of these areas due to potential change in material properties, cracking, and loss of material. These inspections confirm that the intended function is not compromised.

Visual inspections of the earthen berm on a five-year frequency provide a means to detect degradation due to potential change in material properties, loss of form, and loss of material. These inspections confirm that the intended function is not compromised.

Visual inspections of the bottom of an in-service cask as an inspection of opportunity and, as a minimum, at 20-year intervals for the lead cask, provide a means to detect degradation of the bottom material due to potential loss of material and confirm that the intended functions are not compromised.

Visual inspections underneath the protective cover of an in-service cask as an inspection of opportunity and, as a minimum, at 20-year intervals for the lead cask, provide a means to detect degradation due to potential loss of material and confirm that the intended functions are not compromised.

Visual inspections of the ISFSI structures and components provide reasonable assurance that any degradation of the in-service casks, concrete pads, or earthen berm is identified and confirm that the structure or component intended function(s) is not compromised.

A review of plant-specific operating experience and industry operating experience for plants with similar materials and site conditions found that aging

degradation occurs slowly over time and that an inspection frequency of once every five years was sufficient for the detection of aging effects before any loss of intended function for the concrete pads and earthen berm. This has also been confirmed by this same performance frequency of once every five years for those structures and components within the scope of the Maintenance Rule (10 CFR 50.65) such as the Reactor Containment Vessels, Shield Buildings, Auxiliary Buildings, etc. The ISFSI Inspection and Monitoring Activities Program contains provisions to accelerate the frequency of the examinations based on inspection results.

A2.4.3 Comparison to NUREG-1927 Program Element

This PINGP program element is consistent with NUREG-1927, Element 4, Detection of Aging Effect.

A2.5 Monitoring and Trending

A2.5.1 NUREG-1927 Program Element

NUREG-1927 Program Element 5, Monitoring and Trending, (Reference A4.1) states “Monitoring and trending should provide for prediction of the extent of the effects of aging and timely corrective or mitigative actions.”

A2.5.2 PINGP Program Element

The ISFSI Inspection and Monitoring Activities Program, as a subset of the PINGP Structures Monitoring Program, requires monitoring the condition of structures and components using current and historical operating experience along with industry operating experience to detect, evaluate, and trend degraded conditions. When degraded conditions are detected and all associated corrective actions are complete, the structures and components are again monitored against established performance goals. The program ensures the original design basis for the structures and components is maintained by effectively managing the applicable aging effects.

Periodic visual inspections determine the potential existence of loss of material for the in-service cask exterior surfaces and accumulation of debris. The inspection frequency is quarterly. Pressure monitoring of each in-service cask to detect potential loss of material is provided as a continuous process and checked daily for alarms. Radiation levels at the ISFSI site are continuously monitored and are evaluated and recorded quarterly to detect the potential for shielding material degradation. Surveys associated with facility entry and/or cask placement are performed as required and supplement the overall radiation monitoring program. The concrete pads are visually inspected at least once every five years for any evidence of change in material properties, cracking, or loss of material. The earthen berm is visually inspected at least once every five years for any evidence of change in material properties, loss of form, and loss of material. A visual inspection of an in-service cask bottom and a visual inspection of the area underneath an in-service cask protective cover were performed in June 2011. Subsequent inspections of normally inaccessible areas of the cask bottoms and area underneath the protective cover will be performed on an

inspection of opportunity basis and, as a minimum, at 20-year intervals for the lead cask.

All observations regarding the material condition of the ISFSI are recorded in inspection procedures. The ISFSI Inspection and Monitoring Activities Program includes a process used to evaluate past and current conditions of structures and components and to determine whether they represent an adverse trend or random deficiency indicative of normal aging. If degradation exceeds or appears that it will exceed that expected of a properly maintained structure or component, a corrective action is generated requiring further engineering evaluation. All degraded conditions that result in a corrective action are trended in accordance with the Corrective Action Program.

A2.5.3 Comparison to NUREG-1927 Program Element

This PINGP program element is consistent with NUREG-1927, Element 5, Monitoring and Trending.

A2.6 Acceptance Criteria

A2.6.1 NUREG-1927 Program Element

NUREG-1927 Program Element 6, Acceptance Criteria, (Reference A4.1) states "Acceptance criteria, against which the need for corrective action will be evaluated, should ensure that the particular structure and component intended functions are maintained under the existing licensing-basis design conditions during the period of extended operation."

A2.6.2 PINGP Program Element

The ISFSI Inspection and Monitoring Activities Program includes acceptance criteria to evaluate the extent of a degraded condition and the need for corrective action before the loss of intended function. The acceptance criteria include sufficient detail to ensure timely detection of any degraded condition, followed by an evaluation in the Corrective Action Program to ensure that the particular structure or component intended function(s) is maintained under the existing licensing basis design conditions. Industry and plant-specific OE are also reviewed to ensure that the ISFSI Inspection and Monitoring Activities Program's acceptance criteria focus on conditions identified during these OE reviews.

The acceptance criteria for all visual inspections of an in-service cask are the absence of any of the aging effects listed in Table A2.1-1.

The acceptance criterion for interseal pressure monitoring is the absence of an alarmed condition. The alarm setpoint is higher than the interseal pressure specified in the Prairie Island ISFSI Technical Specification 3.1.5.

The acceptance criterion for radiation dose monitoring of an in-service cask is the absence of an increasing trend.

The acceptance criteria for all visual inspections of the concrete pads are consistent with, or more restrictive than, those contained in ACI 349.3R.

The acceptance criteria for all visual inspections of the earthen berm are the absence of any of the aging effects listed in Table A2.1-1.

The "Structures Monitoring Program," which invokes the ISFSI Inspection and Monitoring Activities Program, includes a three tiered classification of inspection findings, namely, "Acceptable," "Acceptable with Deficiencies," and "Unacceptable." An "Acceptable" condition is described as a structure or component capable of performing its intended function free of unexpected deficiencies or degradation. The "Acceptable with Deficiencies" condition is described as a structure or component considered capable of performing its intended function, but has accelerated degradation or unexpected deficiencies which, without special attention, could shorten its design life. An "Unacceptable" condition refers to a structure or component that has been damaged or degraded such that it may not be capable of performing its intended function.

A2.6.3 Comparison to NUREG-1927 Program Element

This PINGP program element is consistent with NUREG-1927, Element 6, Acceptance Criteria.

A2.7 Corrective Actions

A2.7.1 NUREG-1927 Program Element

NUREG-1927 Program Element 7, Corrective Actions, (Reference A4.1) states "Corrective actions, including root cause determination and prevention of recurrence, should be timely."

A2.7.2 PINGP Program Element

Northern States Power Company – Minnesota (NSPM) has a single Corrective Action Program that is applied regardless of the safety classification of the structure or component. The Corrective Action Program requirements are established in accordance with the requirements of the NSPM Quality Assurance Topical Report and 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

The Corrective Action Program procedures require the initiation of an Action Request for actual or potential problems including failures, malfunctions, discrepancies, deviations, defective material and equipment, nonconformances, and administrative control discrepancies, to ensure that conditions adverse to quality, operability, functionality, and reportability issues are promptly identified, evaluated if necessary, and corrected as appropriate. Guidance on establishing priority and timely resolution of issues is contained within the Corrective Action Program procedure.

All corrective actions for deviating conditions that are adverse to quality are performed in accordance with the requirements of the Quality Assurance Program which complies with the requirements of 10 CFR 50, Appendix B. Any resultant maintenance, repair/replacement activities, or special handling requirements are performed in accordance with approved procedures.

Corrective actions provide reasonable assurance that deficiencies adverse to quality are either promptly corrected or are evaluated to be acceptable. Where evaluations are performed without repair or replacement, engineering analysis reasonably assures that the intended function is maintained consistent with the current licensing basis. If the deviating condition is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude recurrence. Corrective actions identify recurring discrepancies and initiate additional corrective actions including root cause analysis to preclude recurrence.

Degraded conditions identified by the AMP inspections will be entered into the Corrective Action Program. Actions required to resolve inspection findings will be tracked to completion and trended within the Corrective Action Program.

A2.7.3 Comparison to NUREG-1927 Program Element

This PINGP program element is consistent with NUREG-1927, Element 7, Corrective Actions.

A2.8 Confirmation Process

A2.8.1 NUREG-1927 Program Element

NUREG-1927 Program Element 8, Confirmation Process, (Reference A4.1) states “The confirmation process should ensure that preventive actions are adequate and appropriate corrective actions have been completed and are effective.”

A2.8.2 PINGP Program Element

The confirmation process is part of the NSPM Corrective Action Program and ensures that the corrective actions taken are adequate and appropriate, have been completed, and are effective. The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions. The measure of effectiveness is in terms of correcting the adverse condition and precluding repetition of significant conditions adverse to quality. Procedures include provisions for timely evaluation of adverse conditions and implementation of any corrective actions required, including root cause evaluations and prevention of recurrence where appropriate. These procedures provide for tracking, coordinating, monitoring, reviewing, verifying, validating, and approving corrective actions, to ensure effective corrective actions are taken.

The Corrective Action Program is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of an Action Request. The AMP or AMAs will also uncover unsatisfactory conditions resulting from ineffective corrective action.

A2.8.3 Comparison to NUREG-1927 Program Element

This PINGP program element is consistent with NUREG-1927, Element 8, Confirmation Process.

A2.9 Administrative Controls

A2.9.1 NUREG-1927 Program Element 9, Administrative Controls

NUREG-1927 Program Element 9, Administrative Controls, (Reference A4.1) states “Administrative controls should provide a formal review and approval process.”

A2.9.2 PINGP Program Element

The NSPM Quality Assurance Program, associated formal review and approval processes, and administrative controls applicable to the AMP and Aging Management Activities, are implemented in accordance with the requirements of the NSPM Quality Assurance Topical Report and 10 CFR Part 50, Appendix B. The administrative controls that govern AMAs at PINGP are established in accordance with the PINGP Administrative Control Program and associated Fleet Procedures.

A2.9.3 Comparison to NUREG-1927 Program Element

This PINGP program element is consistent with NUREG-1927, Element 9, Administrative Controls.

A2.10 Operating Experience

A2.10.1 NUREG-1927 Program Element

NUREG-1927 Program Element 10, Operating Experience, (Reference A4.1) states “Operating experience involving the AMP, including past corrective actions resulting in program enhancements or additional programs, should provide objective evidence to support a determination that the effects of aging will be adequately managed so that the structure and component intended functions will be maintained during the period of extended operation.”

A2.10.2 PINGP Program Element

The ISFSI Inspection and Monitoring Activities Program has been effective in maintaining ISFSI structures and components. A review of ISFSI operating history provides evidence that any potential aging effects have been identified, evaluated, and managed effectively, ensuring that structures and components remain capable of performing their intended functions. It can be concluded that there is reasonable assurance that these structures and components will continue to perform their intended functions during the period of extended operation.

Routine Inspections

The Prairie Island ISFSI has been in operation since May of 1995. Visual inspections of the in-service casks, concrete pads, and earthen berm are performed in accordance with existing PINGP procedures. Inspections of the in-service casks to date have identified only minor cases of coating degradation which are corrected by touching-up of the existing coating material. There has been no evidence of loss of material under the degraded coating. No anomalies have been identified for the earthen berm. No anomalies of consequence have been identified for the concrete pads.

Lead Cask Inspections

Additional visual inspections of the normally inaccessible external surfaces of the in-service casks were evaluated for performance during a baseline inspection. The need and scope for these inspections were based on the OE issues discussed below and the guidance in NUREG-1927 Appendix E – Component-Specific Aging Management (Reference A4.1). NUREG-1927 Appendix E states, "A staff-accepted way to verify canister condition at an independent spent fuel storage installation is by remote visual inspection of one or more canisters ('lead canisters'). A lead canister is selected on the basis of longest time in service, or hottest thermal load, and/or other parameters that contribute to degradation" (Reference A4.1). Following this guidance, NSPM selected Cask TN-40 01 (Cask 01) as the lead cask because it had the longest in-service time of 16 years. The baseline inspection included inspection of the bottom of the cask (cask area in direct contact with the concrete pad) and underneath the protective cover. Due to industry OE concerning the area underneath the protective covers (water intrusion and bolt torque issues), this portion of the baseline inspection was expanded to include the inspection of a second in-service cask. As a result, Cask TN-40 13 (Cask 13) was also selected for inspection of the area underneath the protective cover.

The results of the cask bottom inspection revealed that approximately 25% of the protective coating on the bottom of Cask 01 exhibited loss of adhesion (peeling). In areas with loss of adhesion, the base metal did not exhibit any degradation that would affect the cask's intended function. The majority of the base metal was clean, however some corrosion and corrosion product stains were observed, mainly in areas where the epoxy coating itself was cracking. In those areas, the base metal did not have measurable loss of material. Additionally, the concrete under the cask exhibited no visual signs of degradation. Therefore, the evaluation in the Corrective Action Program concluded that no corrective action was necessary.

With the protective cover removed, inspection of the area underneath the cover of Cask 01 was performed. During this inspection, no subcomponents within the scope of License Renewal exhibited any evidence of degradation. The observable area of the lid and lid bolt heads had no indication of corrosion. A coating of rust was found on the cask flange at the protective cover interface. This rust coating originated on the carbon steel protective cover, was deposited on the cask flange, and was easily removed. The removal of this coating revealed no degradation to the stainless steel overlay surface of the cask flange and no corrosion between the lid and flange in the main lid seal area. The neutron shield bolts were removed, inspected, and observed to have no indication of corrosion with the N-5000 lubricant still intact on the threads. The neutron shield protective coating exhibited no signs of corrosion.

The protective cover was found to have uniform corrosion on the flange sealing surface outside (external side) of the O-ring seal. There was minor corrosion around the protective cover bolt holes where the bolt heads had broken the epoxy coating due to friction upon installation. The underside of the protective cover dome had no signs of degradation. The protective cover O-ring seal remained in acceptable condition with the exterior coating on the protective cover exhibiting checking on approximately 15% to 20% of the surface area.

Inspection of the area underneath the protective cover of Cask 13 was also performed with the protective cover removed. During this inspection, no subcomponents within the scope of License Renewal exhibited any evidence of degradation. The observable area of the lid and lid bolt heads had no indication of corrosion. The stainless steel flange overlay had only small stains where rust from the protective cover was deposited. The stains were removed and there was no indication of corrosion on the observable area of the flange and no corrosion was observed between the lid and flange near the main lid seal area. The neutron shield bolts were removed and inspected with no indication of corrosion and also had the N-5000 lubricant still intact on the threads. The neutron shield had two rust stains on the protective coating directly below the access cover with one stain approximately six inches in diameter and the other approximately two inches in diameter. The protective cover was found to have corrosion on the interior. The corrosion appears to have started at the interior face of the access cover opening where the stainless steel overpressure system piping welded to the access plate made contact with the protective cover. The protective cover dome had evidence of corrosion in the area where it connected to the access plate. The access plate itself had corrosion on the entire interior surface excluding the area that was covered by the rubber gasket. However, none of these subcomponents exhibiting corrosion are within the scope of License Renewal.

The inspections performed for Cask 01 and Cask 13 with the protective covers removed were performed on those subcomponents not normally accessible and included the protective covers, access plates, neutron shields, neutron shield bolts, lid bolts, etc. Additionally, the torque values for the lid bolts were verified to address the industry OE discussed below. No degradation of any of the subcomponents within the scope of License Renewal were identified that would affect their intended function(s). Furthermore, the as-found lid bolt torque value met the original 1995 as-left torque value of 930 ft-lbs.

During the baseline inspections of Casks 01 and 13, the accessible areas of the casks were also inspected. The upper trunnions of Cask 01 exhibited some corrosion product stains on the top of the trunnion shaft. There was no indication of corrosion on all other areas inspected on Cask 01 and Cask 13.

A work order to repair the epoxy coating on Cask 01 upper trunnions, and additional cask coating surfaces was initiated. Based on the results of the above inspections, it was concluded that these structures and components remain capable of performing their intended functions throughout the period of extended operation.

Cask Interseal Pressure Monitoring
Trending of the in-service cask interseal helium pressures has revealed no issues with the seals or age related issues with the pressure monitoring system leak-tight integrity on any of the 29 in-service casks. However, there have been instances during extreme cold weather conditions when a low pressure alarm was received requiring the pressure monitoring system to be charged and the fittings tightened. These event-driven issues were a function of extreme temperature conditions and not age-related.

Radiation Surveys
NSPM performs periodic radiation surveys of the in-service casks. Trending of these surveys results shows no evidence that the shielding is degrading. Figure A2.10-1 provides the gamma dose rates at two meters from the three casks that have been in-service the longest. Figure A2.10-2 provides the neutron dose rates at two meters from the three casks that have been in-service the longest.

Corrective Action Program
A review of items in the Corrective Action Program and the "Structures Monitoring Program Quarterly Inspection Reports" was also performed. Minor maintenance items such as cleaning and painting of pull-box covers and transmitter base plates were identified for components which are not within the scope of License Renewal.

As previously discussed, inspections of the in-service casks identified minor cases of coating degradation. Touch-up of the coating material corrected this condition with no evidence of loss of material on the casks. There have been instances during extreme cold weather conditions, as previously discussed (last instance was January of 2010 with an ambient temperature of -20^0F), when a low pressure alarm was received on casks requiring the pressure monitoring system to be charged and the fittings tightened. These event-driven issues were a function of extreme temperature conditions and not age-related.

No other issues or findings were noted in the Corrective Action Program database relative to aging of the in-scope ISFSI structures and components.

Program Health Status Reports
The ISFSI Inspection and Monitoring Activities Program is a subset of the PINGP Structures Monitoring Program. A summary of the last two Structures Monitoring Program Inspection Reports that included ISFSI structures is provided below:

- Structures Monitoring Program, Quarterly Inspection Report Third Quarter 2001

  Shallow surface spalls were identified around the base plates of three of the monitor stands adjacent to the casks. These spalls were considered acceptable. It was recommended that monitoring be continued at the specified seven-year frequency.

Four shrinkage cracks were identified on the floor slab of the Equipment Storage Building (not within the scope of License Renewal). This condition was considered acceptable. It was recommended that monitoring be continued at the seven-year frequency. Abraded coatings and surface corrosion were also identified on the pull box frames, door frames and sills in addition to loose or missing nuts and washers at the building columns. A Work Request was initiated to correct these deficient conditions. Corrosion of the interseal pressure transmitter frames and supports, including pull box frames, pull box covers, ground clamps, and Environmental Monitor supports (not within the scope of License Renewal) was also identified. A Work Request was initiated to correct these deficient conditions.

- Structures Monitoring Program, Quarterly Inspection Report Second Quarter 2008

  A Work Request was initiated to excavate to sound material the spalled concrete identified in the 3Q01 inspection and then patch the area to prevent further degradation for the shallow surface spalls identified around the base plates of three of the monitor stands.

  Significant holes were found along the foundation of the Alarm Monitoring Building (not within the scope of License Renewal). A Work Request was initiated to correct these deficient conditions by filling these holes and compacting the affected soil.

  Although the inspections identified above noted minor issues that did not pose any challenges and were adequately monitored by existing PINGP procedures which required a seven-year inspection frequency, this frequency was subsequently changed to a five-year frequency in February of 2011. This change was performed to be consistent with the requirements of the Structures Monitoring Program and the Maintenance Rule and, as a result, increased the ISFSI inspection frequency from a seven-year interval to a five-year interval.

System Health and Status Reports

The actual status of the ISFSI is evaluated under the Prairie Island ISFSI System Monitoring and Reporting Tool, “Health and Status Report.” As of July 2011, overall ISFSI performance was “Green” based on no operability concerns, no open corrective work orders and no overdue preventive maintenance work orders. There have not been any Licensee Event Reports associated with the Prairie Island ISFSI.

No issues or findings were noted relative to the ISFSI structures and components.

NRC Inspection Reports

NRC inspection reports issued during the period of February 28, 2005 through April 29, 2010 were reviewed for the ISFSI site.

No issues or findings were noted relative to the ISFSI structures and components.

Industry OE

EPRI Report 1002882, "Dry Cask Storage Characterization Project - Final Report" (Reference A4.2), indicated the possibility of corrosion of the stainless steel fasteners for the rear breech plate which is located on the bottom of the CASTOR V/21 casks. Although NSPM does not utilize the CASTOR V/21 cask design, the concern was addressed as part of the baseline inspections discussed earlier in this section.

Virginia Electric and Power Company (Dominion) identified in the Surry ISFSI License Renewal Application (Reference A4.3) corrosion of their Transnuclear TN-32 lid bolts and outer metallic lid seals. Dominion stated that the corrosion of the lid bolts and outer metallic seal was the result of external water intrusion in the vicinity of the bolts and seal. It was determined that the Conax connector seal for the electrical connector in the cask protective cover was leaking due to improper installation of the connector. This degradation was a function of improper installation and not age-related. However, as a result of this experience, the vendor, Transnuclear (TN), issued an Information Bulletin (Reference A4.4) on these findings. The TN Information Bulletin informed all TN storage cask users of two issues that occurred at Dominion's Surry Power Station involving the TN-32 Storage Casks.

The first issue concerned the Helicoflex metallic seals utilized in the cask lid. Beginning in December 1999, five low-pressure alarms occurred over a six month period. These alarms were investigated and attributed to loose or leaking pressure switches. The installed Ashcroft pressure switches were replaced with Wasco pressure switches for both Surry and North Anna. Future TN casks use the new Wasco pressure switch. This issue was a design and installation issue and not age-related.

As a result of this issue, Dominion brought five casks back to the fuel pool area from the ISFSI for lid removal. The lid seals were removed and examined both visually and microscopically and revealed that the outer metallic seal contained small thru-wall holes caused by corrosion of the outer aluminum seal jacket. No corrosion was observed on the inner containment seal nor was any leakage detected past the inner seal; therefore, containment of the cask was never compromised. Corrosion was also observed on two of the five casks' lid edges where metallic spray and/or paint did not fully cover the surface. The casks showed evidence of water intrusion and/or high humidity inside the protective cover. In some cases, residue from standing/pooling water under the lid was observed. In the presence of water, the galvanic couple between aluminum and stainless steel is sufficient to cause corrosion. It had been concluded that theTN-32 design with aluminum metallic seals is sensitive to galvanic corrosion occurring if standing water or humid conditions near saturation are experienced under the protective cover.

The TN-32 casks at Surry were a unique design in terms of the protective cover and the overpressure (OP) system. The OP system utilized pressure switches attached directly to the OP tank with electrical wires emerging from the top of the protective cover through a Conax fitting. Water entered the protective cover through the Conax fitting at the apex of the dome, due to the Conax connectors not being properly installed on the casks. This issue was a design and installation issue and not age-related. A new protective cover and OP system was retrofitted to the existing casks consistent with other TN metal storage casks with tubing to the OP tank through a bolted and gasketed cover plate located on the protective cover (similar to the TN-40 and TN-40HT cask design). Thus, the potential leak path through the Conax connection at the top of the cover was eliminated.

TN stated that the Surry site location may have exacerbated the corrosion issue due to the brackish environment and the presence of chlorides in the water from precipitation or humidity which would accelerate a galvanic reaction. Although the Prairie Island ISFSI site is not located in an area that is exposed to a brackish environment, NSPM has conservatively included loss of material due to galvanic corrosion for aluminum as a potential aging mechanism in the ISFSI Atmosphere/Weather environment.

The second issue discussed in the TN bulletin was identified upon returning the Surry casks to the fuel pool area to remove the lid. It was discovered that some lid bolts on three casks did not have the original torque value applied prior to placement of the casks at the ISFSI. Lid bolts could be removed by hand on two casks. However, in all cases there was no evidence that the lid metallic O-rings lost their seal due to the reduced bolt torque. A majority of the hand-tight bolts were identified at locations that are tightened early in the “star” torquing sequence. Evaluations by TN confirmed that the lid seals would remain compressed and containment would be maintained.

Consensus was that a change in bolt torquing sequence methodology should be taken to mitigate the possibility of thermal expansion causing the bolting problems. TN stated that it was common practice for the final torque on the lid bolts to be applied after thermal equilibrium of the cask was obtained. This would translate into using an intermediate lid bolt torque value during the draining and vacuum drying operations. A minimum of two passes should be utilized in the star pattern and additional passes made as necessary until there is no further movement of the bolts. Additionally, lubricant should be applied to the bolts and special attention paid to the calibration of the bolt torquing equipment. TN recommended the use of Neolube or Loc-Tite N-5000 as the lubricant. Additional information on this subject may be found in the TN Information Bulletin.

Similar operating experience was identified with the TN-68 casks utilized at the Peach Bottom Atomic Power Station (Reference A4.5). This information was evaluated in NSPM’s review of the operating experience.

In response to the bolting issues, the vendor recommended a bolt torquing sequence methodology and application of Loc-Tite N-5000, as stated above.

These recommendations have been addressed at PINGP and are incorporated in the applicable existing PINGP maintenance procedures.

Precedent License Renewal Applications OE
A review of precedent ISFSI license renewal applications was performed to evaluate any relevant operating experience. ISFSIs included in this review were Calvert Cliffs Nuclear Power Plant, H. B. Robinson Steam Electric Station, and Surry Power Station. The results of these reviews concluded that the Prairie Island ISFSI Inspection and Monitoring Activities Program is effective in monitoring and detecting degradation and taking effective corrective actions as needed to preclude loss of intended function.

Conclusion
The OE, reviews, and monitoring described above confirm that any potential aging effects will be identified, evaluated, and managed effectively, ensuring that these structures and components remain capable of performing their intended functions.

A2.10.3 Comparison to NUREG-1927 Program Element

This PINGP program element is consistent with NUREG-1927, Element 10, Operating Experience.

A3.0 Summary

The review of operating experience identified a number of incidents related to dry fuel storage. Although many of these were event-driven and most were not age-related, for those that did involve credible aging effects and mechanisms, evaluations were conducted to assess potential susceptibility. These evaluations indicated that the aging effects and mechanisms that were identified at the Prairie Island ISFSI are bounded by the Aging Management Reviews that were performed for those structures and components identified as within the scope of License Renewal.

Operating experience to date has not indicated any degradation that would affect the structures or component intended function(s). Inspections, monitoring, and surveillances continue to be conducted that would identify deficiencies. The Corrective Action Program is in place to track and correct deficiencies in a timely manner. Corrective actions have been effectively implemented when inspection and monitoring results have indicated degradation. Continued implementation of the ISFSI Inspection and Monitoring Activities Program provides reasonable assurance that the aging effects will be managed such that the intended functions will be maintained during the period of extended operation.

A4.0 References (Appendix A, Aging Management Program)

A4.1 NUREG-1927, *Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance*, March 2011.

A4.2 EPRI Report 1002882, *Dry Cask Storage Characterization Project, Final Report*, September 2002.

A4.3 Letter from D.A. Christian, Virginia Electric and Power Company to D.A. Cool (NRC), *Surry Independent Spent Fuel Storage Installation License Renewal Application*, dated April 29, 2002, ADAMS Accession Number ML021290068.
A4.4 Transnuclear Information Bulletin, April 2001.
A4.5 Letter from G. L. Stathes, Exelon Generation Company to Director Spent Fuel Project Office (NRC), *Submittal of Independent Spent Fuel Storage Installation (ISFSI) Cask Event Report*, dated December 01, 2010, ADAMS Accession Number ML110060275.

TABLE A2.1-1
Managed Aging Effects

Material	Environment	Aging Effect	Aging Mechanism
Aluminum	Atmosphere/Weather	Loss of Material	Crevice Corrosion
Aluminum	Atmosphere/Weather	Loss of Material	Galvanic Corrosion
Aluminum	Atmosphere/Weather	Loss of Material	Pitting Corrosion
Carbon Steel	Atmosphere/Weather	Loss of Material	Crevice Corrosion
Carbon Steel	Atmosphere/Weather	Loss of Material	Galvanic Corrosion
Carbon Steel	Atmosphere/Weather	Loss of Material	General Corrosion
Carbon Steel	Atmosphere/Weather	Loss of Material	Pitting Corrosion
Stainless steel	Atmosphere/Weather	Loss of Material	Crevice Corrosion
Stainless steel	Atmosphere/Weather	Loss of Material	Pitting Corrosion
Concrete	Atmosphere/Weather	Change in Material Properties	Leaching of $Ca(OH)_2$
Concrete	Atmosphere/Weather	Cracking	Freeze-Thaw
Concrete	Atmosphere/Weather	Cracking	Reaction with Aggregates
Concrete	Atmosphere/Weather	Loss of Material	Freeze-Thaw
Concrete	Soil	Change in Material Properties	Leaching of $Ca(OH)_2$
Concrete	Soil	Cracking	Reaction with Aggregates
Concrete	Soil	Cracking	Settlement
Earthen Structures	Atmosphere/Weather	Change in Material Properties	Desiccation
Earthen Structures	Atmosphere/Weather	Loss of Form	Settlement
Earthen Structures	Atmosphere/Weather	Loss of Form	Frost Action
Earthen Structures	Atmosphere/Weather	Loss of Material	Erosion (Wind/Rain Impact)

Figure A2.10-1
Two Meter Gamma Dose Rates

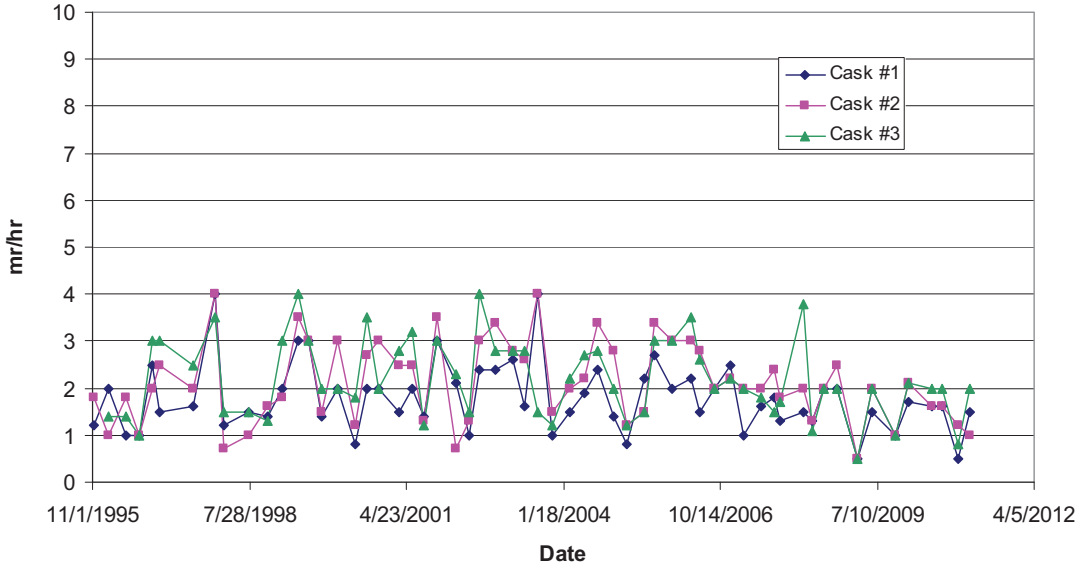
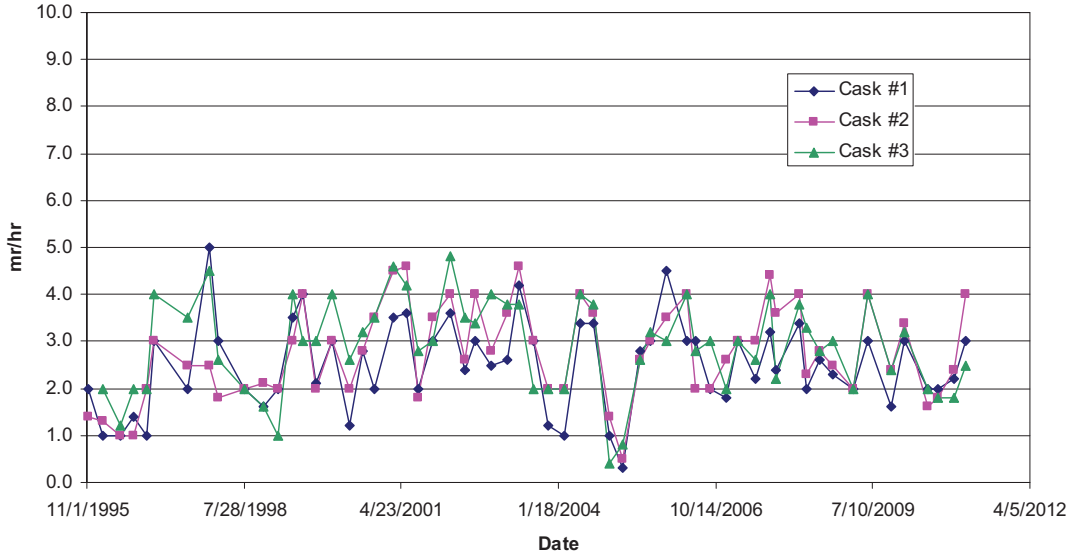


Figure A2.10-2
Two Meter Neutron Dose Rates



APPENDIX B

TIME-LIMITED AGING ANALYSES

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APPENDIX B: TIME-LIMITED AGING ANALYSES

B1.0 Introduction

The Prairie Island Independent Spent Fuel Storage Installation (ISFSI) license renewal methodology for identifying and dispositioning Time-Limited Aging Analyses (TLAA) is based on 10 CFR 72.42(a)(1) and the guidance contained in NUREG-1927, "Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance" (Reference B3.1). Per 10 CFR 72.42(a)(1), an ISFSI license renewal application must include TLAAs that demonstrate that structures, systems, and components important to safety will continue to perform their intended function for the requested period of extended operation. This appendix outlines the attributes used to identify TLAAs (Section B2.0), the TLAAs identified (Section B2.1), and the disposition of the TLAAs (Section B2.2) identified for the Prairie Island ISFSI License Renewal.

B2.0 Identification and Disposition of Time-Limited Aging Analyses

TLAAs are defined in NUREG-1927 as those licensee calculations or analyses that have all of the following attributes:

1. Involves a Structure System or Component (SSC) within the scope of license renewal,
2. Considers the effects of aging,
3. Involves time-limited assumptions defined by the current operating term,
4. Was determined to be relevant in making a safety determination,
5. Involves conclusions or provides the basis for conclusions related to the capability of the SSC to perform its intended functions, and
6. Is contained or incorporated by reference in the licensing basis.

B2.1 Identification Process and Results for the TLAAs

Calculations and analyses for the Prairie Island ISFSI were performed by NSPM, the cask vendor, and the ISFSI architect-engineering firm. These calculations and analyses were reviewed to determine if any of them have all of the six attributes described above. Keyword and manual searches of current licensing basis documents were performed, including the Technical Specifications, Safety Analysis Report (SAR), docketed licensing correspondence, and NRC Safety Evaluation Reports.

No calculations or analyses that have all six attributes of a TLAA were identified for the spent fuel assemblies, concrete pads, or earthen berm. Two analyses for the TN-40HT cask design were identified as having all six attributes of a TLAA. The first TLAA is a calculation of the basket aluminum components deadweight compressive stresses taking into account the effects of material creep. The second TLAA is an evaluation of neutron damage of the cask metallic components due to fast neutron irradiation. The evaluation and disposition of these TLAAs are described in Sections B2.2.1 and B2.2.2. The TN-40 cask design does not have the basket aluminum component deadweight compressive stress calculation or the neutron damage evaluation in its licensing basis. Only

the TN-40HT cask design has calculations or analyses that have the attributes of a TLAA.

B2.2 Evaluation and Disposition of the Identified TLAAs

In order to demonstrate that the TN-40HT casks will remain capable of performing their intended function(s) through the period of extended operation, evaluations were performed on the TLAAs identified in Section B2.1 to show either one of the following:

- The analyses have been projected to the end of the period of extended operation, or
- The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

The results of these evaluations and the disposition of the TLAAs are discussed in Sections B2.2.1 and B2.2.2.

B2.2.1 Basket Aluminum Components for Long Term Storage Deadweight

The evaluation of basket aluminum components for long term storage deadweight is documented in Section A4B.1.5.6 of Reference B3.2 for a period of 60 years. The evaluation determined the long term storage load (deadweight) compressive stresses in the limiting aluminum component for the TN-40HT cask design and compared the results to the allowable stress limit that had been reduced to limit the effects due to creep. The allowable stress limit of 758 psi represents the stress in 1100 Aluminum to produce a strain of 0.01 in 550,000 hours (approximately 60 years).

The evaluation of this TLAA confirmed that the original evaluation of the basket aluminum components for long term storage deadweight was projected through the period of extended operation (60 years). Therefore, it is concluded that the TLAA demonstrates that creep will not prevent the aluminum components of the TN-40HT casks from performing their intended functions during the period of extended operation.

B2.2.2 Neutron Damage of the Cask Metallic Components

The effect of fast neutron irradiation of the metals inside a TN-40HT cask is documented in Section A4.2.3.5 of Reference B3.2. The effect is a function of the integrated fast neutron flux inside a TN-40HT cask, which is on the order of 10^{14} n/cm^2 after 25 years. This value is less than the threshold value of 10^{17} n/cm^2 for neutron damage and thus Reference B3.2 concludes that there will be virtually no neutron damage to any of the TN-40HT cask metallic components after 25 years.

The projected integrated fast neutron flux at the end of 60 years is determined by conservatively assuming that the average fast neutron flux over the period of extended operations is the same as that during the first 25 years of storage.

$$(60 \text{ years}/25 \text{ years}) * (1 \times 10^{14} \text{ n/cm}^2) = 2.4 \times 10^{14} \text{ n/cm}^2$$

Since this projected value is less than the threshold value of 10^{17} n/cm^2, the conclusion that there will be virtually no neutron damage to any of the TN-40HT cask metallic components remains valid for the period of extended operation. Therefore, it is concluded that the TLAA demonstrates that neutron damage will not prevent the metallic components of the TN-40HT casks from performing their intended functions during the period of extended operation.

B2.3 Conclusions

The review of the Prairie Island ISFSI related calculations, the architect engineering firm calculations, the cask vendor calculations, and the current licensing basis identified the following two TLAAs for the TN-40HT casks:

- Basket Aluminum Components for Long Term Storage Deadweight
- Neutron Damage of the Cask Metallic Components

The evaluation of these TLAAs concluded that the TN-40HT casks will perform their intended functions through the period of extended operation.

B3.0 References (Appendix B, Time-Limited Aging Analyses)

B3.1 NUREG-1927, *Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance*, March 2011.

B3.2 *Prairie Island Independent Spent Fuel Storage Installation Safety Analysis Report* (ISFSI SAR), Revision 14.

APPENDIX C

SAFETY ANALYSIS REPORT SUPPLEMENT AND CHANGES

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APPENDIX C: SAFETY ANALYSIS REPORT SUPPLEMENT AND CHANGES

C1.0 Introduction

This appendix identifies pertinent changes to the Prairie Island Independent Spent Fuel Storage Installation (ISFSI) Safety Analysis Report (SAR). Section C2.0 of this appendix contains proposed changes to the existing Prairie Island ISFSI SAR information. Section C3.0 of this appendix contains two new proposed sections to be added to SAR Sections 9 and A9. The new sections provide a summarized description of the activities for managing the effects of aging of ISFSI structures and components, and a description of the time-limited aging analyses review for the period of extended operation.

C2.0 Changes to Existing Prairie Island ISFSI SAR Information

Section A4.2.3.5 – Material Durability

- Change the design life of the TN-40HT cask in the first sentence to 60 years. The proposed sentence would read:

  Materials must maintain the ability to perform their safety functions over ~~**at least**~~ the cask's ~~**25**~~ **60**-year licensed period under the cask's thermal, radiological, corrosion, and stress environment.

- Modify the first paragraph under the metallic components subsection to reflect the disposition of the neutron damage of the cask metallic components TLAA. The proposed paragraph would read:

  Gamma radiation has no significant effect on metals. The effect of fast neutron irradiation of metals is a function of the integrated fast neutron flux, which is on the order of 10^{14} n/cm^2 inside the TN-40HT cask after 25 years. **The integrated fast neutron flux at the end of a 60-year period is projected by conservatively assuming that the average fast neutron flux over the period is the same as that during the first 25 years of storage. Thus, the integrated fast neutron flux for the entire 60-year period is on the order of 2.4E14 n/cm^2.** Studies on fast neutron damage in aluminum, stainless steel, and low alloy steels rarely evaluate damage below 10^{17} n/cm^2 because it is not significant (Reference 14). Therefore, there will be virtually no neutron damage to any of the TN-40HT cask metallic components.

C3.0 New Prairie Island ISFSI SAR Sections

The following information will be integrated into ISFSI SAR Sections 9 and A9 to document aging management programs credited in the PI ISFSI license renewal review and the results of the TLAA evaluations. The information will be located in new ISFSI SAR Sections 9.8 and A9.8. The existing references in ISFSI SAR Sections 9.7 and A9.8 will be re-numbered to reflect the addition of the new Aging Management sections. Following the issuance of the renewed materials license, NSPM makes a commitment to incorporate the summary descriptions of the ISFSI aging management program and Time-Limited Aging Analyses into the

Prairie Island ISFSI Safety Analysis Report (SAR) as part of a periodic SAR update in accordance with 10 CFR 72.70(c).

9.8 Aging Management

9.8.1 Aging Management Review

An aging management review (AMR) of the ISFSI systems, structures, and components (SSC) was conducted as part of the ISFSI License Renewal process. The AMR addresses aging effects/mechanisms that could adversely affect the ability of the structures or components to perform their intended functions during the period of extended operation. The results of the AMR determined that there were aging effects that require aging management activities for the casks, concrete pads, and earthen berm. However, there were no aging effects identified for the spent fuel assemblies. The potential aging effects for the casks, concrete pads, and earthen berm are addressed in the ISFSI Inspection and Monitoring Activities Program and the Time-Limited Aging Analyses.

9.8.2 ISFSI Inspection and Monitoring Activities Program

The purpose of the ISFSI Inspection and Monitoring Activities Program is to ensure that the structure's or component's intended function(s) is not degraded for the in-service dry fuel storage casks, reinforced concrete storage pads or earthen berm.

The ISFSI Inspection and Monitoring Activities Program will perform periodic inspection activities that monitor the condition of ISFSI structures and subcomponents that are classified as Safety Related (or Important To Safety for the TN-40HT casks) or whose failure could prevent fulfillment of a function that is important to safety, or its failure as a support structure or component could prevent fulfillment of a function that is important to safety.

The aging effects managed by this program are included in Table 9.8-1. The aging effects/mechanisms applicable to each structure and component are dependent upon the associated material/environment combinations, design, and installation. Those structures and components that have been grouped together for aging management review (e.g., Carbon Steel in Atmosphere/Weather) have been evaluated and based upon the materials of construction, design, installation, and environments, will have the same aging effects.

The scope of the ISFSI Inspection and Monitoring Activities Program includes:

1) Visual inspection of the exterior of the in-service casks,
2) Monitoring of the interseal pressure of the in-service casks,
3) Radiation monitoring and associated surveillance activities of the in-service casks,

4) Visual inspection of the concrete pads,
5) Visual inspection of the earthen berm,
6) Visual inspection of an in-service cask bottom prior to the end of the current ISFSI license period,
7) Visual inspection under an in-service cask protective cover (surfaces normally not visible or accessible with the cover in-place) prior to the end of the current ISFSI license period,
8) Visual inspection of the cask bottom in the event an in-service cask is lifted in preparation for movement (inspections of opportunity),
9) Visual inspection under the protective cover (surfaces normally not visible or accessible with the cover in-place) of an in-service cask in the event the cover is removed for maintenance (inspections of opportunity), and
10) Visual inspection of the bottom and under the protective cover of the lead cask at least every 20 years.

TABLE 9.8-1
Managed Aging Effects

Material	Environment	Aging Effect	Aging Mechanism
Aluminum	Atmosphere/Weather	Loss of Material	Crevice Corrosion
Aluminum	Atmosphere/Weather	Loss of Material	Galvanic Corrosion
Aluminum	Atmosphere/Weather	Loss of Material	Pitting Corrosion
Carbon Steel	Atmosphere/Weather	Loss of Material	Crevice Corrosion
Carbon Steel	Atmosphere/Weather	Loss of Material	Galvanic Corrosion
Carbon Steel	Atmosphere/Weather	Loss of Material	General Corrosion
Carbon Steel	Atmosphere/Weather	Loss of Material	Pitting Corrosion
Stainless steel	Atmosphere/Weather	Loss of Material	Crevice Corrosion
Stainless steel	Atmosphere/Weather	Loss of Material	Pitting Corrosion
Concrete	Atmosphere/Weather	Change in Material Properties	Leaching of $Ca(OH)_2$
Concrete	Atmosphere/Weather	Cracking	Freeze-Thaw
Concrete	Atmosphere/Weather	Cracking	Reaction with Aggregates
Concrete	Atmosphere/Weather	Loss of Material	Freeze-Thaw
Concrete	Soil	Change in Material Properties	Leaching of $Ca(OH)_2$
Concrete	Soil	Cracking	Reaction with Aggregates
Concrete	Soil	Cracking	Settlement
Earthen Structures	Atmosphere/Weather	Change in Material Properties	Desiccation
Earthen Structures	Atmosphere/Weather	Loss of Form	Settlement
Earthen Structures	Atmosphere/Weather	Loss of Form	Frost Action
Earthen Structures	Atmosphere/Weather	Loss of Material	Erosion (Wind/Rain Impact)

9.8.3 Time-Limited Aging Analyses

A review of time-limited aging analyses (TLAA) involving the TN-40 cask design, spent fuel assemblies stored in a TN-40 cask, concrete pads, and earthen berm was performed as a part of the ISFSI license renewal. TLAAs are defined as those licensee calculations or analyses that have all of the following attributes:

1. Involves a Structure System or Component (SSC) within the scope of license renewal,
2. Considers the effects of aging,
3. Involves time-limited assumptions defined by the current operating term,
4. Was determined to be relevant in making a safety determination,
5. Involves conclusions or provides the basis for conclusions related to the capability of the SSC to perform its intended functions, and
6. Is contained or incorporated by reference in the licensing basis.

No TLAAs were identified for the TN-40 cask design, spent fuel assemblies stored in a TN-40 cask, concrete pads, or earthen berm.

A9.8 Aging Management

A9.8.1 Aging Management Review

The information in Section 9.8.1 is applicable to the TN-40HT casks.

A9.8.2 ISFSI Inspection and Monitoring Activities Program

The information in Section 9.8.2 is applicable to the TN-40HT casks.

A9.8.3 Time-Limited Aging Analyses

A review of time-limited aging analyses (TLAA) involving the TN-40HT cask design and spent fuel assemblies stored in a TN-40HT cask was performed as a part of the ISFSI license renewal. TLAAs are defined as those licensee calculations or analyses that have all of the attributes listed in Section 9.8.3.

No TLAAs were identified for the spent fuel assemblies stored in a TN-40HT cask. Two analyses for the TN-40HT cask design were identified as having all six attributes of a TLAA. The first TLAA is an analysis of the basket aluminum components deadweight compressive stresses taking into account the effects of material creep. The second TLAA is an evaluation of neutron damage of the cask metallic components due to fast neutron irradiation.

The evaluation of basket aluminum components for long term storage deadweight is documented in Section A4B.1.5.6. The evaluation of the effect of fast neutron irradiation of the metals inside a TN-40HT cask is documented in Section A4.2.3.5. These sections demonstrate that the TLAAs are valid for the period of extended operation.

APPENDIX D

TECHNICAL SPECIFICATION CHANGES

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APPENDIX D: TECHNICAL SPECIFICATION CHANGES

A review of the information provided in this License Renewal Application and the Prairie Island ISFSI Technical Specifications confirms that no changes to the Prairie Island ISFSI Technical Specifications are necessary.

APPENDIX E

ENVIRONMENTAL REPORT SUPPLEMENT

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E1.0 INTRODUCTION

Independent Spent Fuel Storage Installations (ISFSI) for storing spent nuclear fuel and associated radioactive materials are licensed by the U.S. Nuclear Regulatory Commission (NRC). ISFSIs are licensed in accordance with the Atomic Energy Act of 1954 (42 United States Code [USC] 2011, et. seq.) and NRC implementing regulations.

Northern States Power Company, a Minnesota corporation, d/b/a Xcel Energy (hereafter "NSPM") owns and operates the Prairie Island Nuclear Generating Plant (PINGP or plant) and the Prairie Island ISFSI (PI ISFSI) in Goodhue County, Minnesota. PINGP Units 1 and 2 operate under separate NRC operating licenses (DPR-42 and DPR-60) which expire in 2033 and 2034, respectively (Reference [Ref.] 8.1). The PI ISFSI operates pursuant to its own site-specific NRC license (SNM-2506), which was issued in October 1993 (Ref. 8.2). SNM-2506 currently allows NSPM to store up to 48 TN-40 and TN-40HT casks within the PI ISFSI. The current site-specific PI ISFSI license will expire on October 31, 2013.

E1.1 Purpose and Need for the Proposed Action

NSPM and the NRC intend for the storage at the PI ISFSI to be interim pending availability of a federal repository. However, there is uncertainty regarding when a repository will be available, and the schedule under which such a repository will accept spent fuel shipments. The repository schedule drives the PI ISFSI schedule; the longer it takes for a repository to begin accepting spent fuel shipments, the longer the PI ISFSI must store spent fuel.

In the Nuclear Waste Policy Act of 1982, Congress directed the U.S. Department of Energy (DOE) to construct and operate a geologic repository for the permanent disposal of commercial spent nuclear fuel. In the Amendments of 1987, Congress directed the DOE to study Yucca Mountain as a potential location for a federal repository. In 2002, the President and Congress approved Yucca Mountain as the site for the federal repository. In June 2008, the DOE submitted a license application to the NRC that proposed initial loading of the facility in the 2020 timeframe. In 2009, the President announced plans to terminate the Yucca Mountain program, and in 2010 the Secretary of Energy announced the formation of a Blue Ribbon Commission on America's Nuclear Future to conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle. The Blue Ribbon Commission must provide recommendations for developing a safe, long-term solution to managing the nation's used nuclear fuel and nuclear waste (Ref. 8.3). Two of the commission's subcommittees (Disposal Subcommittee; Transportation and Storage Subcommittee) have issued draft reports. The reports indicated that centralized interim storage should be developed, but that a deep geological repository will still be necessary. However, on-site ISFSIs will remain critical components to storing spent fuel while interim and permanent storage facilities are pursued (Ref. 8.4; Ref. 8.5). The final report from the commission is due in early 2012.

The NRC's waste confidence decision, codified in 10 Code of Federal Regulations (CFR) 51.23, notes that there is reasonable assurance that sufficient mined geologic repository capacity will be available to dispose of commercial high-level radioactive waste and spent fuel generated in any reactor when necessary. Due to the current uncertainties surrounding the availability of a federal repository, the purpose and the

need for the proposed action is to provide for continued temporary dry storage of spent nuclear fuel generated from operation of PINGP until facilities are available for interim or permanent disposal.

E1.2 The Proposed Action

The proposed action is the renewal of the operating license for the PI ISFSI. The current site-specific license will expire on October 31, 2013. NSPM proposes to extend the PI ISFSI license for 40 years beyond the current site-specific license term (through October 2053), as is allowed in 10 CFR 72.42. Storage at the PI ISFSI is interim pending the availability of a federal repository for interim or permanent disposal, as discussed in Section E1.1. A more detailed discussion of the proposed action is presented in Section E2.1.2.

E1.3 Environmental Background

The NRC has previously evaluated environmental impacts from ISFSIs in accordance with the National Environmental Policy Act (NEPA). These evaluations include preparation of an environmental impact statement in conjunction with establishing the ISFSI regulation (10 CFR 72) and two environmental assessments for substantive revisions to the regulation, in addition to a Generic Environmental Impact Statement (GEIS) for plant license renewal (NUREG-1437; Ref. 8.6). The NRC has prepared environmental impact statements and environmental assessments for site-specific ISFSI licenses at 15 sites and has approved ISFSI operation under general license provisions at 40 sites as of March 2011 (Ref. 8.7). In the course of these evaluations, the NRC has not identified any significant environmental impacts associated with ISFSI operation.

In addition, the NRC has issued and periodically updated its waste confidence decision in 10 CFR 51.23. The December 2010 update to the waste confidence decision notes that spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 60 years beyond the licensed life for reactor operation (which may include the term of a revised or renewed license) in a combination of storage in its spent fuel storage basin and at either on-site or off-site ISFSIs.

In August 1990, Northern States Power Company submitted an application for a NRC license to operate the PI ISFSI using the TN-40 cask. This application was accompanied by an ISFSI Environmental Report (ER) (Ref. 8.8). In August 1993, the NRC issued an Environmental Assessment related to the construction and operation of the PI ISFSI, which concluded that issuance of a materials license would not significantly affect the quality of the environment (Ref. 8.9).

More recently, Nuclear Management Company (NMC, the prior operator of PINGP and the PI ISFSI) submitted a license amendment request to allow for storage of higher enrichment and burnup fuel in the TN-40HT cask. A supplement to this request included updates to the ER for the new cask design (Ref. 8.10). The NRC issued an Environmental Assessment for amendment of the PI ISFSI license, which concluded that the approval of the license amendment would not cause any significant impacts to the human environment and would be protective of human health (Ref. 8.11).

The DOE also has analyzed ISFSI environmental impacts. As part of its evaluation of the impact of constructing a national repository for spent nuclear fuel, the DOE analyzed environmental impacts from a no-action alternative that included leaving spent nuclear

fuel in power plant ISFSIs. The analysis accounted for the fuel at all operating nuclear power plants, including PINGP. The DOE concluded that environmental impacts would be small for at least 100 years (Ref. 8.12).

E1.4 Environmental Report Scope and Methodology

10 CFR 72.34 requires that each application for an ISFSI license contain an Environmental Report (Supplemental ER) that meets the requirements of 10 CFR 51 Subpart A. This Supplemental ER was prepared by NSPM as part of its application to the NRC for PI ISFSI license renewal in accordance with the following NRC regulations:

- 10 CFR 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High Level Radioactive Waste, and Reactor-Related Greater than Class C Waste
  - 10 CFR 72.34, Environmental report; and
  - 10 CFR 72.42, Duration of license, renewal.

- 10 CFR 51, Environmental Protection Requirements for Domestic Licensing and Related Regulatory Functions
  - 10 CFR 51.45, Environmental report; and
  - 10 CFR 51.60, Environmental report-materials licenses.

10 CFR 51.60 requires that the Supplemental ER contain information specified in 10 CFR 51.45. 10 CFR 51.60 directs the applicant to focus on significant environmental changes from the previously submitted ER. Table 1.4-1 indicates which section of the Supplemental ER provides information to meet each requirement of 10 CFR 51.60, including 10 CFR 51.45 as adopted by reference.

NSPM reviewed the NRC's Environmental Review Guidance for Licensing Actions Associated with Nuclear Material Safety and Safeguards (NMSS) Programs (NUREG-1748; Ref. 8.13) when developing this Supplemental ER. NSPM also reviewed a number of previously-submitted environmental reports (in addition to the NRC's requests for additional information) to ensure that this Supplemental ER contains appropriate information to support the NRC's environmental review.

As mentioned previously, the NRC prepared a GEIS for plant license renewal (Ref. 8.6). ISFSIs located at nuclear plant sites share many attributes, including affected environment, monitoring and reporting programs, and staffing with the nuclear plant. Therefore, the GEIS considers spent fuel storage during an ISFSI period of extended operation as being an inherent part of plant license renewal. The GEIS describes spent fuel generation and storage during the current and license renewal terms. The GEIS generically discusses land use and terrestrial resources; water use and aquatic resources; radiological impacts of normal operations, accidents; and off-site and occupational dose, among others.

In April 2008, NMC applied for a renewed operating license for PINGP Units 1 and 2. As part of the plant license renewal application, NMC prepared its *Applicant's Environmental Report – Operating License Renewal Stage,* which analyzed the environmental impacts of operating during a proposed 20-year renewed license term (PINGP ER) (Ref. 8.14). In May 2011, the NRC published the *Generic Environmental Impact Statement for the License* Renewal *of Nuclear Power Plants, Supplement 39;*

Regarding Prairie Island Nuclear Generating Plant, Units 1 and 2, Final Report (SEIS) to address PINGP license renewal. The NRC concluded that the adverse environmental impacts of license renewal for PINGP (i.e., operating an additional 20 years) were not great enough to deny the option of license renewal for energy-planning decision makers (Ref. 8.15).

Table 1.4-1
Cross-Reference Table for Environmental Requirements of 10 CFR 51

Regulatory Requirement	Section/Title of Supplemental ER
10 CFR 51.60(a)	Entire Supplemental ER
10 CFR 51.45(b), description of proposed action	E1.2, The Proposed Action
10 CFR 51.45(b), statement of purposes	E1.1, Purpose and Need for the Proposed Action
10 CFR 51.45(b), affected environment	E3.0, Affected Environment
10 CFR 51.45(b)(1), impact of proposed action on the environment	E4.0, Environmental Impacts
10 CFR 51.45(b)(2), adverse environmental effects that cannot be avoided	E7.1, Unavoidable Adverse Impacts
10 CFR 51.45(b)(3), alternatives to the proposed action	E2.0, Alternatives
10 CFR 51.45(b)(4), short-term use versus long-term productivity of environment	E7.3, Short-Term Use Versus Long-Term Productivity of the Environment
10 CFR 51.45(b)(5), irreversible and irretrievable commitments of resources	E7.2, Irreversible and Irretrievable Resource Commitments
10 CFR 51.45(c), environmental effects, impact of alternatives, and alternatives for reducing or avoiding effects	E2.0, Alternatives; 3.0, Affected Environment; 4.0, Environmental Impacts; 5.0, Mitigation Measures
10 CFR 51.45(d), status of compliance	E1.5, Applicable Regulatory Requirements, Permits, and Required Consultations

The environmental impacts of the PI ISFSI were first presented in the ER for the PI ISFSI license, and more recently in the 2008 cask design license amendment request. The GEIS, the PINGP ER, and the NRC's SEIS address the PI ISFSI operations during a plant's period of extended operation. Because these documents have previously defined the impacts of the PI ISFSI, NSPM adopts appropriate material from these documents by reference.

E1.5 Applicable Regulatory Requirements, Permits, and Required Consultations

The PINGP ER and the NRC's SEIS for plant license renewal present a list of all authorizations for PINGP operations (Ref. 8.14; Ref. 8.15). Other than its site-specific NRC license, the PI ISFSI does not require any additional permits, licenses, or approvals to operate. Table 1.5-1 lists the authorizations and consultations related to the PI ISFSI license renewal application.

Table 1.5-1
Regulatory Requirements, Permits, and Consultations for PI ISFSI License Renewal [a]

Agency	Authority	Requirement	Remarks
Minnesota Public Utilities Commission (MPUC)	Minn. Stat. 116C.83 and MN Rules Chapter 7849	Approval for additional on-site dry cask storage	As discussed in Section E2.1.2.2, the MPUC granted approval in December 2009 for up to 64 casks at the PI ISFSI.
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011 et. Seq.)	PI ISFSI License Renewal	Supplemental ER submitted by NSPM in support of the PI ISFSI license renewal application.
U.S. Fish and Wildlife Service	Endangered Species Act Section 7 (16 USC 1536)	Consultation	Requires the federal agency issuing a license to consult with this agency regarding impacts of the proposed action.
Minnesota State Historic Preservation Office	National Historic Preservation Act Section 106 (16 USC 470f)	Consultation	Requires the federal agency issuing a license to consult with the State Historic Preservation Officer regarding impacts of the proposed action.
Minnesota Pollution Control Agency	Minnesota Statue Chapters 115 and 116, Minnesota Rules Chapters 7001, 7050 and 7060, and U.S. Clean Water Act	National Pollutant Discharge and Elimination System Permit MN0004006	Authorizes discharge of storm water associated with industrial activity from PINGP.

a No renewal-related requirements identified for local or other agencies. The PI ISFSI is not subject to requirements under the Federal Coastal Zone Management Act.

E1.5.1 Special-Status Species Consultations

Section 7 of the Endangered Species Act (16 USC 1531 et seq.) requires federal agencies to ensure that agency action is not likely to jeopardize any species that is listed or proposed for listing as endangered or threatened. The Endangered Species Act addresses consultation with the U.S. Fish and Wildlife Service (FWS) regarding effects on non-marine species. The FWS and the National Marine Fisheries Service have issued joint procedural regulations in 50 CFR 402, Subpart B, which address consultation, and the FWS maintains the joint list of threatened and endangered species in 50 CFR 17. Under Section 7 of the Endangered Species Act, the NRC may consult with the FWS to ensure that the proposed action will not jeopardize the continued existence of any threatened or endangered species.

NSPM has chosen to invite comment from federal and state agencies regarding potential effects that PI ISFSI license renewal may have on federal and state-listed threatened or endangered species. NSPM sent consultation letters to the FWS and the Minnesota Department of Natural Resources (MDNR) on May 18, 2011. NSPM has not received a response from the FWS. The MDNR responded on June 30, 2011, and its response is

summarized in Section E3.6.3. Attachment A includes copies of NSPM correspondence with the FWS and the MDNR.

E1.5.2 Historic and Archaeological Resource Consultations

Section 106 of the National Historic Preservation Act (16 USC 470 et seq.) requires that federal agencies having the authority to license any undertaking, prior to issuing the license, take into account the effect of the undertaking on historic properties and afford the Advisory Council on Historic Preservation the opportunity to comment on the undertaking. Council regulations provide for establishing an agreement with any State Historic Preservation Office (SHPO) to substitute state review for council review (35 CFR 800.2). Therefore, the NRC may request comments from the Minnesota SHPO (MSHPO) to ensure that the proposed action will not impact historic properties.

The Prairie Island Indian Community (PIIC) is located to the northwest of PINGP. NSPM has chosen to invite comment from the MSHPO and the PIIC regarding potential effects that PI ISFSI license renewal may have on historic and archaeological resources. NSPM sent consultation letters to the MSHPO and the PIIC on May 18, 2011. The MSHPO responded on June 15, 2011, and its response is summarized in Section E3.9. Attachment A includes copies of NSPM correspondence with the MSHPO and the PIIC.

E2.0 ALTERNATIVES

The proposed action is the renewal of the PI ISFSI operating license for an additional 40 years. In the ER, NSPM evaluated the following alternatives to constructing the PI ISFSI in addition to the no-action alternative (Ref. 8.8; Chapters 9 and 10):

- Construct an ISFSI at another location on the PINGP site,
- Use an alternate design at the PINGP site,
- Construct the ISFSI at an off-site location,
- Expand the existing fuel pool,
- Construct a new fuel pool,
- Increase the capacity of the existing fuel pool,
- Ship the fuel to existing storage facilities,
- Ship the fuel to a federal facility,
- Ship the fuel to a reprocessing facility, and
- Reduce the rate of spent fuel generation.

These alternatives reflect common alternatives considered by ISFSI license applicants and the NRC. No other alternatives other than those analyzed in the ER have been identified. However, the current regulatory environment offers a new perspective on a number of the alternatives. Of those originally evaluated, only construction of a new spent fuel pool or construction of a new ISFSI on or off the PINGP site are potential alternatives to the proposed action; however, they present their own regulatory limitations and do not present any environmental advantages over PI ISFSI license renewal.

E2.1 Detailed Description of the Alternatives

E2.1.1 No-Action Alternative

Under the no-action alternative, the NRC would not renew the PI ISFSI license. NSPM could not lawfully store spent fuel at the PI ISFSI after October 31, 2013 and would have to remove all currently-stored spent fuel. This alternative also would result in shutdown of PINGP in the event that no other storage option was available. It is likely that another power generation facility would need to be constructed to meet the region's power needs.

The NRC has prepared a GEIS (with supplements) on decommissioning of nuclear facilities, including ISFSIs (NUREG-0586). The NRC evaluated ISFSI decommissioning alternatives, radiation safety, cost, waste disposal, and socioeconomic effects. The NRC identified no prohibitory technical or environmental issues (Ref. 8.16).

The no-action alternative, like the proposed action and all other alternatives, would involve eventual decommissioning of the PI ISFSI. Decommissioning activities and their impacts are not discriminators between the proposed action and any other alternative, including no-action. NSPM will have to decommission the PI ISFSI regardless of the NRC decision on PI ISFSI license renewal; PI ISFSI license renewal would only postpone decommissioning. NSPM adopts by reference the NRC discussion of ISFSI decommissioning effects and concludes that the no-action alternative provides no environmental advantages over PI ISFSI license renewal.

E2.1.2 Proposed Action

The proposed action is to renew the PI ISFSI materials license for 40 years beyond the current license term. The PI ISFSI is licensed by the NRC to store 1,920 spent fuel assemblies in 48 casks on 2 concrete storage pads. Of these 48 casks, 29 casks will be the TN-40 cask design which was originally licensed in 1993. The remaining 19 casks will be the TN-40HT design, which is used to store high-enrichment, high-burnup fuel. Use of the TN-40HT cask was approved with Amendment 7 to the PI ISFSI license in August 2010.

The PI ISFSI Safety Analysis Report (SAR) and its addendum for the TN40-HT cask were used as a source for much of the information presented in this section (Ref. 8.17). Revision 14 of the SAR is included in this license renewal application as Enclosure 4. The information is consistent with the ER (Ref. 8.8), the resultant NRC Environmental Assessment (Ref. 8.9), the TN-40HT license amendment request (Ref. 8.10), and the NRC's resultant Environmental Assessment (Ref. 8.11).

E2.1.2.1 General Installation Information

Location and Boundaries

The PI ISFSI is located within the PINGP site boundary and PINGP exclusion area (see Figures 2.1-1 and 2.1-2). Sections 4 and A4 of the SAR[1] provide descriptive information on PI ISFSI systems, structures, and components.

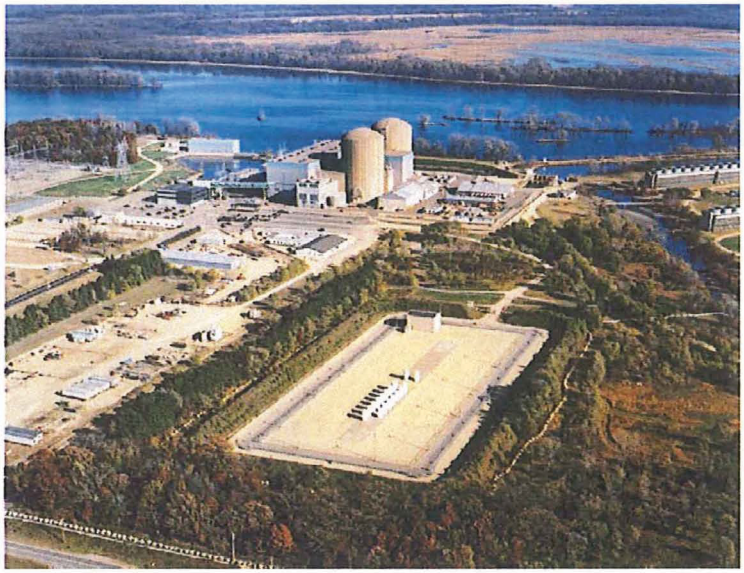
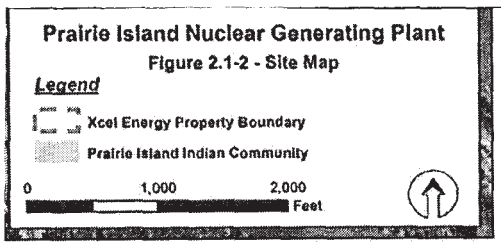


Figure 2.1-1 - PI ISFSI Aerial Photograph

[1] When a section of the ISFSI SAR is referenced, a section number preceded by "A" indicates that the reference is from the SAR Addendum for the TN-40HT cask. A section number not preceded by "A" indicates that the reference is from the SAR for the TN-40 cask.

Figure Withheld Under 10 CFR 2.390



The PI ISFSI fenced area is approximately 720 feet long by 340 feet wide, roughly 5.5 acres in size (Ref. 8.18). The controlled area around the PI ISFSI (required by 10 CFR 72.106) corresponds to the PI ISFSI exclusion area boundary. No activities unrelated to operation of PINGP or the PI ISFSI are permitted within the controlled area. The nearest PINGP site boundary is located 110 meters (about 361 feet) from the western edge of the PI ISFSI concrete pads. The closest occupied off-site residence is approximately 0.45 mile northwest of the PI ISFSI site. Treasure Island Resort and Casino, which is owned and operated by the PIIC, is located approximately one mile northwest of the PI ISFSI site (Ref. 8.17). The Emergency Planning Zone for the PI ISFSI is the same as for PINGP.

Pad and Cask Layout

NSPM is licensed to store TN-40 and TN-40HT casks on two 216 x 36 foot and 3 foot thick seismically-qualified, reinforced concrete pads. The primary function of the concrete pads is to provide a uniform level surface for storing the casks. Each pad provides for two parallel rows of 12 casks, for a total of 24 casks per pad and 48 casks within the PI ISFSI. Figure 1.3-1 of the SAR presents the PI ISFSI site layout.

Additional Features

The PI ISFSI is surrounded by 8-foot-high high security and nuisance chain link fences. The concrete pads are surrounded by a gravel area that has been compacted to allow for movement and positioning of the transport vehicle and tow vehicle. The compacted area is accessed via an access road from the rail bay of the PINGP Auxiliary Building. A 17 foot high earthen berm outside the fenced area provides additional radiological shielding and visually shields the PI ISFSI from the plant exclusion area boundaries. To limit the site area and amount of required fill and prevent slope wasting, a slope of one horizontal to one vertical was used to construct the berm. The berm is reinforced with a geo-fabric material. Erosion control material and vegetation give the berm a natural appearance. PINGP routinely conducts slope stability surveys of the berm to ensure that it remains structurally sound.

An Equipment Storage Building is located on the northeast corner of the PI ISFSI site within the fence. The building is a steel frame structure with painted steel walls and roof panels and houses the cask transport vehicle. Two smaller block buildings house security system and alarm monitoring equipment (Ref. 8.17).

Auxiliary Systems

The only utility connected to the PI ISFSI is electric power for lighting, general utility, and pressure monitoring instrumentation purposes. The source of electricity is a pole mounted transformer and an overhead distribution line.

No instrumentation or control systems are needed for the storage casks to perform their safety functions. Nevertheless, an annunciator panel that monitors cask interseal pressure is located outside of the PI ISFSI protected area to minimize the time required for periodic cask surveillance and reduce personnel exposure.

The design of the storage casks ensures that the stored fuel is maintained in a safe condition. Therefore, no ventilation or off-gas systems are needed or installed. Because there are no airborne contaminants associated with the PI ISFSI, neither compressed air

nor breathing air supply systems are required or provided. Air sampling systems are not required at the PI ISFSI. There are no liquid discharges from the PI ISFSI.

Fire suppression water is not required at the PI ISFSI. No hydrocarbon fuels are stored in the PI ISFSI. Therefore, no fires other than small electrical fires or tow vehicle fuel fires are considered credible. Accordingly, only portable fire extinguishers are provided. Smoke detectors are installed in the PI ISFSI buildings to alert operators if a fire is started. PINGP fire-fighting equipment is available if needed.

Neither sanitary nor chemical sewage is produced at the PI ISFSI. No permanent sewage treatment system is required or provided. Sanitary facilities are available in nearby buildings but not within the PI ISFSI. Cask transport vehicle maintenance is performed in the Equipment Storage Building within the PI ISFSI. Chemical wastes produced during these operations, such as small amounts of ethylene glycol (antifreeze) or drips of lubricating fluid from the transport vehicle, would be cleaned up and disposed of at appropriate facilities. Small amounts of cleaning and maintenance waste products are generated but do not require special processing or decontamination. No chemical operations are required for the PI ISFSI. No chemical storage, handling, processing, or other activity involving chemical reactions occurs within the PI ISFSI area.

Because of their passive nature, the storage casks require little, if any, maintenance over the lifetime of the PI ISFSI. Typical maintenance tasks involve occasional replacement and recalibration of monitoring instrumentation and recoating of some casks with corrosion-inhibiting coatings. No special maintenance techniques are necessary. Minor maintenance can be performed within the PI ISFSI area without moving the casks.

The PI ISFSI does not include active components such as remotely operated equipment or hot cells. There are no fuel handling facilities exclusively dedicated to the PI ISFSI. Handling of the fuel, cask loading, and decontamination of the casks takes place within the PINGP Auxiliary Building (Ref. 8.17).

There are no credible mechanisms that could result in contamination of the outside surfaces of the casks, other PI ISFSI components, or operating personnel after the casks leave the decontamination area (Ref. 8.17). Therefore, the PI ISFSI does not include provisions for decontamination at the PI ISFSI. Disposal of contaminated equipment from the PI ISFSI is not expected.

Incidental operations include receiving new casks from the supplier, temporary empty cask storage, and transfer to the fuel building. During these operations, the casks are inspected in detail and abnormalities are corrected. No repair options at the PI ISFSI are anticipated once the casks are loaded and placed into service.

Cathodic protection is not required for the casks because the surrounding medium for casks is air, which is a poor electrolyte. Hence, protection from electrolytic decomposition of the casks is not required.

There have been no operational accidents, including spills, releases, or accidental discharges during the period of PI ISFSI operation to date.

E2.1.2.2 Inventory

NSPM only plans to store the TN-40 and TN-40HT casks in the PI ISFSI over the proposed period of extended operation. The design of the TN-40 was addressed in the ER and 1993 Environmental Assessment. The design of the TN-40HT was addressed in the 2008 license amendment request and 2009 Environmental Assessment. Other inventory characteristics remain unchanged. Detailed descriptions of the operational characteristics of the casks used at the PI ISFSI are provided in Sections 3 and A3 of the SAR. Figures 1.3-2 and TN40HT-72-2 of the SAR show the TN-40 and TN-40HT casks, respectively.

The original site-specific license for PINGP was issued in 1993 for the TN-40 cask design. The TN-40 cask design and the PI ISFSI site are in one integral license. There is no Certificate of Compliance for the cask design. Each TN-40 cask is designed to hold 40 fuel assemblies with initial enrichment less than or equal to 3.85 weight percent uranium-235 (U-235); assembly average burnup less than or equal to 45,000 megawatt-days per metric ton of uranium (MWD/MTU); and a minimum cooling time of 10 years. The cask is designed for a maximum heat load of 27 kW (kilowatts) from 40 assemblies.

NMC requested use of the TN-40HT cask in 2008 to store higher enrichment and higher burnup fuel. The advantage of higher burn-up fuel is that it reduces the rate of discharge from the reactor. The NRC approved the request with Amendment 7 to the PI ISFSI license in 2010. Each TN-40HT cask is designed to hold 40 fuel assemblies with initial enrichment less than or equal to 5.0 percent weight U-235; assembly average burnup less than or equal to 60,000 MWD/MTU; and a minimum cooling time of 12 years. The cask is designed for a maximum heat load of 32 kW from 40 assemblies.

The total capacity of the fuel to be stored at the PI ISFSI is 715.29 MTU based on the storage of 482 Westinghouse standard assemblies (400 kilograms uranium per assembly [kgU/each]), 481 Exxon standard and TOPROD assemblies (370 kgU/each) and 957 Westinghouse optimized design assemblies (360 kgU/each) (Ref. 8.17).

In all cases, fuel assemblies stored in the PI ISFSI will not be damaged. Only spent fuel which meets the requirements specified in the SAR and Technical Specifications will be stored in the PI ISFSI.

As of September 2011, 29 TN-40 casks are stored at the PI ISFSI. The capacity of the pads is limited to 19 more storage locations. When the PI ISFSI is full at 48 casks, it will contain 29 TN-40 casks and 19 TN-40HT casks. The current SAR assumes in its analyses of all impacts, including radiological/human health impacts, that all 48 spaces on the two pads are full. This Supplemental ER conservatively assumes that 48 TN-40HT casks are stored on the two pads.

In May 2008, NSPM applied to the MPUC for a Certificate of Need to store additional fuel at the PI ISFSI (Ref. 8.18). Operation of PINGP during the period of extended operation will result in the generation of additional spent fuel assemblies. NSPM requested storage of up to an additional 35 dry casks, for a total of 64 casks. Of these 35 casks, 19 would be placed on the two existing pads. The remaining 16 casks would be placed on proposed new 18-foot pads located immediately south of each of the existing pads. In December 2009, the MPUC issued an *Order Accepting Environmental Impact Statement and Granting Certificates of Need and Site Permit with Conditions*

which approved storage of up to 64 casks within the PI ISFSI (Ref. 8.19). The Order became effective on June 1, 2010 as a result of no action by the Minnesota Legislature.

It is important to note that this PI ISFSI license renewal application and Supplemental ER do not request additional storage past the 48 casks currently authorized by the NRC, or analyze the environmental impacts of expanding the PI ISFSI capacity past 48 casks. The Supplemental ER is limited to analyzing the impacts of an additional 40 years of operation for the 48-cask PI ISFSI. It is equally as important to note, however, that the State of Minnesota has approved storage of up to 48 casks at the PI ISFSI, and has granted its approval for storage of up to 64 casks if NSPM deems that course of action necessary. If and when NSPM chooses to pursue a license amendment to store additional casks past the 48 currently authorized, it will do so in a separate license amendment request. That request will be accompanied by a Supplemental Environmental Report that outlines the environmental impacts of such an action.

As discussed in Sections E1.1 and E1.2, NSPM and the NRC intend for the storage at the PI ISFSI to be interim pending availability of a federal repository. In the event that the DOE is eventually successful in meeting its obligations and removing spent fuel from commercial nuclear generating plants, there still exists the possibility that NSPM would not need to use all of its NRC-approved storage capacity.

E2.1.2.3 Construction

No construction is planned as part of the PI ISFSI license renewal request. As discussed in Section E2.1.2.2, if and when NSPM chooses to pursue a license amendment to the NRC to store additional casks past the 48 currently authorized, it will do so in a separate license amendment request which will be accompanied by a Supplemental Environmental Report that addresses the impacts.

E2.1.2.4 Aging Management Activities

The casks stored at the PI ISFSI are subject to aging management activities to ensure their integrity for the duration of the PI ISFSI period of extended operation. The Aging Management Program is discussed in Appendix A of this PI ISFSI License Renewal Application.

E2.1.2.5 Employment

The workers involved in routine PI ISFSI operations are drawn from the general population of employees at PINGP. The amount of time dedicated to PI ISFSI operations can be estimated from calculations of the radiation dose to workers presented in Chapter 7 and A7 of the SAR.

PI ISFSI operations require a very small fraction of the PINGP work force, which is made up of approximately 800 full-time, contract, and security employees. PI ISFSI operations will continue to be performed by employees who have other responsibilities at PINGP. Employment at PINGP will not be affected by continued PI ISFSI operations.

Decommissioning the PI ISFSI may require that the site be restored to pre-construction conditions and could require that the casks be decontaminated. Although detailed decommissioning plans have not been developed, such activities would not likely require a workforce greater than that used to construct the PI ISFSI.

E2.1.2.6 Decommissioning

Although detailed decommissioning plans have not been developed, the SAR presents a complete discussion of decommissioning options in Sections 4.6 and A4.6. In addition, the TN-40 cask design has been certified by the NRC for transporting spent nuclear fuel discharged from the PINGP.

Decommissioning the PI ISFSI site may require that the concrete pads, fencing, and berm be removed and the site restored to pre-construction conditions. Restoration would be limited in large part to the removal and disposal of the concrete slabs in a construction debris landfill, followed by backfilling, grading, and landscaping. Due to the leak tight design of the storage casks, no residual contamination is expected to be left behind on the concrete pads. The pads, fence, and peripheral structures will require no decontamination after the last cask is removed.

The TN-40 and TN-40HT casks are designed to simplify the cask decommissioning process. Decommissioning of the casks could be accomplished by one of two options described below (Ref. 8.17):

- The casks, including the spent fuel stored inside, could be shipped to a suitable fuel repository for interim or permanent storage.

- The spent fuel could be removed from the PI ISFSI cask and shipped in a licensed shipping container to a suitable fuel repository. This would require decontamination of the casks. The volume of waste material produced during PI ISFSI decommissioning will be limited to that necessary to accomplish decontamination once the spent fuel elements are removed. Furthermore, it is estimated that the cask materials will be only very slightly activated as a result of their long-term exposure to the relatively small neutron flux emanating from the spent fuel, and that the resultant activation level will be well below allowable limits for general release of the casks as non-controlled material.

E2.1.3 Other Alternatives

E2.1.3.1 Construct an ISFSI in an Alternate Location on PINGP

The ER considered four potential areas on the PINGP site for the location of the PI ISFSI: Area I, a parcel of land northwest of the substation and north of the meteorological tower; Area II, a parcel of land to the north and south of the plant access road; Area III, a parcel of land north of the substation and adjacent to Sturgeon Lake, and Area IV, the site that was chosen and on which the PI ISFSI currently exists. Area I was not chosen because of its proximity to the nearest resident; Area II was not chosen because of the access road and tower restrictions; and Area III was not chosen because it laid closest to the site boundary. Area IV was chosen because of ideal construction elements, its proximity to the plant site, and its distance from the nearest resident (Ref. 8.8).

Constructing at any one of the previously-assessed sites, or at any other site on the PINGP property, would require NSPM to apply to the NRC for another site-specific license or utilize the general license, depending upon the chosen design. NSPM could theoretically apply for another site-specific license for the PI ISFSI design currently used, apply for another site-specific license for another design, or utilize the general license.

The NRC has certified a number of cask designs for use under the general license. If a site-specific license is obtained, NSPM would have to move the existing casks to the new site. If the general license is utilized, NSPM would have to first repackage the fuel in appropriate storage containers and then move those containers to the new site. This alternative would obviate the need to renew the original PI ISFSI license if a new license was obtained and the fuel transferred before the original license expired.

Construction of a new ISFSI on-site would result in additional cost to NSPM, ground-disturbing activities, the potential for increased exposure to off-site receptors and on-site personnel during transfer, and environmental impacts that would exceed those of extending the license for another 40 years. For these reasons, constructing an ISFSI at an alternate location on the PINGP site, no matter the design employed, does not offer net environmental benefits over renewing the existing PI ISFSI license.

E2.1.3.2 Use an Alternate Dry Storage Design at the PINGP Site

Because the ISFSI had not been built at the time of the ER, NSPM could not have evaluated the alternative of replacing the current cask design with that of another design. However, the ER did consider four other design alternatives for dry storage, all of which could be constructed on the PINGP site. These designs included modular concrete, vault, concrete cask, and metal cask storage designs. NSPM selected the existing storage design after evaluation of bids from the vendors of all dry storage systems at the time (Ref. 8.8). Currently, there are 6 other types of dry storage currently available. Not all of these designs are currently licensed to store the PINGP high enrichment and high-burnup fuel. In addition, there is not sufficient space within the current ISFSI footprint to accommodate these designs. Use of an alternate design on the current ISFSI site would require a license amendment to the original site-specific license.

Replacing the current cask design with that of a different design would result in additional cost to NSPM, ground-disturbing activities, the potential for increased exposure to off-site receptors and on-site personnel during transfer, and environmental impacts that would exceed those of extending the license for another 40 years. In addition this alternative would not obviate the need to renew the original PI ISFSI license. For these reasons, use of an alternate dry storage design on the current ISFSI site, no matter the design employed, does not offer net environmental benefits over renewing the existing PI ISFSI license.

E2.1.3.3 Construct an ISFSI at an Off-site Location

The ER considered construction of a dry storage facility outside the site boundary. Use of a site other than PINGP would require land acquisition and would be more difficult to license than a site within the PINGP boundary. Spent fuel would need to be transported from PINGP to the new site by barge, rail, or road and the new facility would need to have fuel handling and cask loading to transfer spent fuel from transport casks to storage casks. The new site would require personnel and resources for operations, monitoring, and security (Ref. 8.8).

Any new site would present the financial and environmental impacts associated with constructing such a facility. NSPM would be responsible for obtaining necessary land and acquiring a NRC site-specific license for the facility. In addition, Minnesota Statute § 116C.83 (4) limits the storage of spent nuclear fuel to the site at which it is generated. This action eliminates any other site in Minnesota as an alternative storage site without

modification to state law. Any new off-site dry storage facility would have to be built outside the state of Minnesota.

E2.1.3.4 Expand the Existing Fuel Pool

The ER considered two options involving the PINGP spent fuel pool: expand the existing spent fuel pool or construct a new pool. Combining the pools within the spent fuel pool enclosure would result in one enlarged pool. The modification would require substantial demolition, construction, and relocation of equipment (Ref. 8.8). Even if this alternative were pursued, the expanded pool could not store all of the existing fuel, the fuel currently stored in the PI ISFSI, and fuel produced as a result of future operation. Therefore, this is not considered a reasonable alternative.

E2.1.3.5 Construct a New Fuel Pool

The ER considered constructing an entirely new pool in a new building on the PINGP site. This alternative would require the same support facilities as the existing pools in addition to the use of transfer casks to move fuel from the PI ISFSI to the pool and from the existing pool. This alternative would require engineering design, a lengthy federal and state approval and licensing process, significant disturbance of acreage on the PINGP site, additional dose to workers, and additional environmental impacts related to construction (Ref. 8.8). Storage of spent fuel in a fuel pool is expected to involve higher exposures than dry cask storage; for example, storage in a fuel pool would involve use of radioactive water cooling and cleanup systems that would result in higher operator exposures during pump, valve, and motor maintenance of these systems, and filter and resin replacement. This alternative would also lead to additional airborne and liquid releases that are not generated at the PI ISFSI. This alternative has the potential to provide a means to store all spent fuel generated as part of the plant's operational lifetime, provided that sufficient storage capacity is approved by regulators.

Constructing a new fuel pool on the PINGP site would not offer net environmental benefits over renewing the existing PINGP license. Therefore, this is not a reasonable alternative to renewing the PI ISFSI license for an additional 40 years.

E2.1.3.6 Increase the Capacity of the Existing Fuel Pool

The ER considered three options for modifying the spent fuel storage configuration to increase the capacity of the existing spent fuel pool. Methods to increase capacity could include reracking, consolidation of spent fuel rods, or use of two-tiered racks. Structural analysis showed that the capacity could be increased no more than 30-35 percent in weight.

Methods to increase the capacity of the existing fuel pool would not provide a means to store spent fuel for the remainder of the plant's operational lifetime, would be more likely to interfere with plant operations, would result in increased dose to workers and would be accompanied by technical and licensing uncertainties that would be more significant than those associated with dry cask storage (Ref. 8.8). Therefore, these options are not considered reasonable alternatives.

E2.1.3.7 Ship Fuel to Existing Storage Facilities

The ER considered shipping its used fuel to another ISFSI or plant owned by NSPM or a private company. At the time, the three options considered included the Monticello Nuclear Generating Plant in Monticello, Minnesota, the Pathfinder Plant near Sioux

Falls, South Dakota, or a commercial facility such as the General Electric storage facility in Morris, Illinois (Ref. 8.8).

The Monticello option was not considered in the ER because the fuel was a different design and Monticello was approaching exhaustion of its storage capacity. Monticello continues to be a non-viable option, as it was required to build its own ISFSI in 2007 and uses a different storage system than PINGP. In addition, Minnesota Statute § 116C.83 (4) limits the storage of dry casks containing spent nuclear fuel to the site at which it is generated. This action eliminates Monticello as an alternative storage site without modification to the existing law and federal approval. The Pathfinder Plant was in the process of decommissioning at the time of the ER and has been completely decommissioned, making it a non-viable alternative.

The General Electric site in Morris, Illinois is now full. The only ISFSI proposed for receipt of commercial spent fuel is the Private Fuel Storage Facility in Utah. The NRC evaluated the environmental impacts of constructing and operating a private ISFSI at the Skull Valley Goshutes Indian Reservation and concluded that the proposed ISFSI would reduce the already small environmental effects of spent fuel storage at reactor sites (Ref. 8.20). However, legal and regulatory issues have prevented construction of this facility and its future availability is uncertain. The ER also considered sending spent fuel to another utility for management at their plant or ISFSI and determined that other facilities would not likely accept another utility's fuel. Given the difficulties that utilities across the nation continue to experience with regards to spent fuel management, it is unlikely that another utility would agree to store NSPM's fuel. None of these shipment alternatives are reasonable alternatives to renewing the PI ISFSI license.

E2.1.3.8 Ship the Fuel to a Federal Facility

The ER considered shipment of spent fuel to a DOE repository (specifically, Yucca Mountain) or a monitored retrievable storage facility. At the time neither existed, though the ER postulated that Yucca Mountain could be open as soon as 2010 (Ref. 8.8). No permanent federal storage facility or interim monitored retrievable storage facility has been built and there appears to be no prospect for one available in time to eliminate the need for PI ISFSI license renewal, as discussed in Sections E1.1 and E1.2. Therefore, shipping to a federal facility is not a reasonable alternative to renewing the PI ISFSI license.

E2.1.3.9 Ship the Fuel to a Reprocessing Facility

The ER considered shipping the fuel to a reprocessing facility to extract the residual uranium and plutonium for recycling into new fuel assemblies. At that time, no reprocessing facility existed in the United States (Ref. 8.8). No commercial reprocessing facilities currently exist in the United States and there are no prospects for such facilities in the foreseeable future. Therefore, reprocessing is not a reasonable alternative to renewing the PI ISFSI license.

E2.1.3.10 Reduce the Rate of Spent Fuel Generation

The ER considered future reduction in the rate of spent fuel generation, either through use of high-burnup fuel or through reduction in operations. At the time, the combination of fuel and core design in use at PINGP was limited by the maximum burnup allowed under the NRC regulations. The fuel and core design in use at PINGP continues to be limited by the maximum burn-up allowed by NRC regulations. Therefore, a reduction in

the rate of spent fuel generation is not a viable alternative to renewing the PI ISFSI license.

The ER postulated that reduction in operations could be achieved in the event that the DOE could accurately forecast when spent fuel could be received at a federal repository. This alternative would postpone, but not eliminate, the need for storage (Ref. 8.8). Even if the DOE could accurately predict when it could accept used fuel today, the facility would not be available by the end of the PI ISFSI license, making this alternative non-viable.

Finally, reduction in operations (either through bringing down the power output of the plant or shutting down the plant altogether) would still not relieve NSPM's need to manage spent fuel until the DOE could accept it, and would remove a valuable generating asset from NSPM's portfolio. This generation capacity would need to be replaced with another baseload facility (e.g., nuclear, coal, natural gas), the construction of which would be accompanied by significant costs and environmental impacts. Therefore, this option is not a reasonable alternative.

E2.2 Comparison of the Predicted Environmental Impacts

Table 2.2-1 compares the environmental impacts of renewing the license of the PI ISFSI with the alternatives discussed in Section E2.1.

NSPM bases its discussion of impacts in this section and in the remainder of this Supplemental ER on NRC's standard of significance of impacts as identified in the GEIS (Ref. 8.6). The NRC establishes three levels of significance for potential impacts—SMALL, MODERATE, and LARGE, as defined below:

SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Table 2.2-1
Comparison of PI ISFSI License Renewal with the Alternatives

Resource Impact	PI ISFSI License Renewal	No Action	Construct Another ISFSI at PINGP	Use Another ISFSI Design	Construct an ISFSI at a New Site [a]	Expand the Spent Fuel Pool	Construct a New Spent Fuel Pool	Increase Existing Pool Capacity	Ship Fuel to Existing Facility	Ship Fuel to Federal Facility	Ship Fuel to Reprocess. Facility	Reduce the Rate of Fuel Generation
Geology/Soils	None	No environ-mental advantage over PI ISFSI license renewal; would require removal of fuel from PI ISFSI and construction of new power facility.	Small	Small	Small	Not a reasonable alternative	Small	Not a reasonable alternative	Not a reasonable alternative	Not a reasonable alternative	Not a reasonable alternative	Not a reasonable alternative
Surface and Ground Water	None		Small	Small	Small		Small					
Aquatic Resources	None		None	None	None		None					
Terrestrial Resources	None		Small to Large	Small to Large	Small to Large		Small to Large					
Special-Status Species	None		Small to Large	Small to Large	Small to Large		Small to Large					
Demography and Socioeconomics	None		Small	Small	Small		Small					
Taxes	None		Small	Small	Small		Small					
Land Use	None		Small	None	Small		Small					
Social Services/ Public Facilities	None		Small	Small	Small		Small					
Historic/Archaeol ogical Resources	None		Small to Large	Small to Large	Small to Large		Small to Large					
Air Resources	None		Small	Small	Small		Small					
Occupational Dose	Small		Small; > proposed action	Small; > proposed action	Small; > proposed action		Small; > proposed action					
Dose to Public	Small		Small	Small	Small		Small					
Accidents - Occupational Dose	Small		Small	Small	Small		Small					
Accidents - Dose to Public	Small		Small	Small	Small		Small					

[a] Under Minnesota Statute 116C.83 Subdivision 4(b), storage of spent nuclear fuel is prohibited at any site in Minnesota other than the site at which it was generated.

E3.0 AFFECTED ENVIRONMENT

E3.1 Location and Features

The PINGP and PI ISFSI are located on a low island terrace associated with the Mississippi River floodplain. Both PINGP and the PI ISFSI are located in the city limits of Red Wing in Goodhue County, Minnesota, approximately 28 miles southeast of the Minneapolis-St. Paul metropolitan area. The PI ISFSI site and all appurtenant facilities are located in Section 5, T113N, R15W. PINGP is situated on approximately 578 acres owned by NSPM, bordered by the Vermillion River on the west and by the Mississippi River on the east. The PI ISFSI is situated approximately 300 yards southwest from the plant (see Figures 3.1-1 and 3.1-2).

The overburden materials in the site area consist of sandy alluvial soils. Vegetation consists of prairie grass and brush, with some isolated stands of trees. The PI ISFSI itself is covered with a gravel surface. The protected area fence surrounding the PI ISFSI is within the PINGP site boundary and exclusion area. A 17 foot high earthen berm surrounds the PI ISFSI and provides radiological shielding. The protected area of the PI ISFSI and the access road connecting the PI ISFSI and the PINGP Auxiliary Building is on land entirely owned by NSPM (Ref. 8.17).

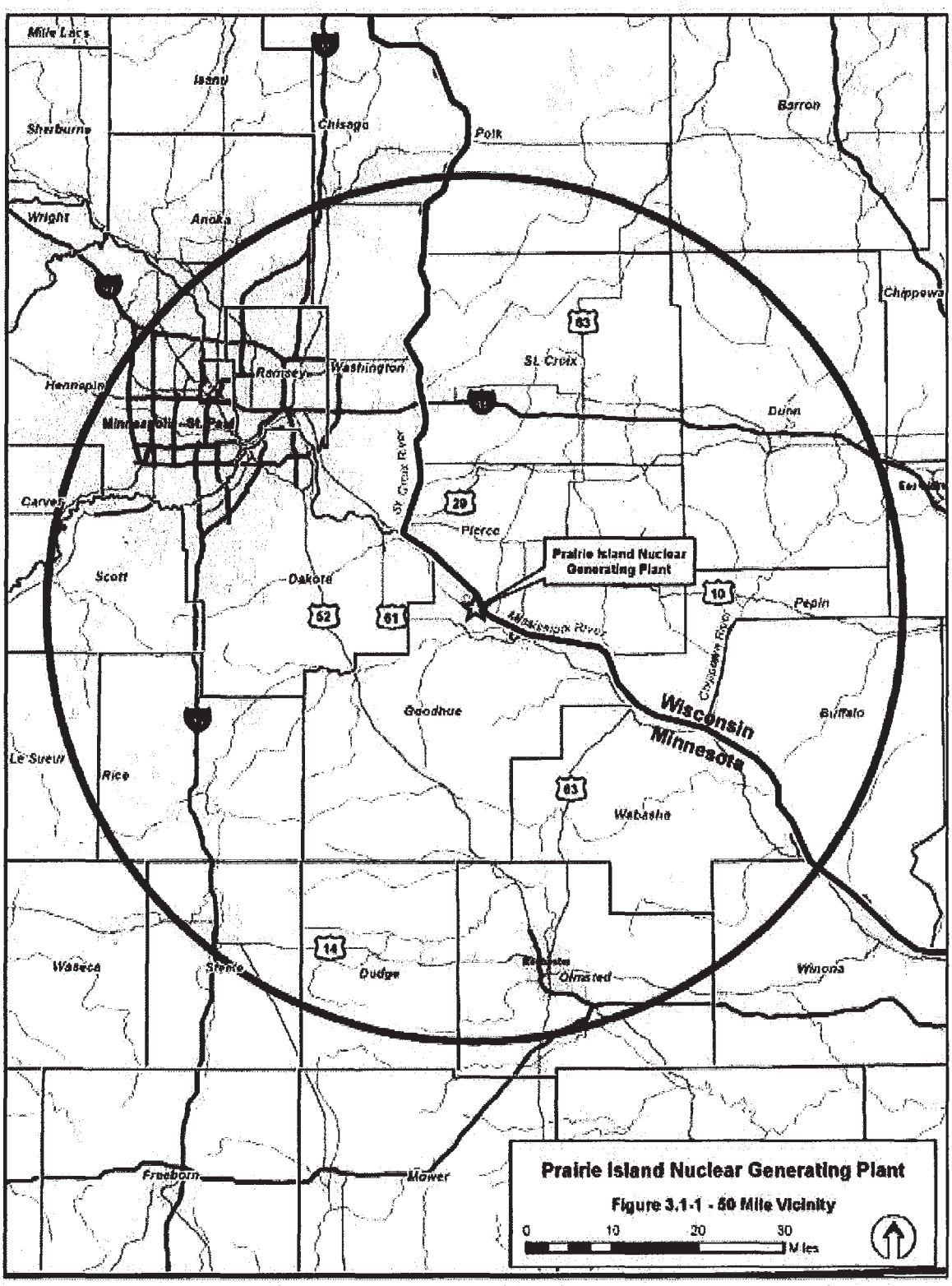
Steep bluffs run parallel to this stretch of the Mississippi River and rise to an elevation of over 1,000 feet above mean sea level (amsl) approximately 1.5 miles northeast and southwest of the site. The ground surface near the PINGP site is fairly level to slightly rolling, ranging in elevation from 675 to 706 feet amsl. The surface slopes gradually towards the Mississippi River to the northeast and Vermillion River on the southwest. Normal water level is 674.5 feet amsl. The actual PI ISFSI pad elevation is 694.5 feet amsl (Ref. 8.17).

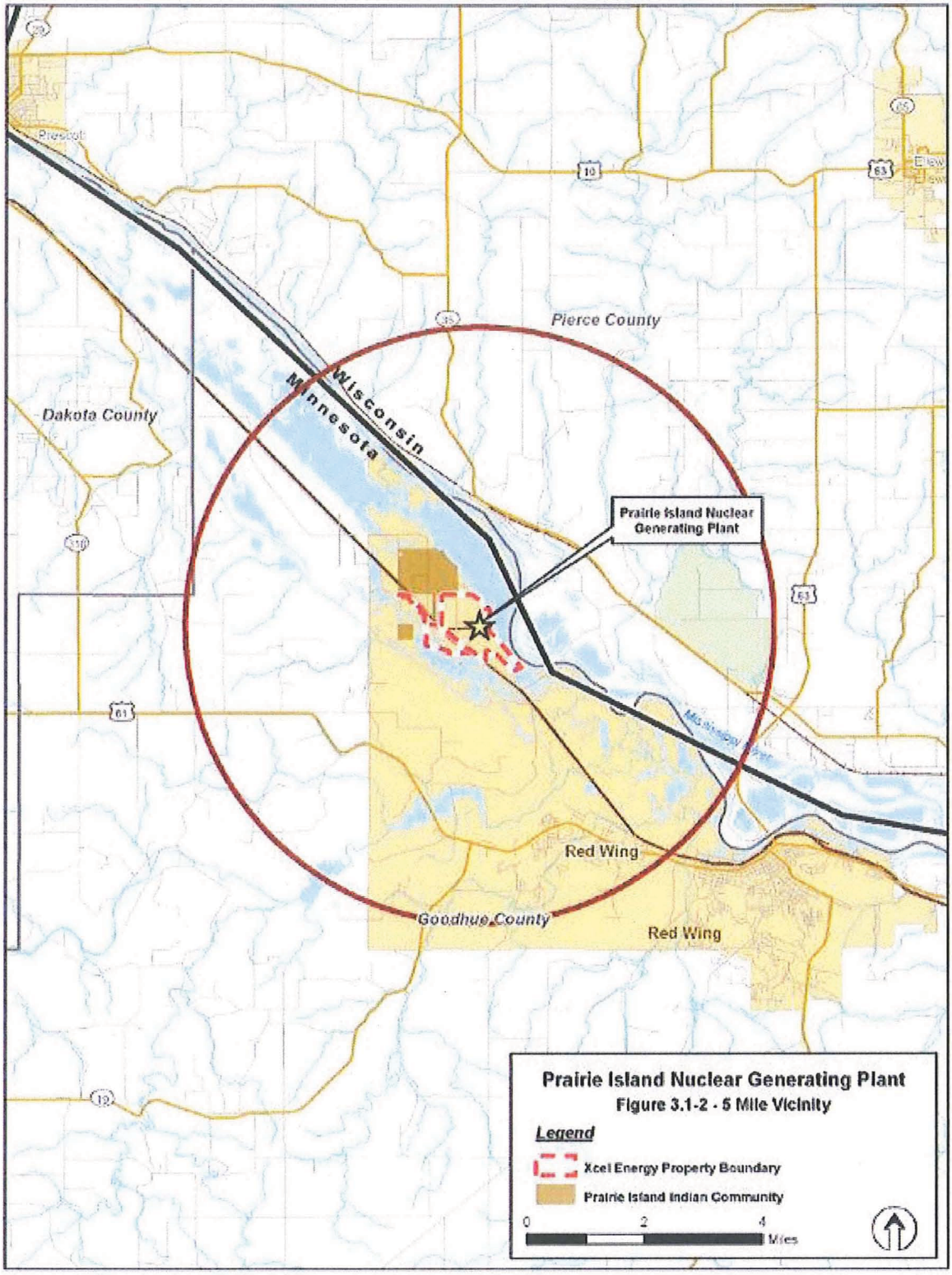
The city of Red Wing serves as the Goodhue County seat. Goodhue County and the adjacent counties of Dakota and Pierce (the latter of which is located in Wisconsin) are predominantly rural. Dairy products and livestock account for most of the farm products with field crops and vegetables accounting for the remainder (Ref. 8.17).

The current land use in the surrounding area is a mixture of commercial, light industrial, residential, municipal, and commercial farming. PINGP and the PI ISFSI occupy a former cultivated field. Land within a radius of five miles of the site is used mostly for agriculture. Beyond the site boundary and within a one-mile radius of the plant, there are approximately 30 permanent residences or summer cottages. The closest occupied off-site residence is approximately 0.45 mile northwest from the plant (Ref. 8.17). The Treasure Island Resort and Casino is the closest business to the PI ISFSI and is located approximately one mile northwest of the PI ISFSI.

The Prairie Island Indian Reservation lies approximately one mile northwest of the site. The PIIC is a federally recognized Indian Tribe organized under the Indian Reorganization Act. As of 2009, the PIIC had 801 enrolled members; approximately 250 members live on tribal land (Ref. 8.15). Sturgeon Lake Road serves as the separating boundary between the PIIC and the PINGP and provides access to the plant as well as to the PIIC's residential areas, government offices, wastewater treatment facility, health clinics, and the Treasure Island Resort and Casino, which includes a 480-room hotel and

convention center. Treasure Island Resort and Casino offers gaming, dining, live entertainment, a 95-space RV park, a 137-slip marina, and sightseeing and dinner cruises on their riverboat. The PIIC is the largest employer in Goodhue County with over 1,500 employees in both the casino and government offices (Ref. 8.11).


Mille Lacs
Isanti
Chisago
Polk
Barron
Sherburne
Wright
Anoka
Chippewa
Hennepin
Ramsey
Washington
St. Croix
Dunn
Carver
Pierce
Prairie Island Nuclear Generating Plant
Scott
Dakota
Pepin
Goodhue
Wisconsin
Minnesota
Buffalo
Le Sueur
Rice
Wabasha
Waseca
Steele
Dodge
Olmsted
Winona
Freeborn
Mower
Prairie Island Nuclear Generating Plant
Figure 3.1-1 - 50 Mile Vicinity
0
10
20
30
Miles


Prescott
Pierce County
Wisconsin
Minnesota
Dakota County
Prairie Island Nuclear Generating Plant
Red Wing
Goodhue County
Red Wing
Prairie Island Nuclear Generating Plant
Figure 3.1-2 - 5 Mile Vicinity
Legend
Xcel Energy Property Boundary
Prairie Island Indian Community
0
2
4
Miles

E3.2 Land Use

This section summarizes and updates a more lengthy discussion of land use in the PINGP ER and focuses on two Minnesota counties (Goodhue and Dakota) and one Wisconsin county (Pierce) because approximately 83 percent of the employees at PINGP live within these counties (Ref. 8.15).

Goodhue County is located southeast of the Minneapolis-St. Paul metropolitan area along the Minnesota-Wisconsin border, and northwest of the Rochester metropolitan area. The majority of land in the county is used for agricultural purposes. Goodhue County zoning and subdivision ordinances guide development within the County, while the Goodhue County 2004 Comprehensive Plan continues to identify goals for future development (Ref. 8.14). Although Goodhue County remains largely undeveloped, the County's population has experienced some growth. The County's population has grown to 46,183 persons from 2000 to 2010, a 4.7 percent growth over the same period as shown in Table 3.11-1.

Dakota County is located south of the Minneapolis-St. Paul metropolitan area. The majority of land in the county is used for agricultural purposes. In general, land use decision-making occurs at the city and township level through zoning and the influence of land use planning at the regional level (Ref. 8.14). The county's population has grown to 398,552 persons from 2000 to 2010, a 12.0 percent growth over the same period as shown in Table 3.11-1.

Pierce County, Wisconsin is located east of Goodhue County and south-southeast of the Minneapolis-St. Paul metropolitan area. With no town larger than 2,500 residents, the county is expected to remain primarily a rural area. As a result, residents continue to rely on larger nearby urban centers for many of their needs. Pierce County has developed a "Smart Growth" Comprehensive Plan to set goals for attaining a desirable development pattern (Ref. 8.22). The county's population has grown to 41,019 persons from 2000 to 2010, an 11.5 percent growth over the same period as shown in Table 3.11-1.

The PIIC is not subject to state or local land use jurisdiction. The Tribe is free to develop its own land-use policies and management plans for its Trust lands (Ref. 8.15).

Land use in affected counties and on the PIIC continues to reflect the area's growing populations through development of services, industries, and residential areas.

E3.3 Transportation and Social Services

In the SEIS, the NRC determined that there would be minimal transportation impacts during the plant's period of extended operation beyond what is currently experienced; however, the PIIC notes their concern with traffic impacts on the Tribe's residential area, the casino, and tribal government offices (Ref. 8.15).

As described in the PINGP ER, the public water systems in the locations where most PINGP employees reside provide sufficient water to the populations in their service areas. County planners are concerned about the impact projected population growth will have on the availability of groundwater as a water source and the possible impacts that over use of the resource could have on surface water resources, in addition to potential sources of groundwater contamination. County planners continue to address these

concerns through their Comprehensive Plans and county ordinances (Ref. 8.14). The NRC determined in its SEIS that public water systems in the region would be adequate to meet the demands of residential and industrial customers in the area over the plant's period of extended operation (Ref. 8.15). This determination would be valid over the period of extended ISFSI operations.

E3.4 Geology and Soils

Information regarding the geology, soils, and seismology of the area has not changed from the information presented in the ER (Ref. 8.8; Section 2.5); therefore, NSPM adopts this information by reference. However, NSPM recently conducted core sampling around the PI ISFSI at eight test pits as part of a Phase I Archaeological Reconnaissance Survey. Visual inspection of the exposed soil profiles in all but one of the test pits suggested that the subsurface deposits in the project area are significantly disturbed and contain limited original integrity. Soils observed included dark grayish brown sand and coarse brown sand in addition to gravel in some areas (Ref. 8.23).

E3.5 Water Resources

The PINGP ER accurately describes the present condition of the surface and groundwater use at PINGP (Ref. 8.14; Section 2.2); therefore, much of this information is incorporated by reference. Several surface water bodies are located adjacent to PINGP and the PI ISFSI. The Mississippi River, Vermillion River, Sturgeon Lake, and the Cannon River all serve as primary surface water bodies near the site. Lock and Dam Number 3, which controls the levels of the Mississippi River and Sturgeon Lake, is located approximately one mile downstream from the site. Normal pool level upstream of Lock and Dam 3 is 674.5 feet. Flow and level in the PINGP section of the Mississippi River is entirely controlled by Lock and Dam 3.

There are no withdrawals of river water for supply of city water for at least 300 miles downstream from the site. Minor withdrawals of river water for irrigation purposes do occur, the nearest being the City of Red Wing. Surface drainage at the site is essentially nonexistent, primarily due to the extremely sandy nature of the soils and the topography of the island. There are no established drainage lines, and because of the nature of the terrain, there are many small internal drainage basins (Ref. 8.14).

Prairie Island is an island terrace associated with the Mississippi River floodplain. The aquifers in the vicinity of the site include the alluvial aquifer (water table) and the underlying bedrock (confined) aquifers. Generally, wells in the alluvial material in the vicinity of the site are less than 100 feet in depth. The Prairie Island alluvial aquifer receives recharge from and discharges to surface waters. The aquifer is also recharged through direct precipitation, flood waters, snowmelt, and from underlying aquifers. A United States Geological Survey study performed in 1997 stated that the amount of water discharged to wells in the Prairie Island study area from the alluvial aquifer was less than one-third of the water that was discharged from the alluvial aquifer to surface waters or to the atmosphere (Ref. 8.14).

Important aquifers in the vicinity of the PINGP site include the Jordan Sandstone, Franconia, St. Lawrence, and the Dresbach formations. The groundwater table in the vicinity of PINGP is generally within 5 to 20 feet of ground surface and slopes to the southwest. Groundwater levels in the alluvial aquifer are directly influenced by the Mississippi River and vary with river fluctuations (Ref. 8.14).

The PIIC public water supply withdraws water from the Eau Claire/Mount Simon aquifer (part of the Dresbach formation) and has replaced most of the once-used individual wells on the reservation. The PIIC derives its water from four deep wells (400 to 730 feet deep) which penetrate sandstone aquifers of the Mount Simon and into the underlying Hinkley formation and yield approximately 1,400 gallons per minute (gpm). One of the closest wells to PINGP is a deep well (595 feet deep) located in the bedrock aquifers at Lock and Dam 3. Several industries in the Red Wing area also use groundwater and derive their supplies principally from the bedrock aquifers (Ref. 8.14). PINGP withdraws groundwater for potable and industrial use from six wells installed within the alluvial aquifer. The six wells produced an average of 102 gpm from 2006 to 2010.

E3.6 Ecological Resources

E3.6.1 Aquatic Biota and Habitats

The ER did not address impacts on aquatic biota and habitats as the PI ISFSI does not use or otherwise impact water resources or discharge water to aquatic features. This continues to be a valid assumption; therefore, no discussion of aquatic biota or habitats are included in this Supplemental ER.

Section 401 of the Clean Water Act requires that any applicant for a Federal license or permit which includes construction or operation activities that may discharge into any surface waters must provide certification from the state in which the discharge originates or will originate, that such discharge complies with the Federal Water Pollution Control Act per 33 USC 1341 and 40 CFR Part 122. No additional discharge or runoff to receiving waters is anticipated for the PI ISFSI in the period of extended operation; therefore no certification or additional permitting requirements are expected.

E3.6.2 Terrestrial Biota and Habitats

The property on which PINGP and the PI ISFSI reside has historically seen a number of land uses. When European settlers arrived in Minnesota in the late 1800s, healthy, native plant communities existed across the landscape. Extensive settlement, development, and agriculture since the arrival of the Europeans have dramatically modified the natural plant communities. The PIIC was dependent on many plants that were native to the current reservation and in the surrounding area where tribal members frequently traveled to hunt and gather (Ref. 8.24).

Approximately 240 acres of the PINGP site were disturbed and modified by plant construction activities in the early 1970s. Approximately 60 acres of the 240 disturbed acres support the generating plant and associated buildings, maintenance facilities, parking lots, and roads. After plant construction was completed, the remaining 180 acres of disturbed land were landscaped and today most of this is mowed grass or unmowed prairie-like grassland. Ten acres were converted to the PI ISFSI site in 1992 and 1993.

The most historic plant surveys of the native plant communities on Prairie Island occurred between 1975 and 1980 for the original licensing of the plant (Ref. 8.8). Prior to construction of PINGP in the 1960s, the land on which PINGP is located was heavily farmed. Pre-construction vegetation studies recorded 63 known species and focused mainly on herbaceous plants.

The PINGP ER accurately describes the present condition of the terrestrial habitats and terrestrial species which inhabit these areas on the PINGP site (Ref. 8.14; Section 2.3.2); therefore, this information is incorporated by reference. However, NSPM recently engaged Biological Services Inc. and John P. McCrady, Inc. (McCrady) to conduct surveys for medicinally and culturally important plant species present on the PINGP site. Prior to its work at PINGP, McCrady conducted a plant species inventory on the PIIC reservation that focused on medicinally and culturally important plants present on the reservation. McCrady developed a list of 180 medicinally and culturally important plants of the Dakota Indians, 80 of which were observed on the PIIC reservation during their surveys.

NSPM retained McCrady to conduct surveys on the PINGP site for traditional medicinal and culturally important plant species. McCrady conducted its surveys in October 2008, April 2009, and June 2009. Four survey transects were established in a variety of landscape types. Each transect was walked by a number of individuals and general species abundance was documented. Species were classified as common, uncommon, or rare (Ref. 8.24).

The McCrady surveys revealed the highest number of plant species since the 1975-1980 surveys. Of the 208 species observed, 78 were determined to have medicinal or cultural significance to the Dakota Indians. A number of the species observed were nonnative invasives. The surveys identified one special-status species, which is further discussed in Section E3.6.3. The surveys also revealed five new species occurrences in Goodhue County. The surveys observed 26 of the 63 species identified during the 1975-1980 surveys (Ref. 8.24).

As a result of these surveys, NSPM has prepared a PINGP Plant Field Guide which presents identification and ethno-botanical information for 113 species of plants that are of cultural and medicinal importance to the PIIC. The Plant Field Guide was developed in association with the PIIC. This Plant Field Guide is an integral part of PINGP's Cultural Resource Management Plan (CRMP), which is discussed further in Section E3.9.

E3.6.3 Special Status Species

The PINGP ER contained a general list of species that could occur in the area (Ref. 8.14). The NRC's analysis of terrestrial special status species in the SEIS found that no federally listed threatened or endangered terrestrial species or critical habitat are known to occur near the site; however, the state-listed peregrine falcon and bald eagle are known to nest in the vicinity of PINGP. The NRC concluded that adverse impacts to threatened or endangered terrestrial species during the PINGP period of extended operation would be small (Ref. 8.15). These species are addressed here, with updates to account for more recent occurrence data obtained via consultation. No areas designated by the FWS as "critical habitat" are present at the site.

PINGP placed a nest box designed for the state-listed threatened peregrine falcon (*Falco peregrinus*) on the Unit 1 containment dome in 1994. A pair of peregrine falcons has nested in the nest box annually since 1997, and 38 falcons have fledged from the nest since that time. Peregrine falcons continue to use the nest box and typically arrive in the vicinity in March; eggs hatch in May and the young fledge in July (Ref. 8.14).

The ER noted that the bald eagle (*Haliaeetus leucocephalus*) was known to occur in the area (Ref. 8.8). The bald eagle has since been removed from the federal list of threatened and endangered species effective August 8, 2007. At the federal level, the bald eagle is still protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The bald eagle continues to be state-listed as a species of special concern. No eagle nests are known to exist on PINGP property, but there are at least two nests nearby. One nest is located in the Vermillion River bottoms just south of the PINGP site, and one nest is located approximately two miles upstream of Lock and Dam 3 on the eastern side of the Mississippi River. At least two studies have documented bald eagle use of the Mississippi River near PINGP as a wintering area. Bald eagles are regularly observed in lower Pool 3 and upper Pool 4 during winter when open water is present due to thermal discharge from PINGP (Ref. 8.14).

The state-listed threatened trumpeter swan (*Cygnus buccinator*) has been known to migrate through the PINGP area. Trumpeter swans are occasionally observed in Goodhue County (Ref. 8.14).

The SEIS noted that two special-status flora species could occur on the PINGP site – the dwarf trout lily (*Erythronium propullans*) and the prairie bush clover (*Lespedeza leptostachya*). The dwarf trout lily is listed as endangered by both the FWS and the MDNR. This forest wildflower is found only in three southeastern Minnesota counties (Goodhue, Rice, and Steele). The prairie bush clover is classified as threatened by the FWS and the MDNR. Within Minnesota, it is known to occur in 12 counties, one of which is Goodhue County (Ref. 8.14; Ref. 8.15). The McCrady surveys did not reveal any occurrences of either the dwarf trout lily or the prairie bush clover on the PINGP site (Ref. 8.24).

The McCrady survey did not identify any federal or state threatened or endangered species on the PINGP site. However, they did identify the state-listed species of special concern beach heather (*Hudsonia tomentosa*) as an uncommon occurrence in Transect 1. Transect 1 is characterized as a steep bank adjoining lowland floodplain habitat, and is far-removed from the PI ISFSI site (Ref. 8.24).

On May 18, 2011 NSPM consulted with the FWS and the MDNR regarding the impacts of the proposed action on special status species and habitats. NSPM has not received response from the FWS. The MDNR responded on June 30, 2011 with known locations of rare species or other significant natural features within a one-mile radius of the PI ISFSI. Species and native plant communities with known occurrences within the same Township/Section/Range as PINGP are presented in Table 3.6-1, below. The peregrine falcon is the only species known to occur within the exact Township/Section/Range as the PI ISFSI. Records of consultation are presented in Attachment A.

Table 3.6-1
Rare Species and Significant Natural Features Known to Occur Within a One-Mile Radius of the PI ISFSI

Common name	Scientific Name	Minnesota Status	Location
Cerulean Warbler	*Dendroica cerulean*	Special Concern	T113N R15W S8,9
Blanding's Turtle	*Emydoidea blandingii*	Threatened	T113N R15W S5,6
Peregrine Falcon	*Falco peregrinus*	Threatened	T113N R15W S5
Bald Eagle	*Haliaeetus leucocephalus*	Special Concern	T113N R15W S8
Western Harvest Mouse	*Reithrodontomys megalotis*	Tracked	T113N R15W S6
American Ginseng	*Panax quinquefolius*	Special Concern	T113N R15W S7,8
Gravel Oak Savannah		N/A	T113N R15W S5
Spikerush – Bur Reed Marsh (Northern)		N/A	T113N R15W S6
Sugar Maple – Basswood –(Bitternut Hickory) Forest		N/A	T113N R15W S7,8

Note: Aquatic species noted in the June 30, 2011 consultation letter from the MDNR were not included in this table.

E3.7 Meteorology, Climatology, and Air Quality

A description of air quality was not included in the ER; therefore, this section has been provided to be consistent with the requirements of NUREG-1748 (Ref. 8.13). Meteorology and climatology (and climatological impacts due to cask-induced fogging) were addressed in the ER, and continue to provide an accurate representation of the conditions in the area. The climate of the region continues to be influenced by the general storms that move eastward along the northern tier of the United States. The geographical location results in frequent changes in weather systems as polar and tropical air masses alternate (Ref. 8.14). Data collected from 1949 to 2001 at the Red Wing Dam 3 weather station indicate that the mean monthly temperatures in the vicinity of PINGP range from 12.0 degrees Fahrenheit (°F) in January to 72.1°F in July. Mean annual precipitation in the vicinity of PINGP is 29.95 inches; June through August receive the most rainfall. Southern Minnesota averages 45 thunderstorm days annually. Annual snowfall averages about 44 inches per year, with snowfalls of 4 inches or greater common from mid-November to mid-April. Tornadoes have been documented in Minnesota from March through November and occur most frequently in May, June, and July. Goodhue County has experienced 18 recorded tornadoes between 1950 and 2005 (Ref. 8.15).

Goodhue County is located in the Southeast Minnesota-La Crosse (Wisconsin) Interstate Air Quality Control Region. Goodhue County is currently an attainment area

for all criteria pollutants. PINGP has a number of stationary emission sources, which include an oil-fired boiler and diesel-fired engines for emergency power, pump cooling water, and fire-fighting systems. PINGP operates under a Synthetic Minor Operating Permit from the Minnesota Pollution Control Agency (Ref. 8.15). There are no air emissions from the PI ISFSI.

E3.8 Noise

The ER briefly discussed the impacts of construction noise on construction workers, the public, and surrounding fauna. In all cases, the impact of noise on sensitive receptors was determined to be acceptable (Ref. 8.8). Noise levels at PINGP include those from operation of equipment, cooling towers, and vehicles. No noise is directly attributable to the operation of the PI ISFSI, other than the occasional vehicle traffic to and from the site during routine maintenance activities and cask transfers.

E3.9 Historical and Cultural Resources

As a federal undertaking, PI ISFSI license renewal requires compliance with the National Historic Preservation Act through the Section 106 process of identification, evaluation, and mitigation of effects to historical cultural resources. NSPM has conducted numerous archaeological studies over the history of PINGP and remains committed to protecting the historical and cultural resources within its boundaries.

PINGP is located in an area known archaeologically as the Red Wing Locality, which is the northernmost North American location that shows evidence of Mississippian contact and interaction with local populations. The Mississippi River and its tributaries have played an important role in the history of the region, both during pre-contact times and after the arrival of European explorers and settlers. There is evidence of five major prehistoric cultural periods in the vicinity of Prairie Island: Paleoindian (initial entrance in America to circa 6050 B.C.), Archaic (circa 6050 B.C. to circa 1050 B.C.), Woodland (circa 500 B.C. to circa 1600 A.D.), Mississippian (circa 1050 A.D. to circa 1300 A.D.), and Oneota (circa 900 A.D. to the arrival of Europeans). When French explorers and voyageurs arrived in the 17th century the area now known as Minnesota was dominated by two Indian tribes, the Dakota (later called Sioux by the French, and including the Santee, Yankton, and Teton bands) and the Ojibwe (sometimes referred to as the Chippewa).

The members of the PIIC are descendants of a larger Dakota group called the Mde wakan ed otunwahe. Over the years this name has been shortened to Mdewakanton. In the 1890s the Secretary of the Interior purchased land for the benefit of the Mdewakanton Dakota in Minnesota, including 120 acres of land purchased on Prairie Island in 1891. This land was assigned to Mdewakanton Dakota tribal members residing on Prairie Island in 10- and 5-acre tracts. An Act of Congress in 1980 changed the status of those lands, transferring them into trust for the benefit of the PIIC. In 1936, the PIIC gained federal recognition as an Indian tribe organized under the Indian Reorganization Act. The Tribe is governed under the terms and conditions of the PIIC's Constitution and By-laws adopted by tribal members on May 23, 1936, and approved by the Secretary of the Interior on June 20, 1936, as amended. Over the last several years, the PIIC has been able to expand its land base through the purchase of additional land. Approximately 1,226 acres of additional land is now in trust and an additional 685 acres are currently in fee status (subject to state and county jurisdiction).

A number of surveys for cultural and historic resources have been conducted on Prairie Island and as part of the operating history of PINGP. The PINGP ER provides an accurate summary of activities up until 2008, and an amendment filed on March 4, 2009 provided additional discussion of the archaeological, historical, and cultural resources within and around the PINGP site and of NSPM's actions to further define and protect these resources (Ref. 8.25). Since submittal of the PINGP ER, NSPM has engaged in and supported a number of other activities to better define and protect the resources present on the PINGP site.

Investigations into the prehistoric archaeology of Prairie Island began in the 1960s, when Northern States Power contracted with University of Minnesota Professor Elden Johnson to survey and recover data prior to construction of the PINGP. Professor Johnson recorded several sites within the PINGP boundaries at that time. More recently, in the summer of 2008, Dr. Ronald Schirmer from Minnesota State University, Mankato conducted a summer field school and excavated at the Bartron Site (21GD02). The 2008 excavation yielded a moderate quantity of artifacts and identified Woodland or Oneota period pit features. The final curation facility for the artifacts has yet to be determined; however, it is understood that a location determined in collaboration with the PIIC will be considered first.

Concurrent with the 2008 field school excavations, NMC contracted with Donald W. Johnson to perform a geophysical survey of portions of the Bartron Site. Johnson utilized electrical resistivity and magnetometry methods to probe the ground in a non-intrusive manner. The geophysical survey identified several below-ground anomalies that appear to be cultural rather than natural (Ref 8.26).

In the fall of 2008, NSPM conducted a Phase I archaeological survey in an area to be expanded for use as a dredge holding pond. This survey had no cultural resource findings, and concern about the possibility of deeply-buried sites led to additional testing, also with no findings (Ref. 8.26).

In 2009, NSPM conducted a limited Phase I survey to provide baseline information about the archaeological sites within the PINGP grounds. A secondary goal was to evaluate the disturbance within the PINGP grounds and consider the potential for discovery of unrecorded sites. The survey attempted to identify levels of disturbance, specifically areas of disturbance that would preclude the discovery of intact archaeological deposits. The survey revisited the locations of eight previously recorded sites (21GD02, 21GD58/61, 21GD59, 21GD62, 21GD148, 21GD149, 21GD207, and 21GD*l*), and recorded five newly identified archaeological sites (21GD277, 21GD278, 21GD279, 21GD280, and the Prairie Island Schoolhouse).

The most recent archaeological activity involves the planned repatriation of a Native American burial. In 1968, Professor Elden Johnson excavated and removed burials from Mound Group 58/61, a site about one-half mile from the PI ISFSI. The original site of the mound group was relocated and re-recorded in the 2009 limited Phase I survey. In preparation for the PIIC to plan and carry out a re-burial within the original mound group, PINGP requested official authentication of the site. In May 2011, Scott Anfinson, the Minnesota State Archaeologist, visited and authenticated the site.

NSPM and the PIIC have entered into a "Settlement Agreement Among the Prairie Island Indian Community and Northern States Power Co. Regarding Contentions 1, 6 and 11" in 2009 to address a number of PIIC concerns expressed during the plant license renewal process. One such commitment was to conduct the 2009 limited Phase I survey, described above. Another commitment was to prepare and implement a CRMP to protect significant historical, archaeological, and cultural resources that may currently exist on the PINGP site. The CRMP includes the results of the 2009 survey, the results of the botanical surveys discussed in Section E3.6.2, and reporting guidelines regarding any archaeological or ground-disturbing activities which occur at PINGP. NSPM has implemented a CRMP and continues to address its preliminary commitments and recommendations from the NRC and the Settlement Agreement with the PIIC regarding historical, archaeological, and cultural resources.

In 2010, NSPM conducted a Phase I Archaeological Reconnaissance Survey of the ground surface surrounding the PI ISFSI. The purpose of the survey was to assess the nature of previous construction disturbance and determine the potential for the presence of previously undocumented cultural resources within the PI ISFSI footprint. The investigation was conducted per an agreement with the PIIC to ensure protection of both recorded and unrecorded cultural resources on NSPM property. The project consisted of a literature review and field investigation at 8 test pits around the perimeter of the PI ISFSI. No prehistoric or diagnostic historic artifacts were recovered as a result of the screening of the excavated materials. Visual inspection of the exposed soil profiles in all but one of the test pits suggested that the subsurface deposits in the project area are significantly disturbed and contain limited original integrity (Ref. 8.23).

Table 2-25 of the SEIS presents archaeological sites within the PINGP boundary (Ref. 8.15). None of these sites are located within the ISFSI boundary. The potential exists for additional undiscovered archaeological resources at PINGP. The NRC concluded in the SEIS that continued operation of PINGP could have moderate impacts on historic and archaeological resources, but that these impacts could be mitigated with the implementation of a number of plans and practices (Ref. 8.15). NSPM has completed NRC-recommended actions to mitigate the impacts.

On May 18, 2011 NSPM consulted with the MSHPO and the PIIC regarding the project's impacts on cultural and historic resources. On June 15, 2011, the MSHPO responded that no properties listed in or eligible for listing in the National Register of Historic Places (NRHP) would be affected by PI ISFSI license renewal. Records of consultation are presented in Attachment A.

E3.10 Visual and Scenic Resources

PINGP and the PI ISFSI are located on an island situated in a valley on the west side of the Mississippi River. Both units can be seen from the river, but are partially shielded by vegetation. The turbine building and reactor containment buildings dominate the viewshed in the area (Ref. 8.15). The PI ISFSI is located at the interior of the site, which makes it impossible to see from the Mississippi River, the Vermillion River, the PIIC, any residences, or any public or private roadways. In addition, the PI ISFSI is shielded from the employee viewshed at most angles.

E3.11 Socioeconomics

Sections E3.11.1 through E3.11.3 describe the current demographic and economic characteristics for the 50 mile and 10 mile geographic areas, as well as the three-county region of influence. Most demographic data was obtained from the U.S. Census Bureau (USCB) for the year 2010 unless specifically noted. Section E3.11.4 describes taxes paid by NSPM for PINGP, which include but do not differentiate the PI ISFSI.

E3.11.1 General Population

The ER estimated the population within 10 miles and between 10 to 50 miles of the site, with county-wide population projections to the year 2010. Estimates were based on evacuation time zone estimates for PINGP and state and local planning data.

The three-county region of influence includes Goodhue and Dakota counties, Minnesota and Pierce County, Wisconsin, where approximately 83 percent of the PINGP workforce resides (Ref. 8.15). PINGP currently employs approximately 800 full-time, contract, and security employees.

The nearest major population centers located within 50 miles of the PI ISFSI include Red Wing (approximately three miles southeast), Hastings (located approximately 13 miles northwest), the Twin Cities of Minneapolis and St. Paul (approximately 28 miles northwest, respectively), and Rochester, Minnesota (approximately 50 miles southeast).

The area within the 10-mile radius of the PI ISFSI includes smaller population centers such as Miesville (approximately nine miles west) and Welch, Minnesota (approximately six miles southwest); and Hager City (approximately five miles southeast) and Diamond Bluff, Wisconsin (approximately two miles northeast). The area within 10 miles is predominantly rural, with the exception of the city of Red Wing and the PIIC.

NSPM used ArcView® geographic information system software to combine USCB year 2010 block group TIGER line spatial data and 2010 census block group data to determine the number of people present within a 10- and 50-mile radius of the PI ISFSI. A census block group was included in a radius if its boundaries were fully contained in the area, or if any part of the census block group was contained in the area.

Based on 2010 census data, an estimated 50,308 people live within 10 miles of PINGP, which equates to a population density of 160 persons per square mile. An estimated 3,066,565 people live within 50 miles of PINGP, which equates to a population density of 390 persons per square mile (Ref. 8.21).

Table 3.11-1 depicts historical, current, and projected population figures for Goodhue and Dakota Counties, Minnesota and Pierce County, Wisconsin.

NSPM compared county-wide 2010 populations with projections in the ER to analyze the accuracy of the original report's conclusions when compared to actual data. NSPM estimated 47,641 people would live in Goodhue County and 46,680 people would live in Pierce County in 2010. NSPM did not provide an estimate for Dakota County 2010 populations; however, they estimated that 279,900 people would live in Dakota County in 2000 (Ref. 8.8). Actual data suggests that NSPM overestimated 2010 populations by 1,458 persons for Goodhue County and 5,661 persons for Pierce County, and underestimated 2000 populations for Dakota County by 76,004 persons (Ref. 8.21).

Although the rate of each county's growth is different; all three counties have experienced positive growth rates since construction of the PI ISFSI and county-wide populations are expected to continue to grow over the period of extended operation.

As of 2009, the PIIC had 801 enrolled members; approximately 250 members live on tribal land. The PIIC is growing at an estimated rate of 30 members per year (based on birth rates for the past several years) (Ref. 8.15). Based on a growth rate of 300 new tribal members every 10 years, the PIIC could grow by 1,200 persons over the 40-year period of extended operation. Not all of these new members would live on tribal land.

Table 3.11-1
PI ISFSI Regional Population and Growth Rates

	Goodhue County, MN		Dakota County, MN		Pierce County, MN	
Year	**Population**	**Percent Growth [a]**	**Population**	**Percent Growth[a]**	**Population**	**Percent Growth [a]**
1990 [b]	40,690	5.0	275,227	41.7	32,765	5.1
2000 [b]	44,127	8.4	355,904	29.3	36,804	12.3
2010 [c]	46,183	4.7	398,552	12.0	41,019	11.5
2020 [d]	49,415	7.0	443,189	11.2	43,931	7.1
2030 [d]	51,836	4.9	471,996	6.5	47,225	7.5
2040 [d]	54,738	5.6	561,203	18.9	51,144	8.3
2050 [d]	57,584	5.2	621,812	10.8	54,519	6.6

[a] Percent growth calculated from previous decade
[b] Ref. 8.15
[c] Ref. 8.21
[d] Calculated from Ref. 8.15 percent growth estimates applied to the prior year's population, based off 2010 census data (Ref. 8.21).

E3.11.2 Transient Populations

Within 50 miles of PINGP, colleges, recreational and employment opportunities, and migrant farm work attract daily and seasonal visitors to the area. In 2007, approximately 187,000 students attended colleges and universities within a 50-mile radius of PINGP (Ref. 8.15). In 2010, 2.0 percent of Goodhue County housing units were considered temporary housing for seasonal, recreational, or occupational use. By comparison, seasonal housing accounted for 0.5 percent of total housing units in Dakota County and 5.6 percent in the state of Minnesota. Seasonal housing accounted for 1.7 percent of total housing units in Pierce County and 7.4 percent in the state of Wisconsin in 2010 (Ref. 8.21).

The PIIC's Treasure Island Resort and Casino may have as many as 16,000 guests at any given time. The hotel has 480 sleeping rooms, a 95-pad RV park, and a 137-slip marina. During the PIIC's annual Pow-Wow, an additional 500 to 2,000 visitors may be in and around the PIIC grounds. There is no rental housing or campgrounds on the PIIC reservation (Ref. 8.15). In addition, the PIIC is the largest employer in Goodhue County with over 1,500 employees in both the casino and government offices (Ref. 8.11).

Information on migrant farm and temporary labor was collected in the 2007 Census of Agriculture. According to this census, approximately 15,700 farm workers were hired to work for less than 150 days and were employed on 4,800 farms within 50 miles of PINGP. Approximately 970 temporary farm laborers were employed on 338 farms in Goodhue County and 1,012 temporary farm workers were employed on 218 farms in Dakota County. Pierce County had 720 temporary farm workers employed on 298 farms (Ref. 8.15).

E3.11.3 Minority and Low-Income Populations

For PINGP license renewal, NMC and the NRC used a 50-mile radius as the area that could contain environmental justice impact sites and the state as the geographic area for comparative analysis (Ref. 8.14; Ref. 8.15). NSPM believes that its 50-mile radius analysis conservatively bounds the impacts to minority and low-income populations within the four-mile radius suggested by the NRC in NUREG-1748.

The NRC guidance calls for the use of the most recent USCB decennial census data when preparing information on minorities and income level (Ref. 8.13). NSPM used ArcView® geographic information system software to combine USCB TIGER line spatial data and 2010 decennial census data to determine the minority population characteristics on a block group level. The 2010 decennial census did not survey participants for income characteristics; therefore, 2010 income level information was not available at the time this document was prepared. NSPM therefore used the most recent decennial census (2000) block group and income data for its low-income analysis. NSPM included a block group if any of its area lay within 50 miles of the PI ISFSI. The 50-mile radius includes 2,262 block groups; 2,117 in Minnesota and 145 in Wisconsin (Ref. 8.21). NSPM defined the geographic area for comparative analysis as the entire states of Minnesota and Wisconsin. Block groups in each state were analyzed separately against their state's data.

E3.11.3.1 Minority Populations

The NRC environmental justice procedures define a "minority" population as: American Indian or Alaskan Native; Asian; Native Hawaiian and other Pacific Islander; Black (African-American) races; other; multi-racial; the aggregate of all minority races; or, Hispanic ethnicity (Ref. 8.13). The guidance indicates that a minority population exists if either of the following criteria are met:

- The minority population of the census block or environmental impact site exceeds 50 percent; or

- The minority population percentage of the environmental impact area is significantly greater (typically at least 20 percentage points) than the minority population percentage in the geographic area chosen for comparative analysis.

NSPM used 2010 census data in determining the percentage of the total population within Minnesota and Wisconsin for each minority category, and in identifying minority populations within 50 miles of PINGP.

NSPM used USCB population data to determine the minority populations within each block group. For each of the 2,262 block groups within 50 miles of PINGP, NSPM compared the percent of the population in each minority category to the corresponding

geographic area's minority category threshold percentage to determine if that block group constituted a minority population using the NRC criteria above. NSPM defined the geographic area for the PI ISFSI as the State of Minnesota when the block group was in Minnesota and the State of Wisconsin when the block group was in Wisconsin.

2010 USCB data for Minnesota characterizes 1.1 percent of the population as American Indian or Alaskan Native, 4.0 percent as Asian, less than 0.1 percent as Native Hawaiian or other Pacific Islander, 5.2 percent as Black or African American, 1.9 percent as some other race, 2.4 percent as multi-racial, 14.7 percent as aggregate of minority races, and 4.7 percent as Hispanic or Latino (of any race). 2010 USCB data for Wisconsin characterizes 1.0 percent of the population as American Indian or Alaskan Native, 2.3 percent as Asian, less than 0.1 percent as Native Hawaiian or other Pacific Islander, 6.3 percent as Black or African American, 2.4 percent as some other race, 1.8 percent as multi-racial, 13.8 percent as aggregate of minority races, and 5.9 percent as Hispanic or Latino (of any race).

Table 3.11-2 presents the number of block groups in each county in the 50-mile radius that exceed the threshold for minority populations. Figures 3.11-1 through 3.11-6 locate the minority block groups within the 50-mile radius. As seen in the Table and Figures, there were no block groups identified in Wisconsin with significant minority populations.

Adjacent to the PINGP site is the PIIC, home to the descendants of the Mdewakanton Band of the Eastern Dakota. The Shakopee-Mdewakanton Sioux (Dakota) Indian Reservation, located in Scott County, also lies within the 50-mile radius. The locations of these reservations are shown on Figure 3.11-1. For PINGP license renewal, the NRC staff designated the PIIC as a minority population within the 50-mile radius of PINGP (Ref. 8.15). NMSS guidance is that for a rural location such as at PINGP, a radius of approximately four miles should be used as the area of potential environmental impact. Except for the PIIC, the census block groups containing minority populations are predominantly in the Minneapolis/St. Paul area. There are no minority census block groups within a four-mile radius of the PI ISFSI.

E3.11.3.2 Low-Income Populations

The NRC guidance defines “low-income” by using USCB statistical poverty thresholds (Ref. 8.13). A low-income population is considered to be present if:

- The low-income population of the census block or environmental impact site exceeds 50 percent, or

- The percentage of households below the poverty level in an environmental impact area is significantly greater (typically at least 20 percent) than the low income population percentage in the geographic area chosen for comparative analysis.

NSPM divided 2000 USCB low-income households in each census block group by the total households for that block group to obtain the percentage of low-income households per block group. If the low-income data in any block group met the NRC criteria above, it was considered a low-income population.

Table 3.11-2
Block Groups Within 50 Miles of PI ISFSI with Minority and Low-Income Populations at Least 20% Greater than the State Population

County	State	Number of Block Groups	American Indian or Alaskan Native	Asian	Native Hawaiian or Other Pacific Islander	Black	Some Other Race	Multi-Racial	Aggregate	Hispanic	Number of Block Groups[a]	Low-Income Households[a]
Anoka	MN	134	0	1	0	1	0	0	13	0	127	0
Carver	MN	25	0	0	0	0	0	1	1	1	17	0
Chisago	MN	4	0	0	0	0	0	0	0	0	4	0
Dakota	MN	232	0	0	0	0	0	14	18	5	194	0
Dodge	MN	15	0	0	0	0	0	0	0	0	15	0
Goodhue	MN	37	0	0	0	0	0	0	0	0	37	0
Hennepin	MN	876	1	20	0	140	0	73	286	50	892	61
Le Sueur	MN	7	0	0	0	0	0	0	0	0	6	0
Olmstead	MN	105	0	0	0	2	0	1	10	1	109	2
Ramsey	MN	400	0	62	0	38	0	23	141	14	401	23
Rice	MN	43	0	0	0	0	0	4	5	3	43	0
Scott	MN	58	0	0	0	0	0	2	5	1	50	0
Steele	MN	21	0	0	0	0	0	0	0	0	21	0
Wabasha	MN	19	0	0	0	0	0	0	0	0	19	0
Waseca	MN	1	0	0	0	0	0	0	0	0	1	0
Washington	MN	137	0	0	0	2	0	0	4	0	117	0
Winona	MN	3	0	0	0	0	0	0	0	0	3	0
Barron	WI	1	0	0	0	0	0	0	0	0	1	0
Buffalo	WI	11	0	0	0	0	0	0	0	0	12	0
Dunn	WI	29	0	0	0	0	0	0	0	0	31	3
Eau Claire	WI	3	0	0	0	0	0	0	0	0	3	0
Pepin	WI	6	0	0	0	0	0	0	0	0	7	0
Pierce	WI	26	0	0	0	0	0	0	0	0	26	0
Polk	WI	23	0	0	0	0	0	0	0	0	16	0
St. Croix	WI	46	0	0	0	0	0	0	0	0	45	0
TOTALS		2,262	1	83	0	183	0	118	483	75	2,197	89

MN = Minnesota, WI = Wisconsin
Source: Ref. 8.21 unless otherwise noted.
[a] Based on 2000 census data for low-income populations (Ref. 8.14)

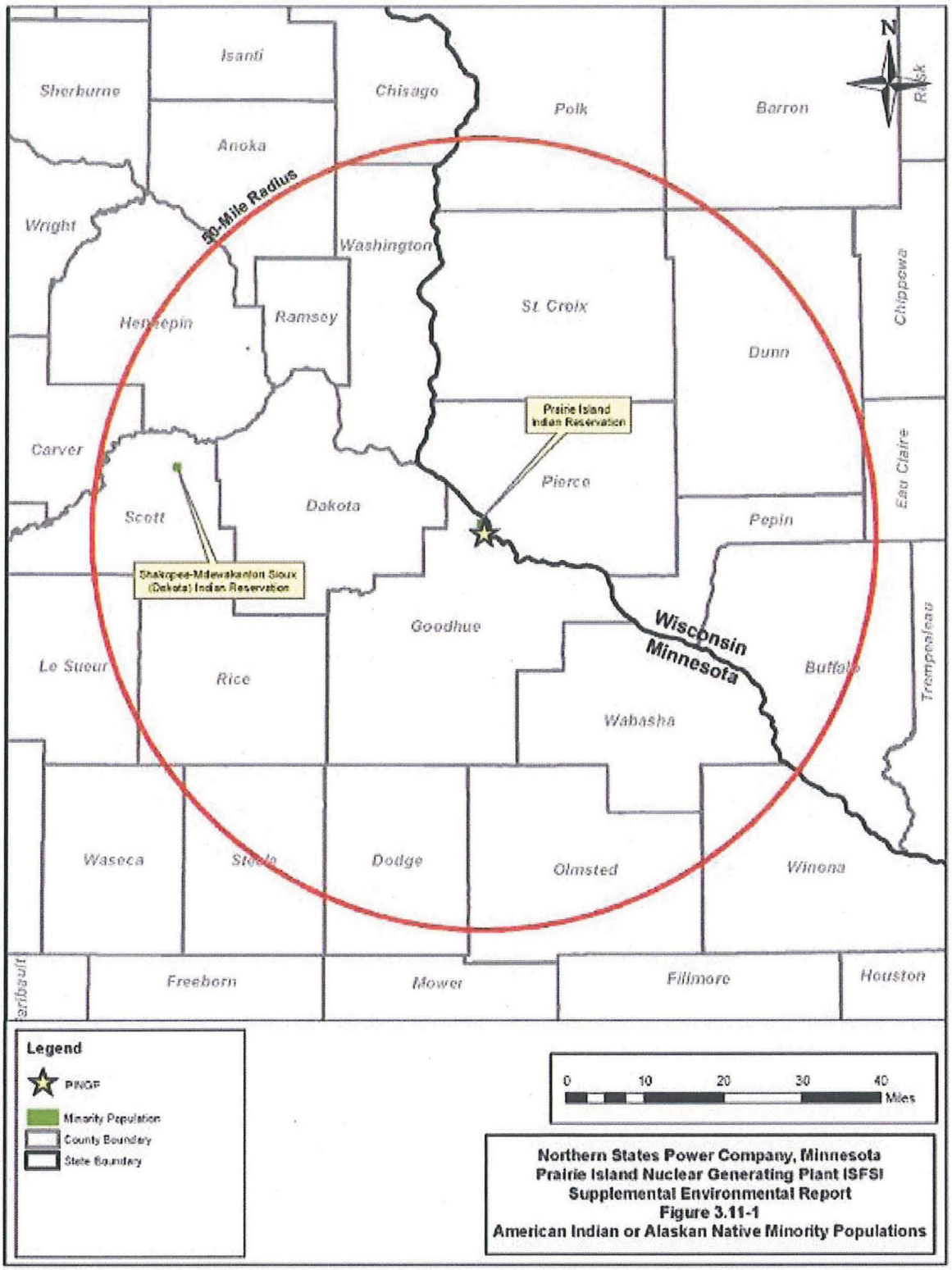

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Figure 3.11-1
American Indian or Alaskan Native Minority Populations

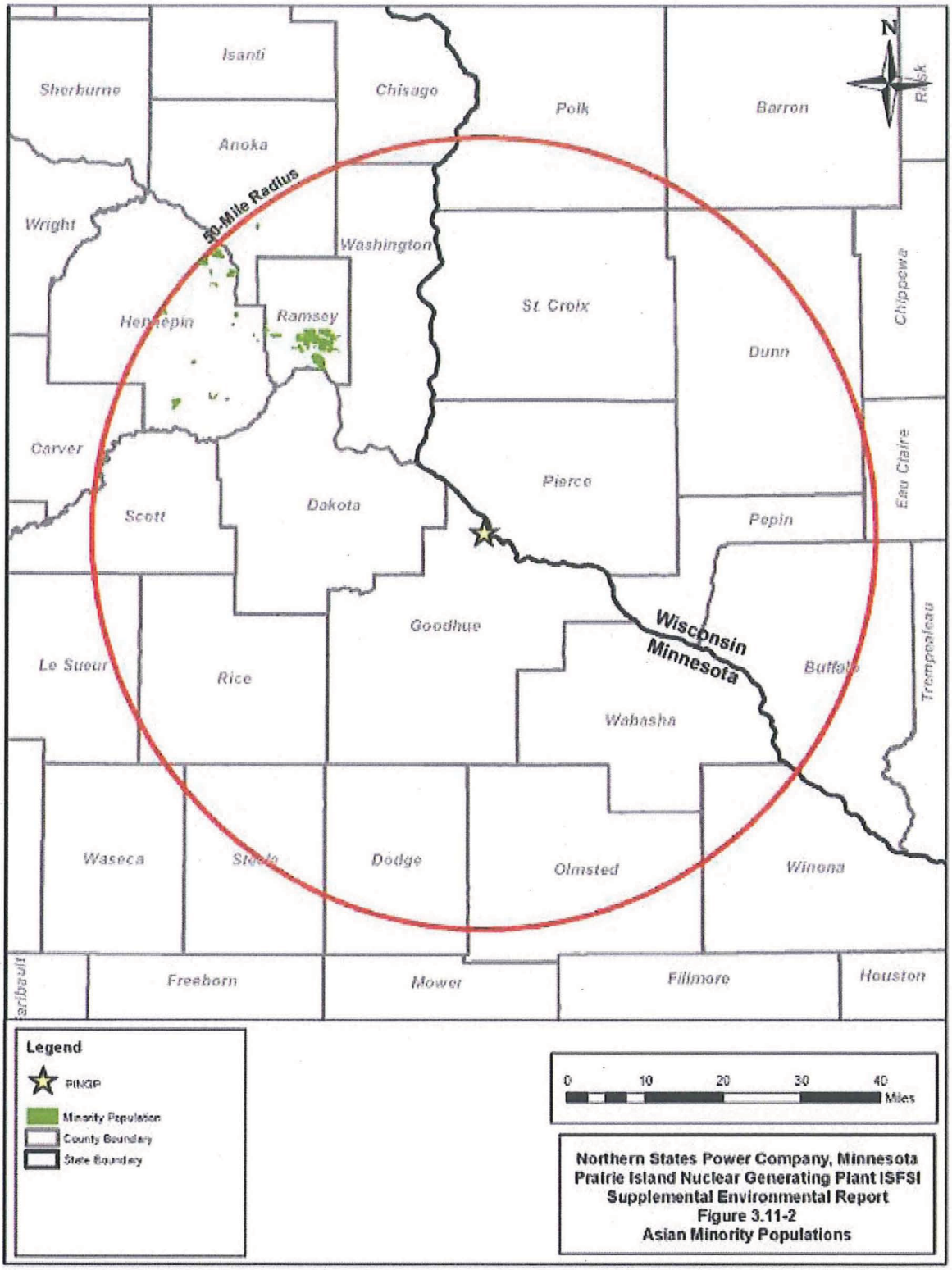
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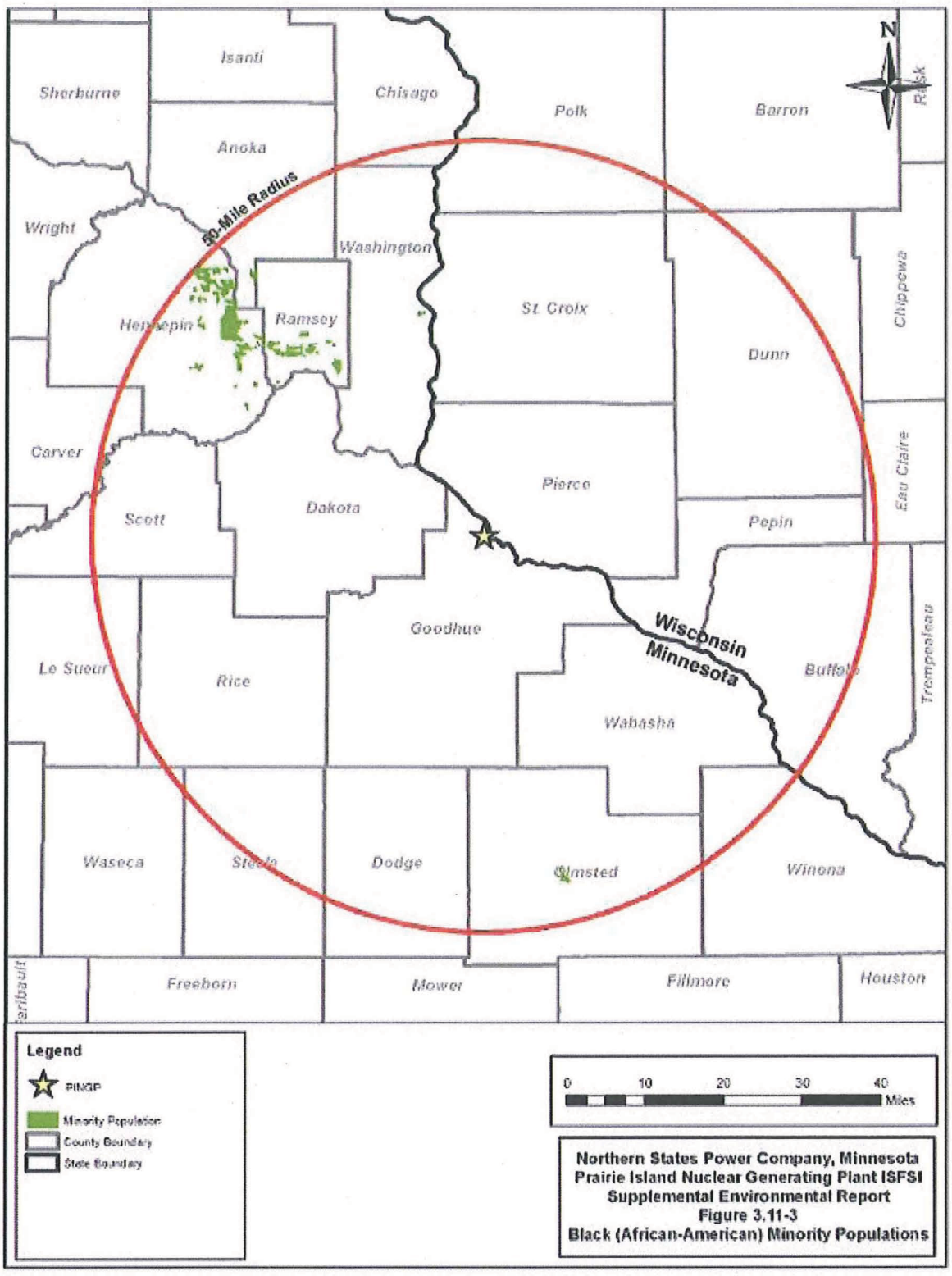
Figure 3.11-2
Asian Minority Populations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Supplemental Environmental Report
Figure 3.11-3
Black (African-American) Minority Populations

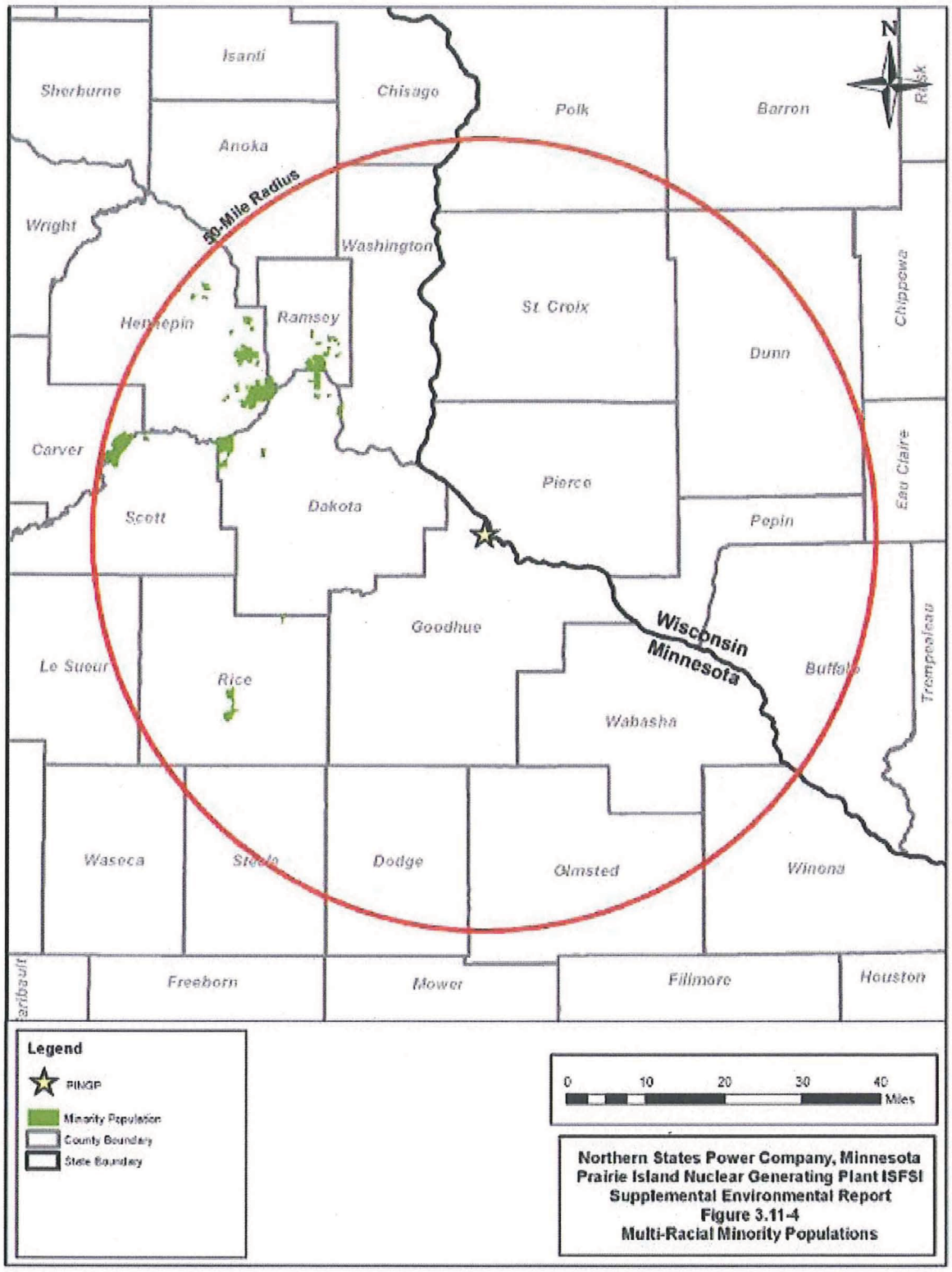
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Figure 3.11-4
Multi-Racial Minority Populations

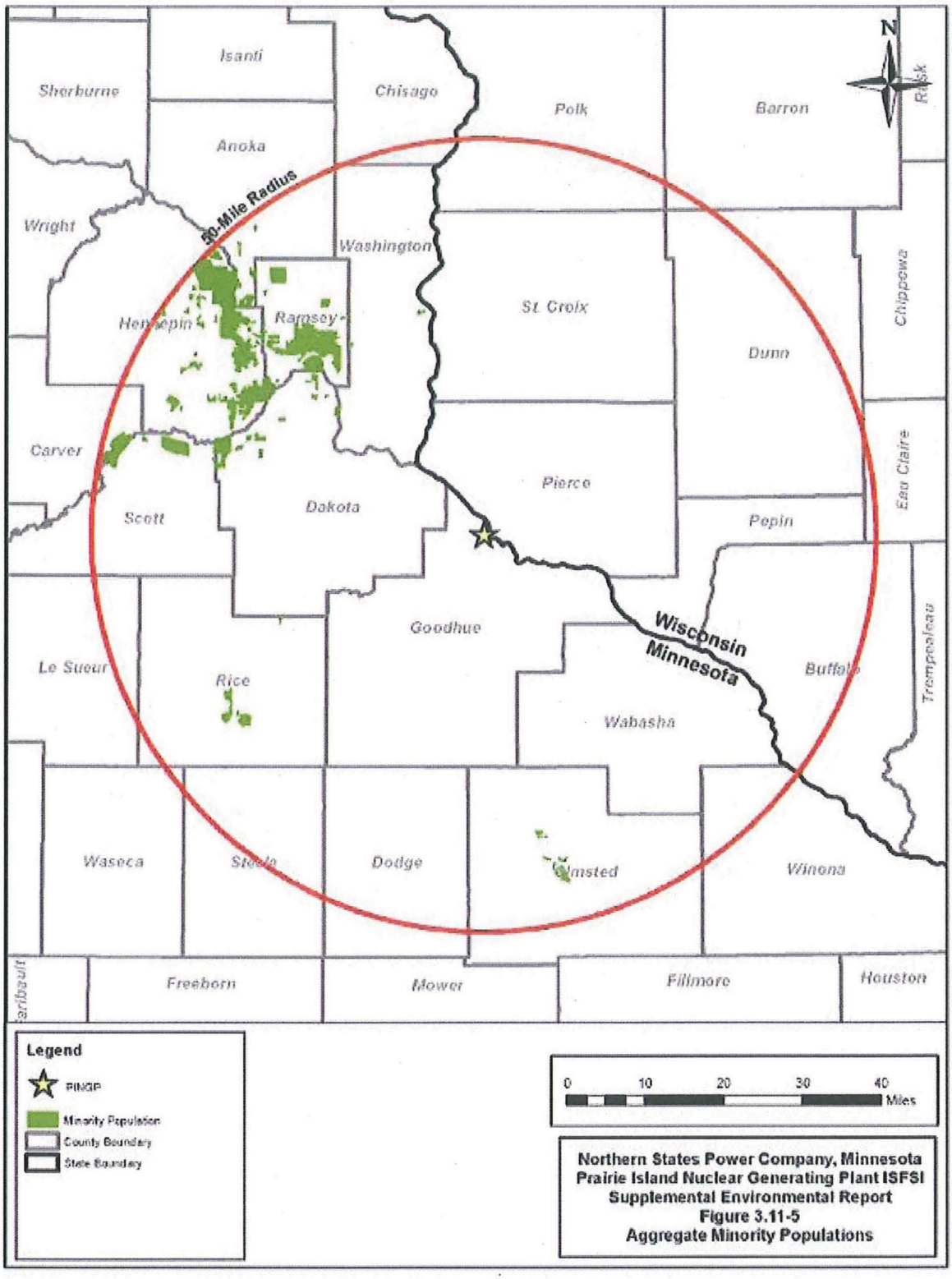
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Figure 3.11-5
Aggregate Minority Populations

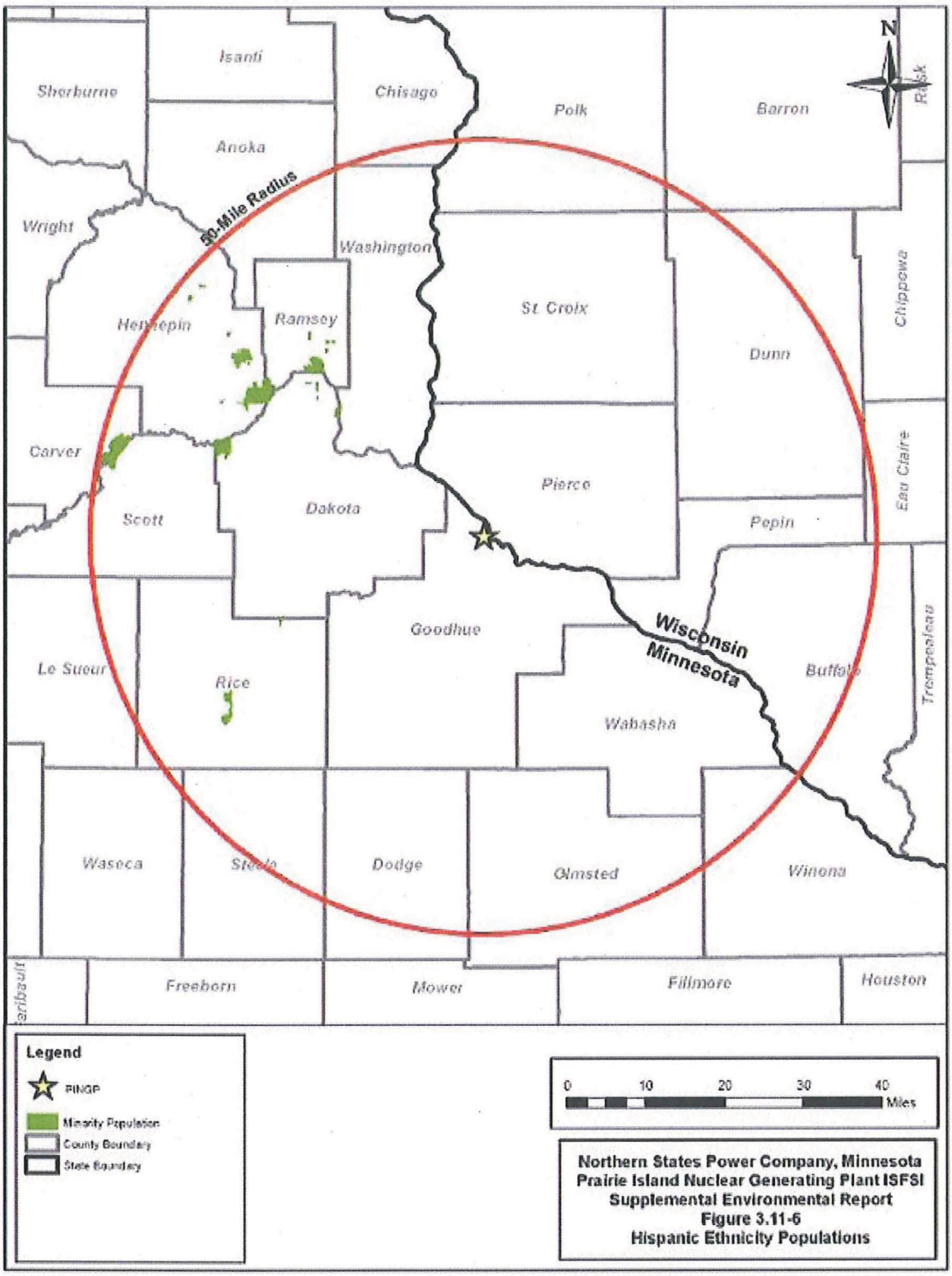
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Figure 3.11-6
Hispanic Ethnicity Populations

In 2000, 7.9 percent of Minnesota households were characterized as low-income and 8.4 percent of Wisconsin households were characterized as low-income (Ref. 8.14). Table 3.11-2 displays the low-income household block group distributions among the counties in the geographic area, based on NRC criteria. Figure 3.11-7 displays the locations of low-income household block groups.

Eighty-nine census block groups within the 50-mile radius have low-income households that meet NRC criteria for a low-income population. The census block groups containing low-income populations are predominantly in the Minneapolis/St. Paul area and are all over 30 miles from PINGP (Ref. 8.14). NMSS guidance is that for a rural location such as at PINGP, a radius of approximately four miles should be used as the area of potential environmental impact. Based on 2000 census data, there are no low-income household block groups within four miles of the PI ISFSI.

E3.11.4 Taxes

A description of taxes was not included in the ER; therefore, this section updates information submitted in the PINGP ER (Ref. 8.14).

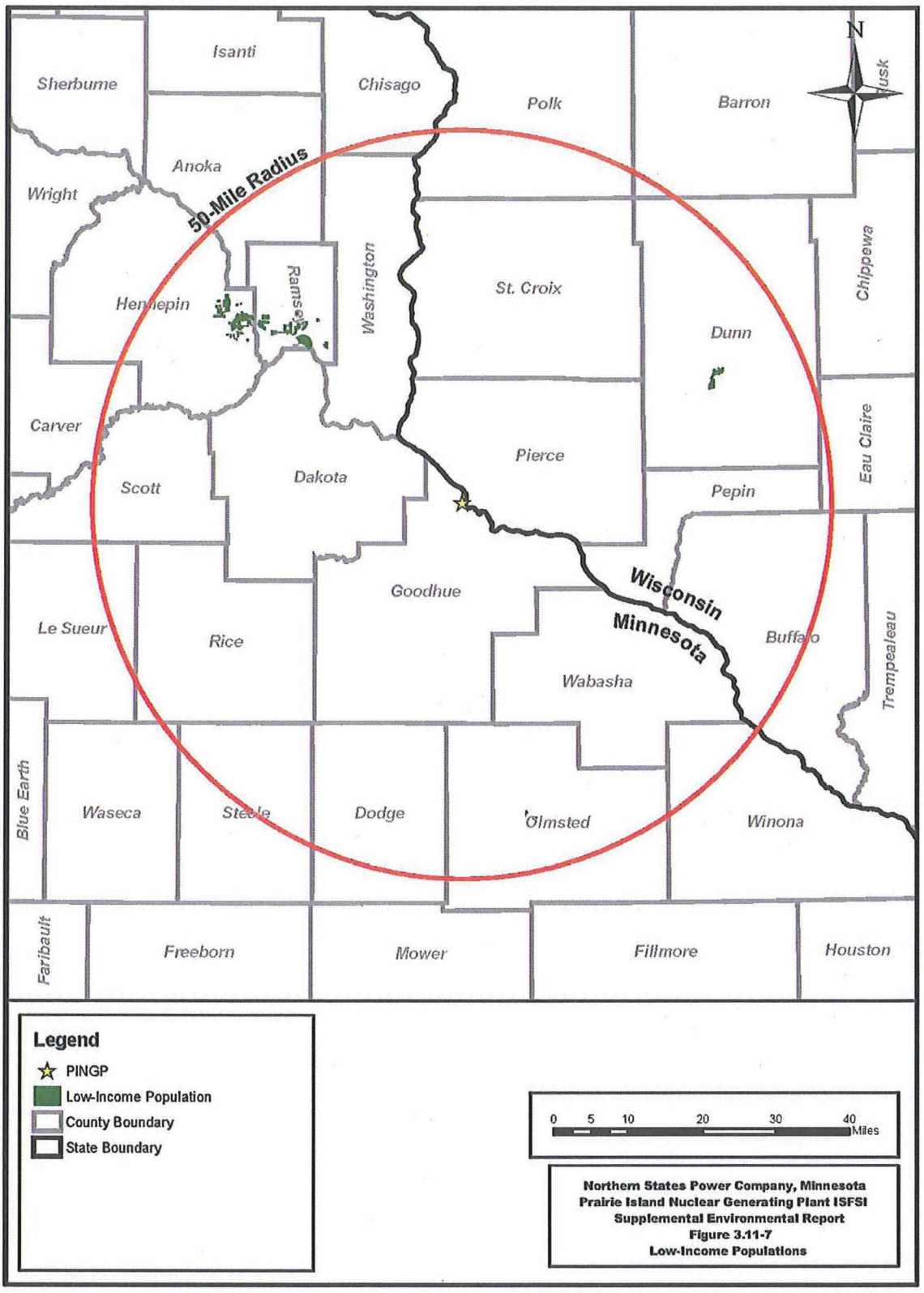
NSPM pays annual property taxes to Goodhue County, which in turn distributes the money to taxing jurisdictions including the county itself, the City of Red Wing, and School District 256. NSPM also pays annual taxes to the Minnesota State General Tax, the Red Wing Housing and Redevelopment Authority, the Red Wing Port Authority, and additional funds to Goodhue County under a Revenue Stabilization Agreement. For all taxes, the payments include, but do not differentiate, the PI ISFSI.

The majority of NSPM's annual property taxes for the PINGP site are assessed by Goodhue County, the City of Red Wing, and School District 256. From 2006 to 2010, NSPM paid 17.3, 21.6, and 10.4 million dollars in property tax revenues to Goodhue County, the City of Red Wing, and School District 256, respectively. Table 3.11-3 presents annual payments to taxing jurisdictions.

Table 3.11-3
PINGP Property Taxes, 2006-2010 (dollars)

Year	Goodhue County	City of Red Wing	School District 256	Other [a]	Total
2006	3,747,250	4,318,291	1,979,347	961,504	11,006,392
2007	3,659,135	4,477,581	2,103,889	981,559	11,222,164
2008	3,486,281	4,466,496	1,940,553	819,164	10,712,494
2009	3,292,311	4,240,779	2,146,374	1,163,103	10,842,567
2010	3,124,987	4,070,179	2,196,365	1,303,182	10,694,713
Total	17,309,964	21,573,326	10,366,528	5,228,512	54,478,330

a Includes taxes paid to Minnesota State General Tax, Red Wing Housing and Redevelopment Authority, Red Wing Port Authority, and to Goodhue County under a Revenue Stabilization Agreement.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State Boundary
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Northern States Power Company, Minnesota
Prairie Island Nuclear Generating Plant ISFSI
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Figure 3.11-7
Low-Income Populations

Property taxes are the chief source of revenue for Minnesota counties, generally providing between 30 and 50 percent of their revenues (Ref. 8.14). From 2006 to 2010, property taxes distributed to Goodhue County, the City of Red Wing, and School District 256 for PINGP comprised 15, 37, and 25 percent of each entity's total tax revenues, respectively. Table 3.11-4 presents total taxes received by Goodhue County, the City of Red Wing, and School District 256.

Table 3.11-4
Total Property Tax Receipts, 2006-2010 (dollars)

Year	Total Goodhue County	Total City of Red Wing	Total School District 256
2006	22,212,800	10,908,904	6,943,346
2007	22,788,683	11,444,617	7,502,367
2008	23,853,442	12,050,542	7,411,639
2009	25,221,707	12,191,749	9,299,778
2010	24,801,773	12,179,611	9,736,551
Total	118,878,405	58,775,423	40,893,681

In 2003, the PIIC entered into an agreement with NSPM which requires NSPM to allocate funds to address a variety of tribal concerns. This agreement is in place as long as PINGP is operational, although certain provisions of the agreement end when the current operating licenses expire. NSPM also provides the PIIC with an annual sum for a number of radiological emergency preparedness activities and supplies (Ref. 8.15).

E4.0 ENVIRONMENTAL IMPACTS

The NRC has reviewed the environmental impacts of dry storage of spent nuclear fuel as part of multiple actions as outlined in Section E1.3. Each analysis has concluded that the spent nuclear fuel activity would have no significant impacts on the affected environment.

E4.1 Impacts from Refurbishment and Construction

No refurbishment or construction is planned as part of this license renewal request. As discussed in Section E2.1.2.2, if and when NSPM chooses to pursue a license amendment to store additional casks past the 48 currently authorized, it will do so in a separate license amendment request accompanied by an environmental report.

E4.2 Occupational and Public Health Impacts

Radiological protection and doses from PI ISFSI operations are discussed in Sections 7 and A7 of the SAR. The major aspects of the radiological protection program are summarized in the following sections. There are no other potential health impacts other than those associated with moving heavy objects, working outside, and working with heavy equipment during cask transfer operations. As discussed in Section E2.1.2.2, this Supplemental ER uses the SAR analysis of 48 TN-40HT casks on two pads as a bounding analysis. Actual dose would be less than analyzed in this Supplemental ER, as the dose associated with the TN-40 casks is lower (Ref. 8.17).

E4.2.1 Policy Considerations

PINGP health physics policies are also applicable to the PI ISFSI through a site-wide Radiation Protection Program. The goals and objectives of the Radiation Protection Department and health physics programs are to maintain As Low As Reasonably Achievable (ALARA) both the annual dose to individual PINGP personnel and the annual integrated dose to PINGP personnel, i.e., the sum of annual doses (expressed in person-rem) to all PINGP personnel. The PINGP ALARA Program, which includes PI ISFSI operations, complies with 10 CFR 20.1101, Radiation Protection Programs, and is consistent with Regulatory Guides and publications that deal with ALARA concepts and practices, including 10 CFR 20. In addition, NSPM regularly reviews operational experience from throughout the industry and incorporates relevant lessons learned into PI ISFSI operations.

The Radiation Protection Program identifies the organizations participating in the programs, the positions involved, and the responsibilities and functions of the various positions in conducting the programs. Adequately trained personnel develop and conduct the health physics programs. Radiation Protection personnel receive Institute of Nuclear Power Operations-certified training and obtain process experience to carry out the Radiation Protection programs in an efficient manner to assure that company and regulatory requirements are met.

NRC-mandated training programs in the fundamentals of radiation protection and PINGP exposure control procedures are established to provide instructions to all PINGP personnel, including contractors, whose duties require working in radiation areas. Training programs for health physics personnel are provided to improve their performance in the health physics programs. A complete discussion of the ALARA Program can be found in Section 7.1.1 of the PI ISFSI SAR (Ref. 8.17).

E4.2.2 Design Considerations

The PI ISFSI is located within the PINGP site to allow PINGP Radiation Protection employees, facilities, and equipment to be readily available to be sure ALARA considerations can be met. The PI ISFSI is also located at a sufficient distance from buildings and occupied spaces to minimize total personnel exposure. The layout of the PI ISFSI is designed to reduce exposure because the casks are stored with sufficient separation to allow personnel adequate access between the casks for surveillance and handling operations.

The equipment design takes into account radiation protection considerations, which ensure that occupational radiation exposures are ALARA. The fuel is stored dry, inside sealed, heavily-shielded casks, which eliminates the possibility of leakage. There is no need for airborne radioactivity monitoring since no airborne radioactivity is anticipated. The most significant radiation protection design consideration provides for heavy shielding to minimize personnel exposures. To avoid personnel exposure, the casks will not be opened nor fuel removed from the casks while at the PI ISFSI. The exterior of the casks will be decontaminated before leaving the PINGP Auxiliary Building, thereby minimizing exposure of personnel to surface contamination. The storage casks contain no active components which require periodic maintenance or surveillance. This method of spent fuel storage minimizes direct radiation exposures and eliminates the potential for personnel contamination.

Both concrete storage pads and the Equipment Storage Building at the PI ISFSI were constructed prior to operation to eliminate occupational radiation exposure which would result from additional construction following placement of storage casks in the PI ISFSI.

The annunciator panel that serves to monitor cask interseal pressure is located outside of the PI ISFSI protected area, which minimizes the amount of time required for periodic cask surveillance and reduces personnel exposure.

The PI ISFSI is surrounded by an access control gate to prevent unauthorized access. Area radiation monitors are not required because the PI ISFSI is not normally occupied; however, 12 thermoluminescent dosimeters (TLDs) have been installed along the controlled access fence inside the berm, and 8 TLDs have been installed outside the berm. A complete discussion of the PI ISFSI design considerations can be found in Section 7.1.2 of the SAR (Ref. 8.17).

E4.2.3 Operational Considerations

Operational considerations at PINGP that promote the ALARA philosophy include determination of the origins of radiation exposures, the proper training of personnel, the preparation of radiation protection procedures, implementing these procedures, and the formation of a review system to assess the effectiveness of the ALARA philosophy.

The PI ISFSI is considered a radiation control area. Operational radiation protection objectives deal with access to radiation areas, exposure to personnel, and decontamination. Working at or near highly radioactive components requires planning, special methods, and criteria directed toward keeping occupational radiation exposure ALARA. Job training and debriefing following selected high exposure jobs contribute toward reduced exposures. Decontamination also helps to reduce exposure. Procedures and techniques are based upon operational criteria and experience that

have worked to keep radiation exposure ALARA. Procedures for the PI ISFSI are integrated into the current plant operating manual and incorporate the same ALARA philosophy.

E4.2.4 Sources of Radiation

Neutron and gamma radiation emanating from the spent fuel and the shielded casks is the primary source of radiation exposure. Descriptions of the fuel that the casks are designed to store are provided in Sections 7.2 and A7.2 the SAR. The 14x14 Westinghouse standard fuel assembly is the design basis fuel for shielding purposes for the TN-40HT cask design because it has the highest initial heavy metal loading (modeled as 0.410 MTU), and therefore results in the highest radioactive source terms for a given irradiation history. Initial enrichment of 3.4 weight percent U-235, assembly average burnup of 60 gigawatt days per metric ton of uranium, and cooling time of 18 years complete the specification of the design basis fuel. The source terms include the irradiated fuel and activated portions of the fuel assembly structural materials. Detailed information regarding the radiation source terms for the TN-40HT cask can be found in Section A7.2 of the SAR (Ref. 8.17).

The exterior surfaces of the casks are decontaminated prior to transfer to the PI ISFSI. Fuel is not removed from the casks and the casks are not opened or decontaminated at the PI ISFSI.

E4.2.5 Occupational Dose

This section establishes the expected cumulative dose delivered to site personnel during the fuel handling and transfer activities associated with one TN-40HT cask. Chapter 5 of the SAR describes in detail the PI ISFSI operational procedures, a number of which involve radiation exposure to personnel.

PINGP personnel involved in PI ISFSI operations will incur the highest occupational dose from the PI ISFSI because of their proximity to the casks. Due to the distance between the PI ISFSI, the power station, and the site boundary, much smaller doses are incurred by other plant workers and members of the public. The occupational exposure to PI ISFSI personnel from a number of PI ISFSI operations involving the bounding TN-40HT cask are calculated in Section A7.4 of the SAR.

Table A7.4-1 of the SAR shows the estimated design basis occupational exposures to NSPM personnel during the loading, transport and emplacement of the storage casks. The collective dose to workers involved in the loading, transport and emplacement of a single cask in the PI ISFSI was estimated to be 3.117 person-rem, assuming a reference TN-40HT cask. These estimates are therefore conservative.

Table A7.4-2 of the SAR shows the estimated design basis annual exposure for surveillance and maintenance activities. The annual collective dose for surveillance and maintenance activities was estimated to be 4.470 person-rem. Dose attributed to visual surveillance was based on a walkdown of each of the two pads at a distance no closer than 2 meters (about 7 feet) to the casks. The dose rate for visual surveillance activities was increased to account for dose rate due to loaded casks already at the PI ISFSI and to account for short term activities close to the cask. To estimate dose rates for operability tests and calibration, the worker was assumed to be at the monitoring panel at the perimeter fence entrance and exposed to a dose rate of 4 millirem (mrem)/hr.

During instrumentation and surface defect repairs the worker was assumed to be exposed to a dose rate of 300 mrem/hr, which is representative of high surface dose rates on the cask. For major maintenance work, the worker was assumed to be exposed to the 1 meter (about 3 feet) side dose rate.

The purpose of the estimates in the SAR are to provide an estimated total dose and not to prescribe limits or restrictions on dose rates, times to complete tasks, or number of persons working on tasks. Actual loading and maintenance activities may deviate from those shown in the tables but are conducted such that exposure is ALARA. Localized regions of elevated dose rates are anticipated and minimized with good ALARA practices.

A dose rate analysis was performed using dose rate versus distance to evaluate the dose attributed to the PI ISFSI that is received by plant personnel who do not work on PI ISFSI operations. The occupational dose calculation considers all workers at the PINGP to be in buildings (however, no credit was taken for shielding of personnel by buildings) or in the plant yard. This population includes a normal work force and contractor personnel as well as the increased staffing required during outages. Table A7.4-3 of the SAR provides a summary of staffing levels assumed at various site locations along with the distance from the center of the PI ISFSI. Tables A7.4-3 and A7.4-4 summarize the calculated total doses to full time and outage help at the various locations due to PI ISFSI operation. The annual plant personnel collective dose was estimated to be 12.88 person-rem per year. This dose is based on loading 48 TN-40HT casks over a 22-year period and assumes that 4 spent fuel casks are loaded every 2 years (Ref. 8.17). A description of historical radiation monitoring at the PI ISFSI is included in Section E6.0.

E4.2.6 Dose to the Public

The only dose to members of the public during normal operations will result from the gamma and neutron radiation that is emitted from the cask surfaces. The dose rate decreases rapidly as a function of distance from the PI ISFSI, as indicated in Table A7A.7-2 of the SAR.

Because the casks provide containment, yielding essentially no radioactive effluents, assessment of off-site collective dose is limited to one of direct and scattered radiation to the nearest residence. In calculating the off-site collective dose, the entire permanent population within a two-mile radius of the plant was conservatively taken to be at the location of the residence subject to the highest exposure, i.e., 0.45 miles northwest of the PI ISFSI. In addition to the permanent population, there is a large transient population of persons employed at or visitors to the Treasure Island Resort and Casino. For these calculations it is assumed that this entire transient population is located 0.8 mile from the PI ISFSI. The estimates of the population (both permanent and transient) within the two-mile radius were taken from PINGP's 2003 evacuation time study. A description of the off-site locations considered in this evaluation, the relevant population data, distances and occupancy times are shown in Table A7.5-1 of the SAR.

At a distance of 0.45 mile in the corner direction, the total annual dose rate is 2.20 E-3 rem/year at the nearest resident location. SAR Table A7.5-2 summarizes the calculated total doses to the off-site population within a two-mile radius due to PI ISFSI operation. The total collective off-site dose is calculated to be 3.60 person-rem (Ref. 8.17). As stated earlier, these dose estimates are bounding in that they assume that the PI ISFSI

is fully loaded with 48 TN-40HT casks. The actual exposure is within the regulatory limits set forth in 40 CFR 190 even when combined with dose from the operating power plant, and would remain so for the duration of the period of extended operation. A description of historical radiation monitoring at the PI ISFSI is included in Section E6.0.

E4.3 Other Impacts

The continued operation of the PI ISFSI during the 40-year period of extended operation would have no impacts on the following resources:

- Land Use
- Transportation and Social Services
- Geology and Soils
- Water Resources
- Ecological Resources
- Air Quality
- Noise
- Historic and Cultural Resources
- Visual/Scenic Resources
- Socioeconomics
- Waste Management

The PI ISFSI is a passive installation that provides shielding and containment of irradiated fuel. The PI ISFSI is within the PINGP exclusion zone, and there are no residences or agricultural activities within the exclusion zone.

There are no liquid discharges from the PI ISFSI, so geologic, water, or aquatic resources would not be affected. There are no air emissions from the PI ISFSI, so air quality would not be affected.

As described in Section E2.1.2.5, maintenance and surveillance activities at the PI ISFSI would be performed by existing PINGP employees. No additional employees would be required to maintain or monitor the PI ISFSI. Therefore, NSPM concludes that the continued operation of the PI ISFSI would not affect regional transportation, socioeconomics, or social services.

As described in Section E3.2, the presence of the PI ISFSI has had little impact on land use in Goodhue, Pierce, and Dakota counties. The continued operation of the PI ISFSI would not affect land use patterns in the region.

As described in Section E3.6.3, bald eagles and trumpeter swans have been observed at the site, and an active peregrine falcon nest is present on the Unit 1 reactor building. Two special-status flora species could occur on the PINGP site – the dwarf trout lily and the prairie bush clover; however, recent surveys did not reveal any instances of the species. The MDNR identified a number of species and special habitats that have been recorded within one mile of the PI ISFSI. Recent surveys did identify the state-listed species of special concern beach heather on one transect to the northeast of the plant substation; however, operations will not impact this species or any other species. NSPM is aware of no activities during the period of extended operations that would adversely affect threatened or endangered species, and the NRC concluded that plant license renewal would be unlikely to adversely affect any terrestrial species.

As described in Section E3.9, Historic and Archaeological Resources, the PI ISFSI is located on land with the potential to contain additional historic and archaeological resources other than those already identified. The MSHPO responded that no properties listed in or eligible for listing in the NRHP would be affected by PI ISFSI license renewal. Continued operations would have no adverse effect on historic, archaeological, cultural, scenic, or aesthetic resources.

Occupational and public dose from neutron and gamma radiation emanating from the spent fuel and the shielded casks will continue over the period of extended operation. However, estimates of dose are bounded by the conservative assumption of 48 TN-40HT casks and remain well within regulatory limits.

Based on review of minority populations near the PI ISFSI, no minority populations other than the PIIC are located in a way to be disproportionately affected by PI ISFSI license renewal. No low-income populations are located within 30 miles of the PI ISFSI. Because of its proximity to the PI ISFSI, there is the potential for the PIIC to be disproportionately affected by the continued operation of the PI ISFSI. However, the analyses of impacts for all resource areas indicate that the impact of PI ISFSI license renewal would be small. Therefore, based on the analysis in this Supplemental ER, NSPM believes that there would be no disproportionately high and adverse impacts to the PIIC or any other minority population from the continued operation of the PI ISFSI.

E4.4 Impacts from Potential Accidents

Section 8 of the SAR presents an accident analysis for the original TN-40 cask design, while Section A8 of the SAR presents an accident analysis for the TN-40HT cask for storage of higher enrichment and higher burnup fuel (Ref. 8.17). Sections 8 and A8 describe the potential for off-normal operations, defined as events which can be expected to occur with moderate frequency or on the order of once during a calendar year of operation (Design Event II) and accidents, defined as infrequent events that could reasonably be expected to occur during the lifetime of the ISFSI (Design Event III) or postulated events that could result in the maximum potential impact on the immediate environs (Design Event IV). Site-specific characteristics of the PI ISFSI and its environs were considered in the formation of the bases for these safety analyses. This section summarizes the analyses and conclusions in the SAR.

E4.4.1 Design Event II Analysis

The SAR defines one off-normal scenario that is applicable and credible for the TN-40 and TN-40HT casks: loss of electrical power. Loss of power could occur as a result of natural phenomena (e.g., lightning, extreme wind) or as a result of a disturbance in the non-safety-related portion of the electric power system of PINGP. Loss of power would result in de-energizing the area lighting, area receptacles, and the cask pressure monitoring instrumentation.

This event has no safety or radiological consequences because a loss of power will not affect the integrity of the storage casks, jeopardize the safe storage of the fuel, or result in radiological releases. None of the systems whose failure could be caused by this event are necessary for safety functions. The lighting system functions merely for convenience and visual monitoring, and the instrumentation monitors the long-term performance of the storage casks with respect to the cask seals. None of these parameters are expected to change rapidly and their status is not dependent upon

electric power. This conclusion is applicable to both the TN-40 and TN-40HT casks (Ref. 8.17; Sections 8.1.1, A8.1.1).

E4.4.2 Design Event III and IV Analyses

The SAR considers design events of the third and fourth types. The third type of events (Design Event III) are those that could reasonably be expected to occur over the lifetime of the PI ISFSI. The fourth type of events (Design Event IV) include severe natural phenomena and man-induced low probability events postulated because their consequences could result in the maximum potential impact on the immediate environs. Accidents classified as Design Event III and IV are summarized below.

E4.4.2.1 Earthquake

The SAR postulates the effects of a design earthquake as a design basis extreme natural phenomenon. Such an earthquake would have a maximum ground acceleration of 0.12 gravity horizontal, 0.08 gravity vertical. Results of the analyses in the SAR show that the design earthquake would not be capable of damaging the cask, that cask leak-tight integrity would not be compromised, and that no damage would be sustained. Therefore, this event would not result in a release of radioactivity or associated dose. This conclusion is applicable to both the TN-40 and TN-40HT casks (Ref. 8.17; Sections 8.2.1, A8.2.1).

E4.4.2.2 Extreme Wind

The SAR postulates the extreme winds due to passage of a design tornado or impact from a design tornado missile (a stationary object made airborne by the design tornado) as an extreme natural phenomenon. Such a tornado would have a rotational wind velocity of 300 miles per hour, a forward progression of 60 miles per hour (mph), and a pressure drop of 3 pounds per square inch (psi) in 3 seconds. These extreme winds would not be capable of overturning the casks or damaging their seals. Therefore, this event would not result in a release of radioactivity or associated dose. This conclusion is applicable to both the TN-40 and TN-40HT casks (Ref. 8.17; Sections 8.2.2, A8.2.2).

The design tornado missile would be equivalent to an airborne 4 inch x 12 inch x 12 foot plank travelling end-on at 300 mph, or a 4,000 pound automobile flying through the air at 50 mph and at not more than 25 feet above ground level. Local damage to the cask's neutron shield could be caused by a tornado missile. However, the dose rate without any shield would continue to be less than the allowable accident dose rate. This conclusion is applicable to both the TN-40 and TN-40HT casks (Ref. 8.17; Sections 8.2.2, A8.2.2).

E4.4.2.3 Flood

The PI ISFSI pad is located at 694.5 feet amsl (Ref. 8.17; Section 4.2.1). The probable maximum flood would reach a level of 703.6 feet amsl with a water velocity of 6.2 feet per second and wave action to a maximum level of 706.7 feet amsl. The PI ISFSI is sited and designed such that the lowest point of potential leakage into the cask is above the level of the probable maximum flood. The casks are designed to withstand the forces developed by the probable maximum flood without damage to cask integrity or tipping of the casks. The height of the cask seals will be above the level of the probable maximum flood and associated wave action. No fuel damage or criticality is postulated to occur as a result of flooding. The probable maximum flood is not capable of overturning the casks or of damaging their seals. Therefore, this event would not result

in a release of radioactivity or associated dose. This conclusion is applicable to both the TN-40 and TN-40HT casks (Ref. 8.17; Sections 8.2.3, A8.2.3).

E4.4.2.4 Explosion

No activities at nearby industrial facilities present a hazard to the safe operation of the PI ISFSI, no military installations are within five miles of the PI ISFSI site, and no large natural gas pipelines pass close to the PI ISFSI site. Railroad and truck traffic occur within five miles of the site. Barge traffic occurs on the Mississippi River, which flows in its main channel no closer than 0.5 mile from the PI ISFSI site. The SAR postulates a transportation accident involving a jumbo barge explosion as having the worst case impact on the safe operation of the PI ISFSI (Ref. 8.17; Section 2.2). This event would not result in a release of radioactivity or associated dose (Ref. 8.17; Sections 8.2.4, A8.2.4). All other potential sources of explosion are bounded by the barge explosion. This conclusion is applicable to both the TN-40 and TN-40HT casks.

E4.4.2.5 Fire

The PI ISFSI area is cleared of trees, and the entire area surrounding the equipment storage building and concrete pad within the perimeter road is covered with crushed rock. In addition, other equipment in the area is adequately separated from the PI ISFSI slabs. Therefore, no fires other than small electrical fires are considered credible at the PI ISFSI. The only combustible materials in the PI ISFSI are in the form of insulation on instrumentation wiring and paint on the outside surface of the storage casks. No other combustible or explosive materials are allowed to be stored on the PI ISFSI slabs. The tow vehicle contains a small amount of gasoline or diesel fuel. The only real source of fuel which could cause a fire in the vicinity of the cask is the fuel tank of the tow vehicle which transports the cask to the storage pad (Ref. 8.17; Sections 8.2.5, A8.2.5). The SAR postulated the impacts of a bounding 200 gallon engulfing fire directly around the cask. The SAR postulated that 200 gallons of fuel would sustain a fire for about 12 minutes, and therefore analyzed a 15 minute fire. The containment of the cask will be assured as long as the metallic lid seals remain below 570 degrees Fahrenheit (°F) for the TN-40 cask and 536 °F for the TN-40HT cask and the cavity pressure is less than 100 psig for both casks.

Based on the thermal analyses for the fire accident conditions, the TN-40 and TN-40HT casks would withstand the hypothetical fire accident event without compromising the containment integrity. Therefore, this event would not result in a release of radioactivity or associated dose. This conclusion is applicable to both the TN-40 and TN-40HT casks (Ref. 8.17; Sections 8.2.5, A8.2.5). Even in the unlikely event of total loss of the neutron shield, the site boundary accident dose rates would continue to be below 10 CFR 72.106(b) limits (Ref. 8.17; Section A8.2.5).

E4.4.2.6 Inadvertent Loading of a Newly Discharged Fuel Assembly

The possibility of a spent fuel assembly (with a heat generation rate greater than the maximum allowable for the TN-40 and TN-40HT casks) being erroneously selected for storage in a cask was considered in the SAR. Such an accident could occur due to an error during the loading operations (e.g., wrong assembly picked by the fuel handling crane) or a failure in the administrative controls governing the fuel handling operations. Currently, the PI ISFSI Technical Specifications require that fuel assemblies are stored in the spent fuel pool for several years before the heat generation decays to a rate below the maximum allowable heat generation rate. This accident scenario postulates the

inadvertent loading of an assembly not intended for storage in the storage canister with a heat generation rate in excess of the design basis.

In order to preclude this accident from going undetected, and to ensure that appropriate rectification actions can take place prior to the sealing of the casks, PINGP requires a final verification of the assemblies loaded into the casks and a comparison with fuel management records to ensure that the loaded assemblies do not exceed any of the specified limits. Appropriate and sufficient actions are taken to ensure that an erroneously loaded fuel assembly does not remain undetected. Therefore, the storage of a fuel assembly with a heat generation in excess of the maximum allowable heat generation rate is not considered credible in view of the multiple administrative controls in place. Therefore, no doses are postulated for this accident. This conclusion is applicable to both the TN-40 and TN-40HT casks (Ref. 8.17; Sections 8.2.6, A8.2.6).

E4.4.2.7 Cask Seal Leakage

The storage casks feature redundant seals in conjunction with an extremely rugged body design. Additional barriers to the release of radioactivity are presented by the sintered fuel pellet matrix and the Zircaloy cladding which surrounds the fuel pellets. Furthermore, the interseal gaps are pressurized in excess of the cask cavity. As a result, no credible mechanisms that could result in leakage of radioactive products have been identified. Nevertheless, a loss of the storage cask confinement capability was postulated in the SAR and is presented in the section titled “Loss of Confinement Barrier,” below. This conclusion is applicable to both the TN-40 and TN-40HT casks (Ref. 8.17; Sections 8.2.7, A8.2.7).

E4.4.2.8 Hypothetical Cask Drop

Casks are lifted at PINGP using a single failure-proof crane. The crane elements are designed for lifting devices for critical loads with increased stress design factors. In addition, casks are handled and moved to the PI ISFSI by a specific transport vehicle. The casks will always be in a vertical orientation and never lifted higher than 18 inches during transport. Therefore, it is extremely unlikely that the cask could be dropped. However, the SAR examines the potential for a dropping accident, which is a hypothetical impact event that is extremely unlikely to occur.

The SAR evaluates the cask under bottom end impact on the PI ISFSI storage pad after a drop from a height of 18 inches. The storage pad is the hardest concrete surface outside of the containment building. The cask is always oriented vertically and is never lifted higher than 18 inches once it leaves the PINGP Auxiliary Building. Therefore this case is an upper bound drop event since impact onto a softer surface would result in lower cask deceleration and a lower impact force. The SAR evaluates the impact of such an event on the cask body, lid bolts, and basket. The SAR concludes that a cask drop would not breach the cask confinement barrier and would not result in a release of radioactivity, or any resultant dose. This conclusion is applicable to both the TN-40 and TN-40HT casks (Ref. 8.17; Sections 8.2.8, A8.2.8). Even in the unlikely event of total loss of the neutron shield, the site boundary accident dose rates would continue to be below 10 CFR 72.106(b) limits (Ref. 8.17; Sections A8.2.8).

E4.4.2.9 Loss of Confinement Barrier

For the TN-40 cask, loss of the confinement barrier was not considered to be credible in the SAR, but was hypothesized solely to demonstrate the inherent safety of the PI ISFSI

by subjecting it to a set of simultaneous multiple failures, any one of which is far beyond the capability of natural phenomena or man-made hazards to produce. In this accident, the confinement function is non-mechanistically removed. Heat removal and radiation shielding functions operate in the normal passive manner. This is equivalent to breaking the cask seal barriers (no release), removing the closure lids (no release), failing all the cladding in all the loaded fuel assemblies (gap activity release), and finally, failing the fuel pellets themselves such that the fuel matrix confinement is no longer operable and Krypton-85 is released.

The analysis in the SAR determined the radiological consequences of a release of the entire gaseous inventory in a cask containing 40 fuel assemblies. The only nuclide which naturally occurs in the gaseous state and could escape from the cask following a postulated breach of cask confinement barrier and which would be a significant dose contributor is Krypton-85. All of the Krypton-85 gas was conservatively assumed to be instantaneously released from the TN-40 cask. The SAR analysis assumed no additional decay of Krypton-85 in transit from the spent fuel storage cask to the receptor and took no credit for personnel protection due to any structure or system. Table 8.2-1 of the SAR presents the off-site radiological consequences of the loss of TN-40 cask confinement barrier event at the PI ISFSI. In all instances, dose for the hypothetical loss of spent fuel cask confinement barrier would remain well within the 5 rem criteria in 10 CFR 72.106(b) (Ref. 8.17; Section 8.2.9).

For the TN-40HT cask, the SAR considered a combined event of failure of one of the seals in addition to a failure of the pressure monitoring system. This could also be a failure of the pressure boundary of the overpressure system. Cask bolts would be able to maintain the seal under accident conditions. Thus, the SER outlined three possible leaks that could occur: 1) a leak in any of the inner containment seals (lid seal, inner vent seal or inner drain seal), 2) a leak in any of the outer seals (lid, overpressure port cover, vent cover or drain cover), and 3) a leak in the overpressure system.

The results of the calculations in the SAR, assuming accident conditions indicated that at the site boundary (110 meters from the cask), for a 30 day release, the total effective dose equivalent is 24 mrem. The total organ dose equivalent to any individual organ (the critical organ in this case is the bone surface) is 244 mrem for a 30 day release. The lens dose equivalent to the lens of the eye is 24.1 mrem for a 30 day release. The results of the analysis indicated dose values are well below the limiting off-site doses defined in 10 CFR 72.106(b). In the event of failure of the overpressure system and the inner seal, the accident analysis demonstrated that a latent failure up to 100 times greater that the test value could occur and there would be ample time for recovery before the limiting off-site doses in 10 CFR 72.106(b) are met. The probability that a gross leak of an inner seal in combination with a gross leak in the outer seal was not considered a credible event (Ref. 8.17; Section A8.2.9).

E4.4.2.10 Conclusion

In summary, the accident dose rates for all scenarios analyzed in the SAR for both the TN-40 and TN-40HT casks are either non-existent or are well below the 10 CFR 72.106 regulatory limits. The accident analyses summarized above bound operations throughout the 40-year period of extended operation.

E5.0 MITIGATION MEASURES

The impacts of PI ISFSI license renewal are small and would not require mitigation. Current operations include mitigation activities that would continue during the term of the renewed license. NSPM performs routine monitoring activities and any associated mitigation to ensure the safety of workers, the public, and the environment. These monitoring activities include the radiological environmental monitoring program conducted for PINGP and the PI ISFSI, periodic monitoring of the TN-40 and TN-40HT casks and preventative maintenance as necessary, and monitoring and maintenance of the perimeter, berm, security fences, and grounds on which the PI ISFSI is located.

E6.0 ENVIRONMENTAL MEASUREMENT AND MONITORING

Current NRC monitoring requirements for the PI ISFSI are defined in the PI ISFSI Technical Specifications and are an integral part of the plant-wide Radiological Environmental Monitoring Program (REMP). The purpose of the REMP is to assess the impact of PINGP and the PI ISFSI on the environment.

As part of the PI ISFSI Technical Specifications, NSPM conducts quarterly monitoring of PI ISFSI radiation levels from two TLDs on the fence inside the berm at each side of the PI ISFSI (8 total). Information regarding results of these quarterly surveys is included in PINGP's annual REMP Report, which is sent to the NRC and is publicly available through the NRC's ADAMS system. A sample of information regarding Technical Specification-driven radiation monitoring and other radiation monitoring at the PI ISFSI can be found in the last 5 years of Annual REMP Reports:

- 2010 Annual REMP Report. May 12, 2011. ADAMS Accession Number: ML11133A369
- 2009 Annual REMP Report. May 12, 2010. ADAMS Accession Number: ML101380302
- 2008 Annual REMP Report. May 13, 2009. ADAMS Accession Number: ML091340147
- 2007 Annual REMP Report. May 13, 2008. ADAMS Accession Number: ML081370083
- 2006 Annual REMP Report. May 7, 2007. ADAMS Accession Number: ML071350517

There are no other physical, chemical, or ecological monitoring requirements beyond that described above to the operations of the facility. The proposed action does not involve any changes to the Technical Specifications, refurbishment or changes in operation that would impact the design of the REMP. Therefore, this program would continue through the period of extended operation, and no additional environmental measurement or monitoring would be required beyond that of the current REMP described above.

Appendix A of this license renewal application describes the PI ISFSI Inspection and Monitoring Activities Program, which contains detailed information about proposed inspection and monitoring activities that will be conducted over the 40-year period of extended operation.

E7.0 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

This Supplemental ER describes the proposed action, which is renewal of the license of the PI ISFSI for 40 years, and the associated impacts. Table 7-1 identifies the non-radiological and radiological environmental impacts of PI ISFSI license renewal. Based on this evaluation, PI ISFSI license renewal would involve no significant environmental impact.

Table 7-1
Environmental Impacts of PI ISFSI License Renewal

Issue	Environmental Impact
Land Use	None
Transportation and Social Services	None
Geology and Soils	None
Water Resources	None
Ecological Resources	None
Air Quality	None
Noise	None
Historic and Cultural Resources	None
Visual/Scenic Resources	None
Socioeconomics	None
Waste Management	None
Environmental Justice	SMALL. The PIIC is located directly adjacent to the PINGP site boundary; however, impacts on all other resources are small.
Occupational Dose from Normal Operations	SMALL. PINGP workers conducting maintenance operations would receive an annual collective dose of 4.470 person-rem. PINGP workers participating in cask loading, transport, and emplacement would receive a collective dose of 3.117 person-rem per TN-40HT cask.
Other Occupational Health Effects	SMALL. Any other health effects would be the result of normal workplace hazards (moving heavy objects, etc.)
Dose to the Public from Normal Operations	SMALL. The maximum dose to the nearest potential resident is 2.20 E-3 rem per year. The total collective off-site dose is calculated to be 3.60 person-rem/year.
Dose to the Public from Accidents	SMALL. Even with total loss of the confinement barrier, the site boundary accident dose rates would continue to be below 5 rem to the whole body or any organ as specified in 10 CFR 72.106(b).

E7.1 Unavoidable Adverse Impacts

Renewing the PI ISFSI license would incur no unavoidable adverse impacts as a result of normal operations. In the very unlikely event of a loss of confinement barrier, a small amount of radioactive material could be released, but dose would be managed to remain well below the 10 CFR 72.106(b) regulatory limits.

E7.2 Irreversible and Irretrievable Resource Commitments

The continued operation of the PI ISFSI for the period of extended operation would result in no additional irreversible or irretrievable resource commitments beyond those committed during the initial licensing which cannot be recovered or recycled, or those that are consumed or reduced to unrecoverable forms.

E7.3 Short-Term Use Versus Long-Term Productivity of the Environment

The current balance between short-term use and long-term productivity of the environment at the PI ISFSI site has remained relatively constant since the PI ISFSI began operating. Because the PI ISFSI is a temporary on-site storage facility, PI ISFSI license renewal would postpone restoration of the site and its potential availability for other uses for up to an additional 40 years. Once the spent nuclear fuel is moved to a centralized interim or permanent repository, the casks, concrete pads, berm, and fencing could be removed and the land used for another purpose.

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E9.0 LIST OF PREPARERS

Table 9-1
PI ISFSI Supplemental ER List of Preparers

Name	Title/Affiliation	Responsibility
Bergland, Britta	Senior Analyst, Merjent, Inc.	Document Preparation/Review
Boden, Peg	Senior Archaeologist, Merjent, Inc.	Document Review
Eckholt, Jennie	Licensing Engineer, NSPM	Document Review
Holthaus, James	Program Manager, NSPM	Project Manager, Document Preparation/Review
Kuhl, Brent	Environmental Analyst IV, NSPM	Subject Matter Expert Review
Mackitole, Sackitey	Senior Property and Sales Tax Analyst, NSPM	Subject Matter Expert Review
Morrison, Tim	Spent Nuclear Fuel Project Supervisor, PINGP	Document Review
Nelson, Oley	Spent Nuclear Fuel Project Engineer, PINGP	Document Review
Pickens, Terry	Director, Nuclear Regulatory Policy, NSPM	Subject Matter Expert Review
Tobias, Jeanne	Environmental Coordinator, PINGP	Subject Matter Expert Review
Wildenborg, Pete	Principal Health Physicist, PINGP	Subject Matter Expert Review
Zelenak, Brian	Manager, Regulatory Administration, NSPM	Subject Matter Expert Review

Attachment A

1. Letter from Mr. Mark Schimmel (PINGP) to Mr. Phil Mahowald (PIIC General Counsel), dated May 18, 2011, Prairie Island Nuclear Generating Plant ISFSI Request for Information Regarding Cultural and Historic Resources

2. Letter from Mr. Mark Schimmel (PINGP) to Mr. Tony Sullins (FWS), dated May 18, 2011, Prairie Island Nuclear Generating Plant ISFSI Request for Information Regarding Federally-Listed Threatened or Endangered Species

3. Letter from Mr. Mark Schimmel (PINGP) to Ms. Lisa Joyal (DNR), dated May 18, 2011, Prairie Island Nuclear Generating Plant ISFSI Request for Information Regarding State-Listed Protected Species and Habitats

4. Letter from Mr. Mark Schimmel (PINGP) to Ms. Mary Ann Heidermann (SHPO), dated May 18, 2011, Prairie Island Nuclear Generating Plant ISFSI Request for Information Regarding Cultural and Historic Resources

5. Letter from Ms. Britta L. Bloomberg (SHPO) to Mr. Mark Schimmel (PINGP), dated June 15, 2011, ISFSI at Prairie Island Nuclear Generating Plant T113 R15 S5, Goodhue County SHPO Number: 2011-2448

6. Letter from Ms. Heidi Cyr (DNR) to Mr. James Hothaus (Xcel Energy), dated June 30, 2011, Natural Heritage Review of the proposed Prairie Island Nuclear Generating Plant, T113N R15W Section 5, Goodhue County

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

May 18, 2011

Mr. Phil Mahowald
General Counsel
Prairie Island Indian Community
Legal Department
5636 Sturgeon Lake Road
Welch, MN 55089

SUBJECT: Prairie Island Nuclear Generating Plant
Independent Spent Fuel Storage Installation
Request for Information Regarding Cultural and Historic Resources

Dear Mr. Mahowald:

Northern States Power Company—Minnesota, doing business as Xcel Energy, Inc. (NSPM) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to extend the license of the Prairie Island Nuclear Generating Plant (PINGP) Independent Spent Fuel Storage Installation (ISFSI) in Goodhue County, Minnesota for an additional 40 years. NSPM plans to file this application no later than October 31, 2011. The 20-year ISFSI license will expire on October 31, 2013. NSPM is requesting that NRC grant a 40-year license extension so that the PINGP facility can operate through the expected 20-year PINGP license extension, or until October 31, 2053.

You are aware that the NRC is currently preparing a final Supplemental Environmental Impact Statement (SEIS) to quantify the impacts of 20-year license renewal for the PINGP facility. The ISFSI, although on the same property as the PINGP facility, is licensed separately from the PINGP facility. Therefore, renewal of the ISFSI license is considered an entirely separate licensing action by the NRC.

The ISFSI currently consists of a 5.5-acre area located west of the PINGP cooling towers as shown on Figures 1 and 2 (see attached). Two fences surround the facility with a monitored clear zone between the two fences. Within the storage area, casks are stored on two reinforced concrete pads which are 36 feet wide by 216 feet long by 3 feet deep. The approach to the pads consists of 14 inches of compacted Class 5 aggregate material. A 17-foot-high earthen berm surrounds the ISFSI and shields it from visibility both onsite and offsite, and an access road connects the ISFSI to the rest of the PINGP property.

Operational activities at the ISFSI include periodic transfers of filled casks to the pad after refueling outages and routine inspection and monitoring. NSPM will continue to add casks to the storage pads up to the NRC-approved storage capacity of the ISFSI. Routine operation, inspection, and monitoring activities will not change under the renewed license. None of these routine activities include ground-disturbing of any kind. NSPM will eventually remove the casks once the U.S. Department of Energy (DOE) completes a federal geologic repository for spent fuel and NSPM can ship spent fuel to the repository.

Impacts to Historic and Archaeological Resources

As part of the ISFSI license renewal process, NRC requires that an applicant, "assess whether any historic or archaeological properties will be affected by the proposed project" (10 CFR 51.53(c)(3)(ii)(K)).

The renewal of the ISFSI license will not require any ground disturbing. According to original licensing documents no archeological resources were found in the vicinity of the ISFSI site during investigations conducted during the licensing process. More recently, PINGP performed a limited Phase I archaeological reconnaissance survey of the PINGP property in 2009. The survey revisited eight previously recorded sites and resulted in discovery of new sites, none of which were within or near the ISFSI footprint. The results of the limited Phase I were shared with your office in March 2010.

In addition, NSPM recently conducted core sampling around the ISFSI fence at 8 test pits. Visual inspection of the exposed soil profiles in all but one of the test pits suggested that the subsurface deposits in the project area are significantly disturbed and contain limited original integrity. Soils observed included dark grayish brown sand and coarse brown sand in addition to gravel in some areas. A copy of the final report is provided for your review.

Based on scope of the project and the information from the above-mentioned survey, we conclude that the existing ISFSI has no adverse effects on any historic and archaeological resources and that extension of the license would not alter this conclusion. As part of its environmental review, NRC may request consultation with your Tribe regarding this licensing activity.

By contacting you early in the ISFSI license renewal application process, any questions or concerns may be addressed early in order to facilitate an expeditious NRC consultation. After your review, NSPM would appreciate receiving a letter from your agency detailing any concerns or confirming NSPM's conclusion that operation of the ISFSI over the license renewal term would not adversely affect any historic or archaeological resources. Your agency's response will be included in the Environmental Report that will be submitted to the NRC as part of the license renewal application.

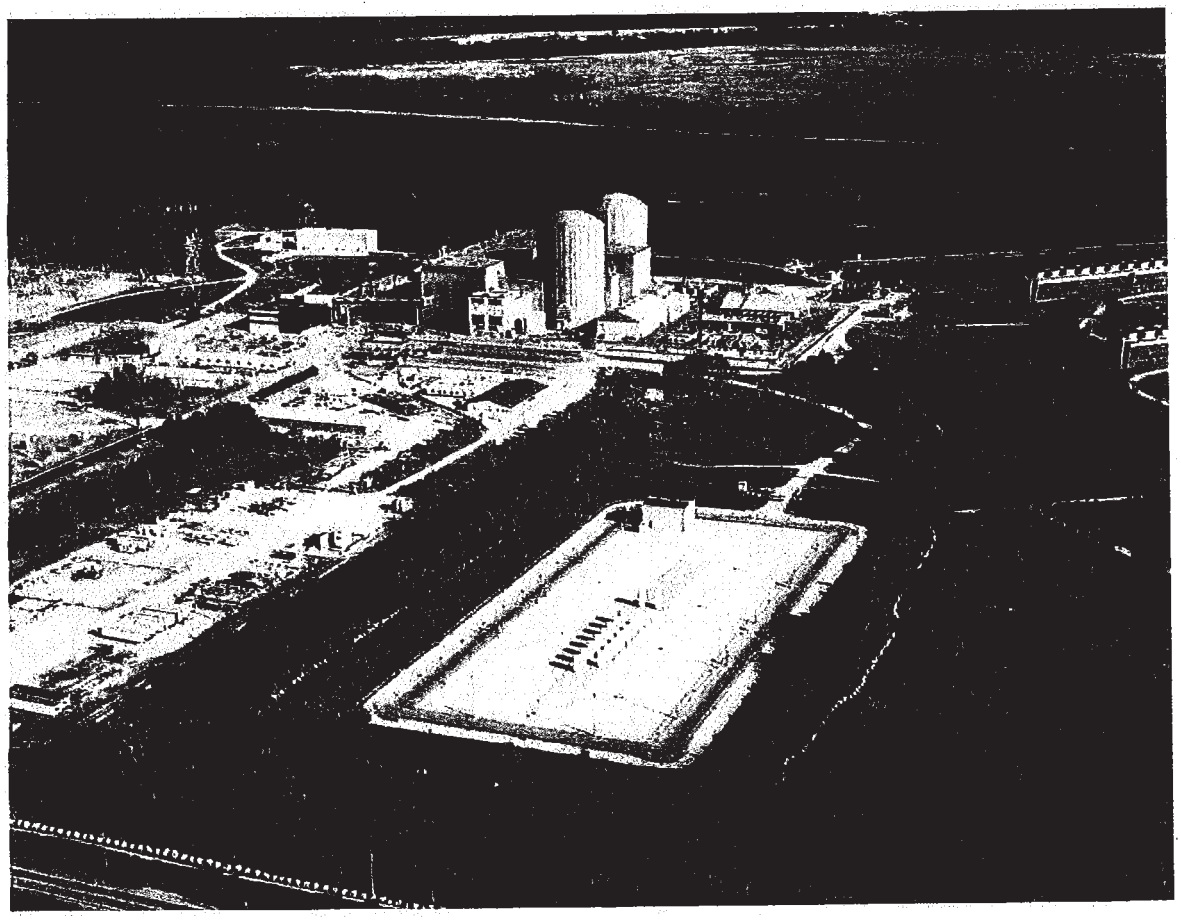
If you have any questions regarding this matter, please contact Mr. James Holthaus, NSPM's Environmental Project Manager, at 612-330-6635.

Sincerely,

Mark Schimmel
Prairie Island Nuclear Generating Plant
Site Vice President

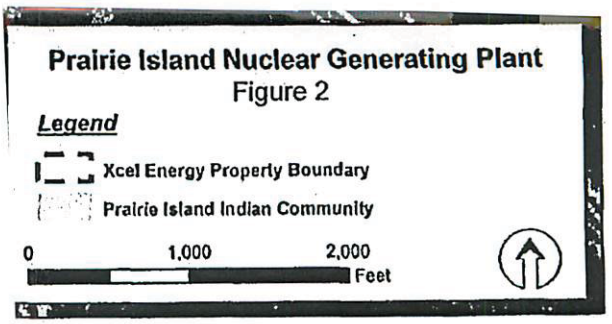
Attachments as noted

Cc: James Holthaus, Environmental Project Manager, NSPM
Whitney White, Prairie Island Indian Community Tribal Historic Preservation Officer (via email)
James Myster, Bureau of Indian Affairs (via email)



Prairie Island Nuclear Generating Plant: Independent Spent Fuel Storage Facility
Figure 1

Figure Withheld Under 10 CFR 2.390



PHASE I ARCHAEOLOGICAL RECONNAISSANCE SURVEY REPORT FOR THE PROPOSED UPGRADES TO THE INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) AT THE Xcel ENERGY PRAIRIE ISLAND NUCLEAR GENERATING PLANT, GOODHUE COUNTY, MINNESOTA

November 29, 2010

Prepared for
Northern States Power MN, d.b.a Xcel Energy
Prairie Island Nuclear Generating Plant
1717 Wakonade Drive East
Welch, MN 55089-9642

Prepared by
Dean T. Sather
Westwood Professional Services, Inc.
7699 Anagram Drive
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INTRODUCTION

Westwood Professional Services, Inc. (Westwood) was retained by Northern States Power MN d.b.a Xcel Energy (Xcel) to conduct a Phase I Archaeological Reconnaissance Survey of the ground surface surrounding the Independent Spent Fuel Storage Installation (ISFSI) facility located on the Prairie Island Nuclear Generating Plant (PINGP) in Section 5, Township 113 north, Range 15 west, Goodhue County, Minnesota (**Exhibit 1**). The project area is located on property that has experienced a significant amount of industrial development.

The defined project area for this cultural resource investigation consists of a small strip of land situated between the secured storage yard within the ISFSI and the earthen embankment structure surrounding the ISFSI. This strip of land measures approximately 30 feet in width and is comprised of a 25 foot wide gravel access road. This road abuts to the immediate external edge of the security fencing of the ISFSI storage yard. Between the gravel access road and the earthen embankment structure is an approximately 5 foot wide drainage ditch. The road measures approximately 700 feet along the northern and southern sides, and approximately 300 feet along the eastern and western side.

The purpose of the survey is to access the nature of previous construction disturbance within the ISFSI facility and determine the potential for the presence of previously undocumented cultural resources within the proposed project's area of potential effect (APE). This "Due Diligence" investigation is being conducted in part as compliance with an established agreement with local Native American Tribes to ensure protection of both recorded and unrecorded cultural resources on lands managed by the PINGP.

METHODOLOGY

Westwood conducted a Cultural Resource Literature Review and Assessment of the proposed project area in November of 2010. Westwood Cultural Resource Specialist Dean T. Sather conducted background research and literature review at the Office of the State Archaeologist. On November 22, 2010, a Phase I Archaeological Survey was completed by Westwood Senior Cultural Resource Specialist Dean T. Sather and Cultural Resource Specialist Ryan P. Grohnke. The field survey consisted of visual inspection, pedestrian survey, and the screening of material recovered from sub-surface test pits through ¼ inch hardware mesh.

Due to governing policies established by Xcel, Westwood personnel were not allowed to excavate on-site. All test pits examined during this investigation were excavated by Xcel personnel. The test pits measured approximately 30 centimeters in diameter and were excavated to an average depth 1.8 meters (6 feet). The material removed from the excavated pits was stored in a series of containers numbered sequentially relative to depth of recovery. Archaeological investigations initiated with the visual inspection of the soil profiles exposed in the test pits followed by the screening of the removed matrix.

Due to proximity to several previously recorded archaeological sites the project area was considered to have moderate potential for prehistoric cultural resources. Survey methods consisted of a combination of visual inspection and subsurface (shovel) testing. Due to the high frequency of prehistoric earthworks in the surrounding area special interest was given to the identification of subsurface features. It was considered that, despite the obvious disturbance of the ground surface resulting from the construction and maintenance of the power facility, intact remnants of prehistoric earthworks may exist immediately below the surface.

ENVIRONMENTAL BACKGROUND

The project study area is located in the Blufflands subsection of the Paleozoic Plateau Section of the Eastern Broadleaf Forest Province (MNDNR 2007). This subsection consists of an ancient plateau covered by loess deposits that has been significantly eroded near rivers and streams. Dissected landscapes are characteristic of the area with bluffs and stream valleys located in 500 – 600 foot deep valleys. The soils are derived from loess deposits. Presettlement vegetation consisted of a combination of tallgrass prairie and bur oak savanna on ridgetop settings. Red oak, white oak, hickory and basswood forests were located on the valley slopes. Red oak, basswood and black walnut forests were located in the protected valleys. Present vegetation consists of a combination of tilled agricultural land (ca 30%), maintained pasture (ca 20%) and wooded land (ca 50%). The project area lies in Anfinson's (1990) Archaeological Region 3, the Southeast Riverine. Woodland period subsistence resources would have included deer, elk, and occasional bison in the uplands with mussels, fish, and various waterfowl species in the bottom. Aquatic floral species, such as the water lily would have been available in the

bottomlands. Acorns would have been abundant in the forested areas while the prairie turnips would have been collected in the uplands (Anfinson 1990).

ARCHAEOLOGICAL LITERATURE REVIEW

Westwood conducted a Cultural Resources Literature Review for the proposed project area. The known cultural resources information, derived from previous professional cultural resources surveys and reported site information, was collected from the Office of the State Archaeologist in St. Paul, Minnesota. Collected data includes archaeological site files and previous cultural resources studies and reports. In addition, Westwood reviewed 19th-century Public Land Survey (PLS) maps and the Andreas' Atlas to identify potential historic-period cultural features that may yet exist in the project area.

The proposed project is located in a region where few cultural resources surveys have been executed. Archaeological properties related to American Indian occupation and activities are frequently found along lakes and streams, or former large permanent bodies of water on prominent topographic features (i.e. uplands or terraces). A total of 27 archaeological sites have been previously identified within two miles of the project area. Fourteen of the twenty-seven previously recorded archaeological sites are identified as either individual mounds or mound groups containing 147 earthwork features, collectively. The remaining 10 or the remaining sites area classed as artifact scatters, two are historic farmsteads, and one is a historic trading post.

FIELD INVESTIGATION RESULTS

A total of 8 test pits were excavated within the project area (**Exhibit 1**). No prehistoric or diagnostic historic artifacts were recovered as a result of the screening of the excavated materials. Visual inspection of the exposed soil profiles in all but one of the test pits suggested that the subsurface deposits in the project area are significantly disturbed and contain limited original integrity.

Test Pit #1 was excavated near the northern end of the western road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface. The soils beneath the road gravels consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #2 was excavated near the western end of the southern road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface. Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of very dark grayish brown (10YR 3/2) sand. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #3 was excavated near the center of the southern road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface.

Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of very dark grayish brown (10YR 3/2) sand. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #4 was excavated near the eastern end of the southern road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface. Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of very dark grayish brown (10YR 3/2) sand with a relatively high percentage of gravels. The soils beneath the very dark grayish brown sand consisted of 25 centimeter (10 inch) layer of coarse brown (10YR 4/3) sand and gravel. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand with limited gravels that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #5 was excavated near the southern end of the eastern road segment. The upper 10 centimeters (4 inches) consisted of the hard packed Class V gravel road surface. Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of dark brown (10YR3/3) sand. Beneath the sand layer was an 18 centimeter (7 inch) layer of Class V gravels. It was suggested at the time of the investigation that this may have been a remnant road segment from the construction phase of the ISFSI that had been subsequently covered during later landscaping events. Immediately beneath the second layer of road gravels was a 50 centimeter (20 inch) layer of dark grayish brown (10YR 3/3) sand. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #6 was excavated near the eastern end of the northern road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface. Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of very dark grayish brown (10YR 3/2) sand. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #7 was excavated near the center of the northern road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface. Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of very dark grayish brown (10YR 3/2) sand. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #8 was excavated near the western end of the northern road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface. Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of very dark grayish brown (10YR 3/2) sand. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased. A total of five test pits

were initiated in the immediate vicinity of Test Pit #8. The other four tests were not completed to the required depth of 180 centimeters (6 feet) due to the presence of concrete fragments hindering progress. Concrete fragments were generally encountered at an approximate depth of 120 centimeters (4 feet).

The soil profile encountered in **Test Pit #8** is comparable to those found at the other test locations. The presence of concrete fragments at the 120 centimeter level suggests that significant prior disturbance has occurred in this location. The continuity of profiles in the area; discounting the minor variations near the immediate surface) suggests a comparable deposition history for the area. It is likely that the majority of the deposits in the vicinity of the ISFSI have been significantly modified by past construction and landscaping events.

RECOMMENDATIONS

Due to the significant degree of previous disturbance of the current ground surface and the fact that no cultural materials were identified during this survey, Westwood recommends that a determination of No Historic Properties be made for the project area and no additional cultural resource investigations are warranted. However, if during construction activities unrecorded buried cultural resources are identified, an archaeologist should be consulted. Further, if human remains are encountered during construction activities, all ground disturbing activity must cease and local law enforcement must be notified. *Minnesota Statute 307.08, the Private Cemeteries Act, prohibits the intentional disturbance of human burials.*

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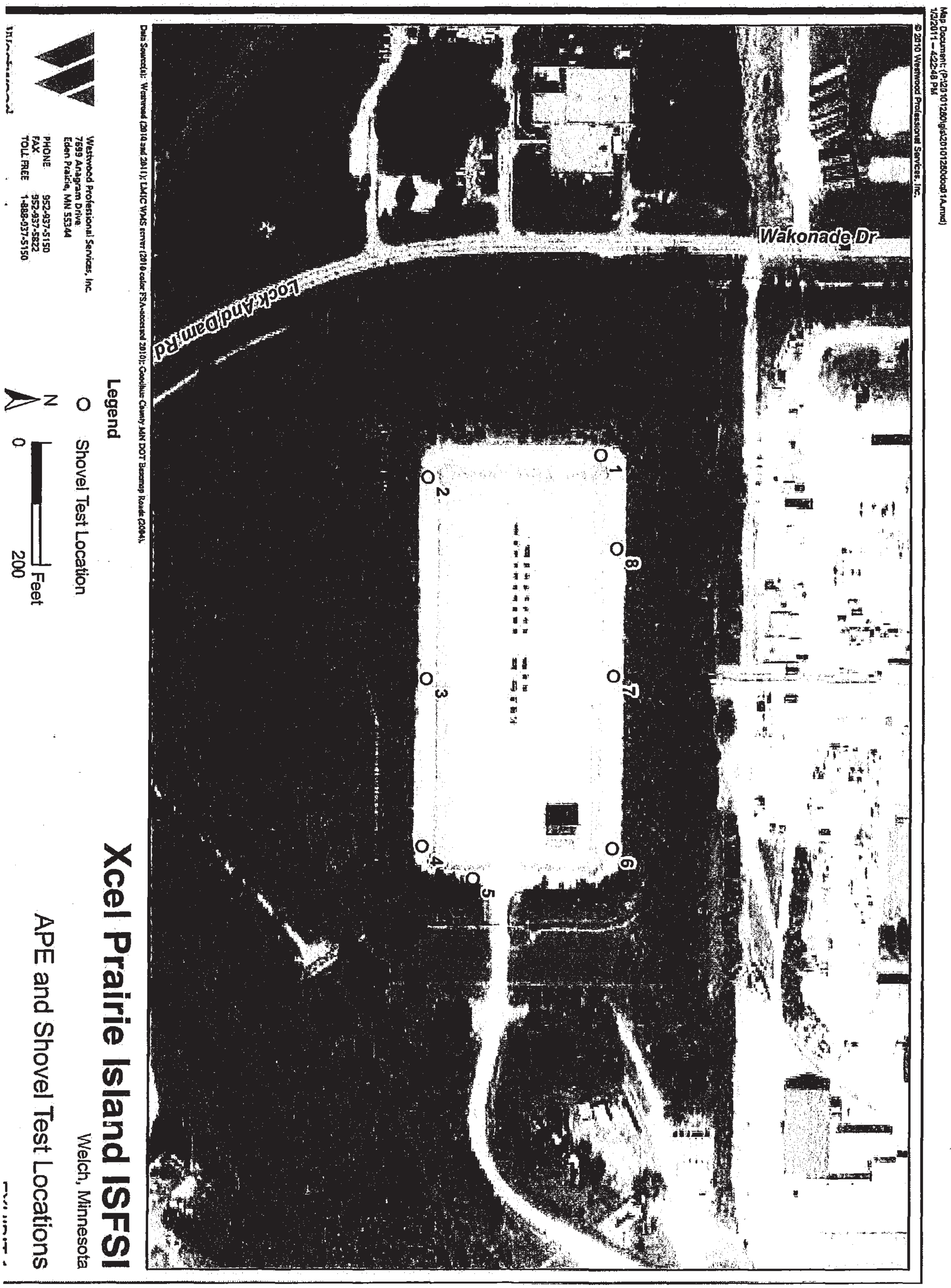
© 2010 Westwood Professional Services, Inc.
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Prairie Island Nuclear Generating Plant
1717 Wakonade Drive East
Welch, MN 55089

May 18, 2011

Mr. Tony Sullins
Field Supervisor
U.S. Fish and Wildlife Service
Twin Cities Minnesota Field Office
4101 East 80th Street
Bloomington, MN 55425

SUBJECT: Prairie Island Nuclear Generating Plant
Independent Spent Fuel Storage Installation
Request for Information Regarding Federally Listed Threatened or Endangered Species

Dear Mr. Sullins,

Northern States Power Company—Minnesota, doing business as Xcel Energy, Inc. (NSPM) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to extend the license of the Prairie Island Nuclear Generating Plant (PINGP) Independent Spent Fuel Storage Installation (ISFSI) in Goodhue County, Minnesota for an additional 40 years. NSPM plans to file this application no later than October 31, 2011. The 20-year ISFSI license will expire on October 31, 2013. NSPM is requesting that NRC grant a 40-year license extension so that the PINGP facility can operate through the expected 20-year PINGP license extension, or until October 31, 2053.

Your office may be aware that the NRC is currently preparing a final Supplemental Environmental Impact Statement (SEIS) to quantify the impacts of 20-year license renewal for the PINGP facility. The NRC consulted with your office on July 22, 2008 with a letter that requested a list of federally threatened and endangered species that may occur in the vicinity of PINGP. You responded on August 13, 2008, stating that the federally endangered Higgins eye pearlymussel was present in the portion of the Upper Mississippi River near the facility. The NRC concluded in its October 2009 Biological Assessment that renewal of the PINGP operating licenses was not likely to adversely affect the Higgins eye pearlymussel.

The ISFSI, although on the same property as the PINGP facility, is licensed separately from the PINGP facility. Therefore, renewal of the ISFSI license is considered an entirely separate licensing action by the NRC. The ISFSI currently consists of a 5.5-acre area located west of the PINGP cooling towers as shown on Figures 1 and 2 (see attached). Two fences surround the facility with a monitored clear zone between the two fences. Within the storage area, casks are stored on two reinforced concrete pads which are 36 feet wide by 216 feet long by 3 feet deep. The approach to the pads consists of 14 inches of compacted Class 5 aggregate material. No trees or other vegetation grow in the graveled area, and it is NSPM policy to keep the area free of vegetation for the life of the ISFSI. A 17-foot-high earthen berm surrounds the ISFSI and shields it from visibility both onsite and offsite, and an access road connects the ISFSI to the rest of the PINGP site. The ISFSI is an entirely passive system with no liquid or gaseous effluents.

Operational activities at the ISFSI include periodic transfers of filled casks to the pad after refueling outages and routine inspection and monitoring. NSPM conducts routine inspections of the berm to maintain its structural integrity. NSPM will continue to add casks to the storage pads up to the NRC-approved storage capacity of the ISFSI. Routine operation, inspection, and monitoring activities will not change under the renewed license. This action will not include any ground-disturbing activities. NSPM will eventually remove the casks once the U.S. Department of Energy completes a federal geologic repository for spent fuel and NSPM can ship spent fuel to the repository.

As part of the ISFSI license renewal process, NRC requires that an applicant identify adverse impacts to threatened or endangered species. As this project would in no way impact the Mississippi River, we believe that the existing ISFSI has no adverse effects on any federally listed species and that extension of the license would not alter this conclusion. As part of its environmental review, NRC may request consultation with your agency regarding this licensing activity, in accordance with Section 7 of the Endangered Species Act (16 USC 1536).

By contacting you early in the ISFSI license renewal application process, any questions or concerns may be addressed early in order to facilitate an expeditious NRC consultation. After your review, NSPM would appreciate receiving a letter from your agency detailing any concerns or confirming NSPM's conclusion that operation of the ISFSI over the license renewal term would not adversely affect any federally listed threatened or endangered species. Your agency's response will be included in the Environmental Report that will be submitted to the NRC as part of the license renewal application.

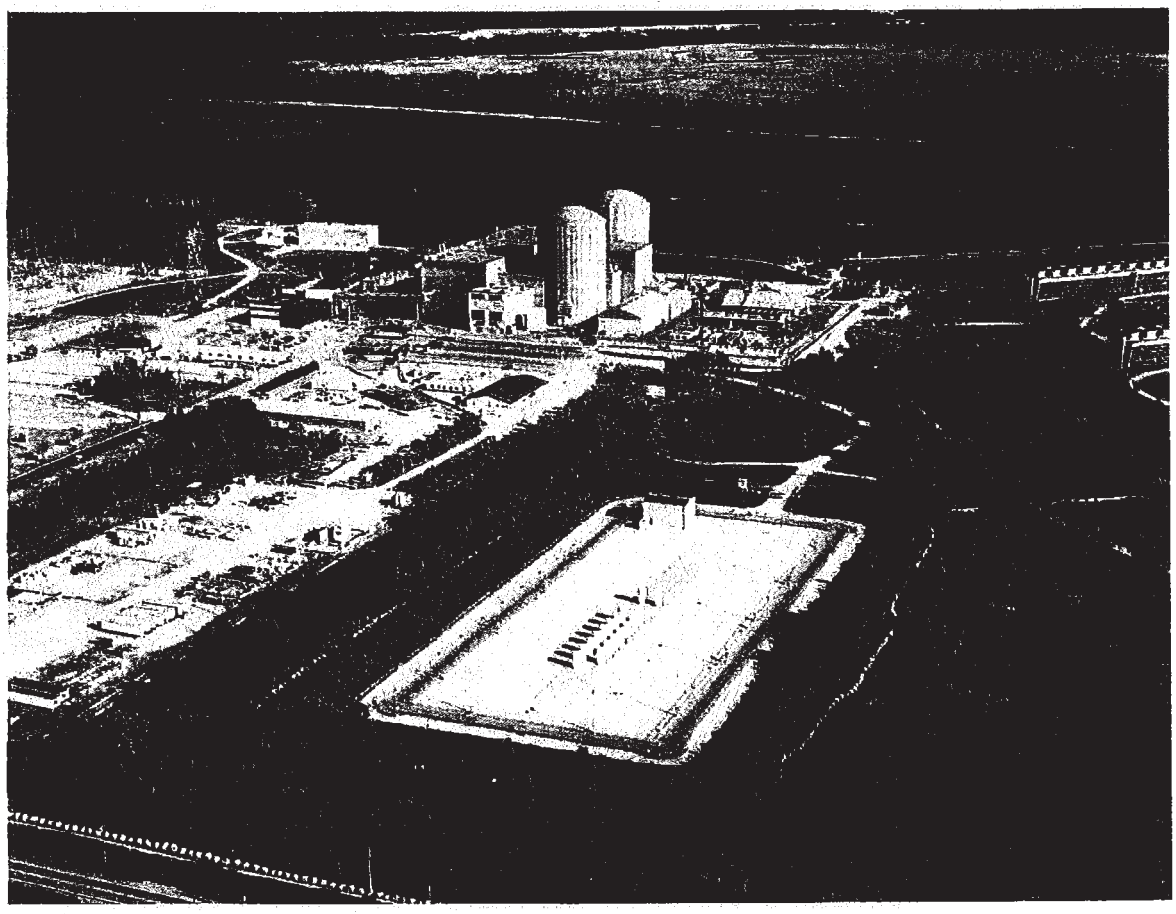
If you have any questions regarding this matter, please contact Mr. James Holthaus, NSPM's Environmental Project Manager, at 612-330-6635.

Sincerely,

Mark Schimmel
Site Vice President
Prairie Island Nuclear Generating Plant

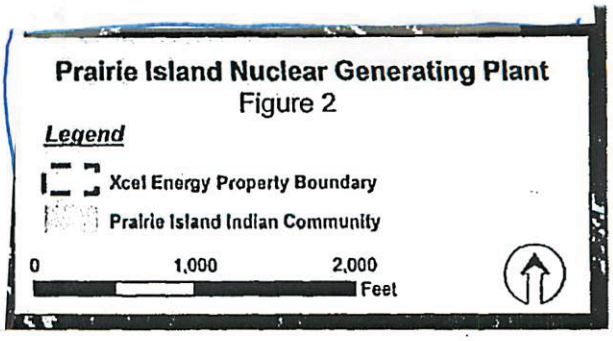
Attachments as noted

Cc: James Holthaus, Environmental Project Manager, NSPM



Prairie Island Nuclear Generating Plant: Independent Spent Fuel Storage Facility
Figure 1

Figure Withheld Under 10 CFR 2.390



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

May 18, 2011

Lisa Joyal, Natural Heritage Review Coordinator
Division of Ecological Resources
Minnesota Department of Natural Resources
500 Lafayette Road, Box 25
St. Paul, Minnesota 55155

SUBJECT: Prairie Island Nuclear Generating Plant
Independent Spent Fuel Storage Installation
Request for Information Regarding State-Listed Protected Species and Habitats

Dear Ms. Joyal,

Northern States Power Company—Minnesota, doing business as Xcel Energy, Inc. (NSPM) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to extend the license of the Prairie Island Nuclear Generating Plant (PINGP) Independent Spent Fuel Storage Installation (ISFSI) in Goodhue County, Minnesota for an additional 40 years. NSPM plans to file this application no later than October 31, 2011. The 20-year ISFSI license will expire on October 31, 2013. NSPM is requesting that NRC grant a 40-year license extension so that the PINGP facility can operate through the expected 20-year PINGP license extension, or until October 31, 2053.

Your office may be aware that the NRC is currently preparing a final Supplemental Environmental Impact Statement to quantify the impacts of 20-year license renewal for the PINGP facility. The NRC consulted with your office on July 22, 2008 with a letter that requested a list of state-listed protected species and important habitats that may occur in the vicinity of PINGP. The ISFSI, although on the same property as the PINGP facility, is licensed separately from the PINGP facility. Therefore, renewal of the ISFSI license is considered an entirely separate licensing action by the NRC.

This letter transmits information to supplement the enclosed Natural Heritage Information System (NHIS) Data Request Form.

Description of Project

The ISFSI currently consists of a 5.5-acre area located west of the PINGP cooling towers as shown on Figures 1 and 2 (see attached). Two fences surround the facility with a monitored clear zone between the two fences. Within the storage area, casks are stored

on two reinforced concrete pads which are 36 feet wide by 216 feet long by 3 feet deep. The approach to the pads consists of 14 inches of compacted Class 5 aggregate material. A 17-foot-high earthen berm surrounds the ISFSI and shields it from visibility both onsite and offsite, and an access road connects the ISFSI to the rest of the PINGP site.

Operational activities at the ISFSI include periodic transfers of filled casks to the pad after refueling outages and routine inspection and monitoring. NSPM conducts routine vegetation maintenance on the berm to maintain its structural integrity. NSPM will continue to add casks to the storage pads up to the NRC-approved storage capacity of the ISFSI. Routine operation, inspection, and monitoring activities will not change under the renewed license. NSPM will eventually remove the casks once the U.S. Department of Energy (DOE) completes a federal geologic repository for spent fuel and NSPM can ship spent fuel to the repository.

Existing Land Use/What Types of Cover/Habitat will be Impacted by the Proposed Project

Operations will remain entirely within the existing footprint of the ISFSI. The project does not involve any ground disturbing. As shown on Figure 1, the existing land use is industrial and the area consists of a graded surface that is covered with aggregate material. The ISFSI is contained by a fenced area which prevents terrestrial wildlife from entering the enclosure. No trees or other vegetation grow in the graveled area, and it is NSPM policy to keep the area free of vegetation for the life of the ISFSI. No land cover or habitat will be impacted by the proposed project.

Waterbodies that may be Affected by the Proposed Project

The PINGP site is adjacent to the Mississippi River (see Figure 2). However, the proposed project will not impact the river in any way. The project will not require any water appropriation or discharge (other than storm water), and will not disturb the riverbed or shoreline. There are no intermittent streams or wetlands located within or adjacent to the project area.

Native Plant Community or Rare Species Surveys

In 2008, NSPM commissioned a study of traditional native medicinal and culturally important plants within the PINGP site. The study was conducted by John McCrady, Inc. and Biological Services, Inc. and consisted of an Autumn 2008, Spring 2009, and Summer 2009 field survey along four transects. Transects were selected based on integrity/disturbance observations coupled with proximity to historic village sites. The survey revealed the highest number of plant species recorded in within the PINGP site since a 1975-1980 survey for facility licensing. Approximately 208 species were observed, 78 of which were determined to have medicinal or cultural significance to the Dakota Indians. None of the survey transects were located within or near the ISFSI project area, as surveys within this area would have revealed no species, medicinally or culturally important or otherwise. The project will not impact any species identified by the 2008-2009 survey, or any other plant species within the PINGP site.

Conclusion

As part of the ISFSI license renewal process, NRC requires that an applicant identify adverse impacts to special status species. Based on the information presented above, we believe that the existing ISFSI has no adverse effects on any state protected species and important habitats and that extension of the license would not alter this conclusion. As part of its environmental review, NRC may request consultation with your agency regarding this licensing activity in accordance with Section 7 of the Endangered Species Act (16 USC 1536).

By contacting you early in the ISFSI license renewal application process, we hope that any questions or concerns may be addressed early in order to facilitate an expeditious NRC consultation. NSPM would appreciate receiving a letter from your agency detailing any concerns or confirming our conclusion that operation of the ISFSI over the license renewal term would not adversely affect any state protected species or important habitats. Your agency's response will be included in the Environmental Report that will be submitted to the NRC as part of the license renewal application.

If you have any questions regarding this matter, please contact Mr. James Holthaus, NSPM's Environmental Project Manager, at 612-330-6635.

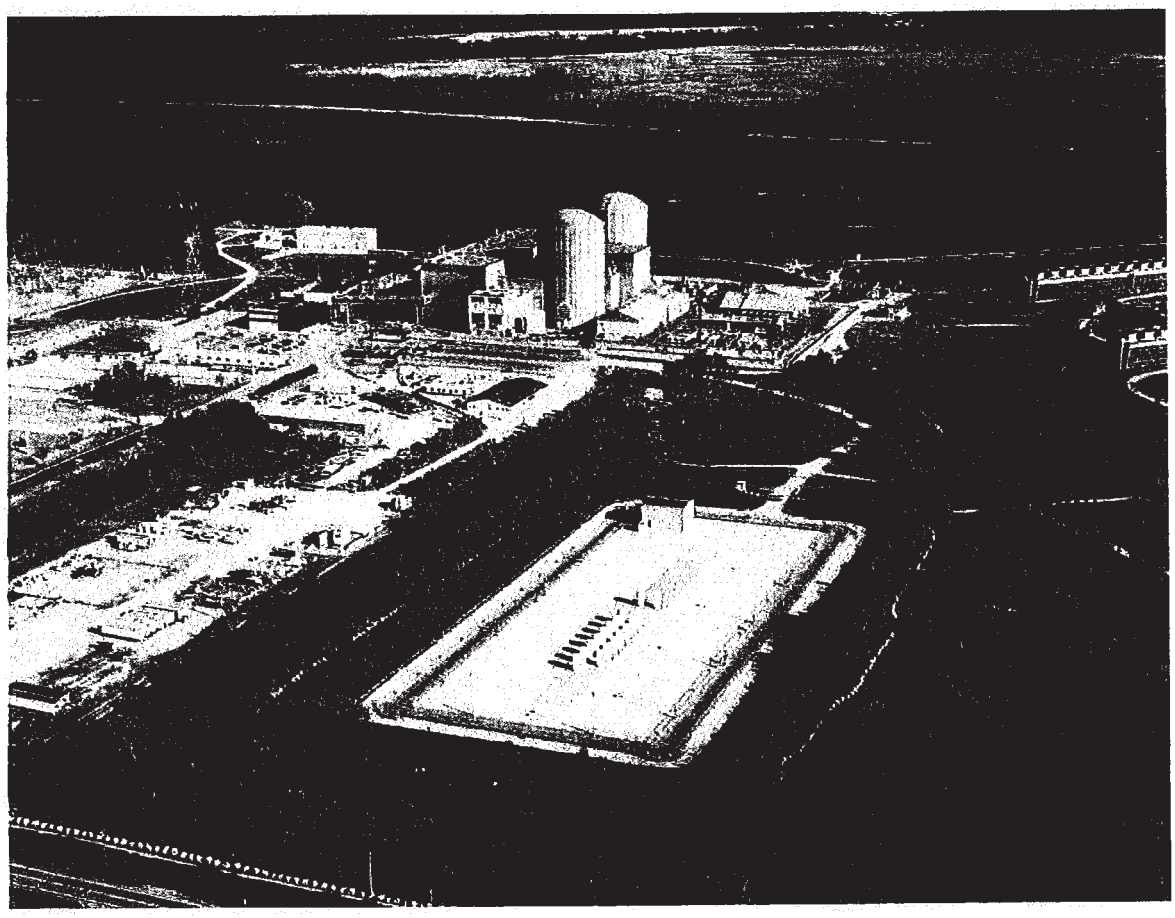
Sincerely,

Mark Schimmel

Mark Schimmel
Prairie Island Nuclear Generating Plant
Site Vice President

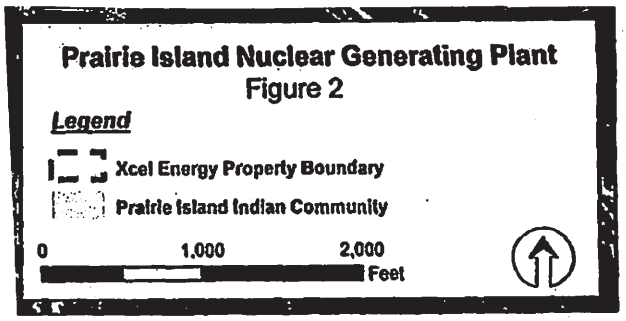
Attachments as noted

Cc: James Holthaus, Environmental Project Manager, NSPM



Prairie Island Nuclear Generating Plant: Independent Spent Fuel Storage Facility
Figure 1

Figure Withheld Under 10 CFR 2.390



NO STAPLES PLEASE

For Agency Use Only:		#Sec _____	Contact Rqsted? _____
Received _____	Due _____ RUSH Inv _____	#EOs _____	Survey Rqsted? _____
Search Radius _____mi.	ER / All Map'd _____	#Com _____	
NoR / NoF / NoE / Std / Sub	Let _____ Log out _____	Related ERDB# _____	

Minnesota Department of Natural Resources

NATURAL HERITAGE INFORMATION SYSTEM (NHIS) DATA REQUEST FORM

Please read the instructions on page 3 before filling out the form. Thank you!

WHO IS REQUESTING THE INFORMATION?

Name and Title: James Holthaus, Environmental Project Manager

Agency/Company: Xcel Energy, Inc.

Mailing Address: 414 Nicollet Mall, MP-4 (Street) | Minneapolis (City) | MN (State) | 55401 (Zip Code)

Phone: 612-330-6635 e-mail: james.holthaus@xenuclear.com Responses will be sent via email. If you prefer US Mail check here: ☐

THIS INFORMATION IS BEING REQUESTED FOR A:

☐ Federal EA ☐ State EAW ☐ PUC Site Application ☐ Watershed Plan
☐ Federal EIS ☐ State EIS ☐ Local Government Permit ☐ Research Project
☐ NEPA Checklist ☐ AUAR
☑ Other (describe) Applicant-prepared Environmental Report to U.S. Nuclear Regulatory Commission

INFORMATION WE NEED FROM YOU:

1) **Enclose a map** of the project boundary/area of interest (topographic maps or aerial photos are preferred).
2) Please **provide a GIS shapefile*** (NAD 83, UTM Zone 15N) of the project boundary/area of interest.
3) List the following locational information* (attach additional sheets if necessary):

For Agency Use: TRS Confirmed ☐

For Agency Use: Region / MCBS Status	County	Township #	Range #	Section(s) (please list **all** sections)
	Goodhue	T113N	15W	4 and 5

4) Please provide the following information (attach additional sheets if necessary):

Project Name: Prairie Island Nuclear Generating Plant ISFSI License Renewal

Project Proposer: Northern States Power, Minnesota d/b/a Xcel Energy, Inc.

Description of Project (including types of disturbance anticipated from the project):

see attached

* Please see the instructions on page 3.

Describe the existing land use of the project site. What types of land cover/habitat will be impacted by the proposed project?
see attached

List any waterbodies (e.g., rivers, intermittent streams, lakes, wetlands) that may be affected by the proposed project, and how they may be impacted (e.g., dewatering, discharge, riverbed disturbance).
see attached

To your knowledge, has the project undergone a previous Natural Heritage review? If so, please list the correspondence #: ERDB # _____. How does this request differ from the previous request (e.g., change in scope, change in boundary, project being revived, project expansion, different phase)?
N/A

To your knowledge, have any native plant community or rare species surveys been conducted within the site? If so, please list:
see attached

List any DNR Permits or Licenses that you will be applying for or have already applied for as part of this project:
N/A

INFORMATION WE PROVIDE TO YOU:

1) The response will include a Natural Heritage letter. If applicable, the letter will discuss potential impacts to rare features.

☐ Check here if this information is being requested for a formal environmental review document (e.g., EAW, EIS) **and** your company/agency has a staff ecologist who will be making the impact determination **and** you do not want DNR staff to provide any interpretation of impacts.

2) The response will also include an Index Report of known aggregation sites and known occurrences of federally and state-listed plants and animals*within an approximate one-mile radius of the project boundary/area of interest.

☐ Check here if you would also like geologic features and rare species with no legal status included in the report.

3) If desired, a Detailed Report that contains more information on each occurrence can be obtained. Please note that the Detailed Report may contain specific location information that is protected under *Minnesota Statutes*, section 84.0872, subd. 2, and, as such, the Detailed Report may not be included in any public document (e.g., an EAW). The Index Report and Natural Heritage letter can be included in any public environmental review document.

☑ Check here if you would also like to receive a Detailed Report.

FEES / TURNAROUND TIME

There is a fee* for this service. Requests generally take **3-4 weeks** from date of receipt to process, and are processed in the order received. Rush requests* are processed in 2 weeks or less if workloads allow, but are not guaranteed.

☐ Check here to RUSH this request. You will be charged an additional $50.

I have read the entire form, and the information supplied above is complete and accurate. I understand that material supplied to me from the Minnesota Natural Heritage Information System is copyrighted and that I am not permitted to reproduce or publish any of this copyrighted material without prior written permission from the Minnesota DNR. Further, if permission to publish is given, I understand that I must credit the Minnesota Division of Ecological Resources, Minnesota Department of Natural Resources, as the source of the material.

Signature **(required)**	Note: Digital signatures representing the name of a person shall be sufficient to show that such person has signed this document.
James J. Rothaus	

Mail or email completed form to:
Lisa Joyal, Natural Heritage Review Coordinator
Division of Ecological Resources
Minnesota Department of Natural Resources
500 Lafayette Road, Box 25
St. Paul, Minnesota 55155
lisa.joyal@state.mn.us

Form is available at
http://files.dnr.state.mn.us/eco/nhnrp/nhis_data_request.pdf

Revised July 2009

* Please see the instructions on page 3.

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

May 18, 2011

Ms. Mary Ann Heidermann
Manager of Government Programs and Compliance
State Historic Preservation Office
Minnesota Historical Society
345 Kellogg Boulevard West
St. Paul, MN 55102-1903

SUBJECT: Prairie Island Nuclear Generating Plant
Independent Spent Fuel Storage Installation
Request for Information Regarding Cultural and Historic Resources

Dear Ms. Heidermann:

Northern States Power Company—Minnesota, doing business as Xcel Energy, Inc. (NSPM) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to extend the license of the Prairie Island Nuclear Generating Plant (PINGP) Independent Spent Fuel Storage Installation (ISFSI) in Goodhue County, Minnesota for an additional 40 years. NSPM plans to file this application no later than October 31, 2011. The 20-year ISFSI license will expire on October 31, 2013. NSPM is requesting that NRC grant a 40-year license extension so that the PINGP facility can operate through the expected 20-year PINGP license extension, or until October 31, 2053.

Your office may be aware that the NRC is currently preparing a final Supplemental Environmental Impact Statement (SEIS) to quantify the impacts of 20-year license renewal for the PINGP facility. The NRC consulted with your office during the development of the SEIS. The ISFSI, although on the same property as the PINGP facility, is licensed separately from the PINGP facility. Therefore, renewal of the ISFSI license is considered an entirely separate licensing action by the NRC.

The ISFSI currently consists of a 5.5-acre area located west of the PINGP cooling towers as shown on Figures 1 and 2 (see attached). Two fences surround the facility with a monitored clear zone between the two fences. Within the storage area, casks are stored on two reinforced concrete pads which are 36 feet wide by 216 feet long by 3 feet deep. The approach to the pads consists of 14 inches of compacted Class 5 aggregate material. A 17-foot-high earthen berm surrounds the ISFSI and shields it from visibility both onsite and offsite, and an access road connects the ISFSI to the rest of the PINGP property.

Operational activities at the ISFSI include periodic transfers of filled casks to the pad after refueling outages and routine inspection and monitoring. NSPM will continue to add casks to the storage pads up to the NRC-approved storage capacity of the ISFSI. Routine operation, inspection, and monitoring activities will not change under the renewed license. None of these routine activities include ground-disturbing of any kind. NSPM will eventually remove the casks once the U.S. Department of Energy (DOE) completes a federal geologic repository for spent fuel and NSPM can ship spent fuel to the repository.

Impacts to Historic and Archaeological Resources

As part of the ISFSI license renewal process, NRC requires that an applicant, "assess whether any historic or archaeological properties will be affected by the proposed project" (10 CFR 51.53(c)(3)(ii)(K)).

The Plant is located adjacent to the Prairie Island Indian Community Reservation. In addition, there are six National Register historic sites located within 5 miles of PINGP. Five of the sites are in Goodhue County and one is in Pierce County, Wisconsin. These properties are listed on Table 1, below. There are no Minnesota Historical Society Sites within 5 miles of the site.

Table 1: National Register Sites within Five Miles of PINGP

Name of Historic Site	Location	Approx. Distance from PINGP	Comments
Bartron Archaeological Site	Undisclosed location on Prairie Island	0-1 miles	Prehistoric site
Metro Archeological District	Pierce County Wisconsin Restricted Address	1-2 miles	810 acre prehistoric site
Mendota to Wabasha Military Road	Cannon Bottom Road, Red Wing, MN	2-4 miles	48 acre military roadway
Alexander Anderson Estate	West of Red Wing on U.S. 61	2-4 miles	50 acre brick and stone structure of architectural and engineering significance
Cross of Christ Lutheran Church	U.S. 61 Red Wing	4.5 miles	50 acre structure of architectural, engineering, and religious significance
Silvernale Site	Goodhue County Restricted Address	4-5 miles	No Information available

The renewal of the ISFSI license will not require any ground disturbing. According to original licensing documents no archeological resources were found in the vicinity of the

ISFSI site during investigations conducted during the licensing process. More recently, PINGP performed a limited Phase I archaeological reconnaissance survey of the PINGP property in 2009. The survey revisited eight previously recorded sites and resulted in discovery of new sites, none of which were within or near the ISFSI footprint. The results of the limited Phase I were shared with your office in March 2010.

In addition, NSPM recently conducted core sampling around the ISFSI fence at 8 test pits. Visual inspection of the exposed soil profiles in all but one of the test pits suggested that the subsurface deposits in the project area are significantly disturbed and contain limited original integrity. Soils observed included dark grayish brown sand and coarse brown sand in addition to gravel in some areas. A copy of the final report is provided for your review.

Based on scope of the project and the information from the above-mentioned survey, we conclude that the existing ISFSI has no adverse effects on any historic and archaeological resources and that extension of the license would not alter this conclusion. As part of its environmental review, NRC may request consultation with your agency regarding this licensing activity, in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470), and the federal Advisory Council on Historic Preservation Regulations (36 CFR 800).

By contacting you early in the ISFSI license renewal application process, any questions or concerns may be addressed early in order to facilitate an expeditious NRC consultation. After your review, NSPM would appreciate receiving a letter from your agency detailing any concerns or confirming NSPM's conclusion that operation of the ISFSI over the license renewal term would not adversely affect any historic or archaeological resources. Your agency's response will be included in the Environmental Report that will be submitted to the NRC as part of the license renewal application.

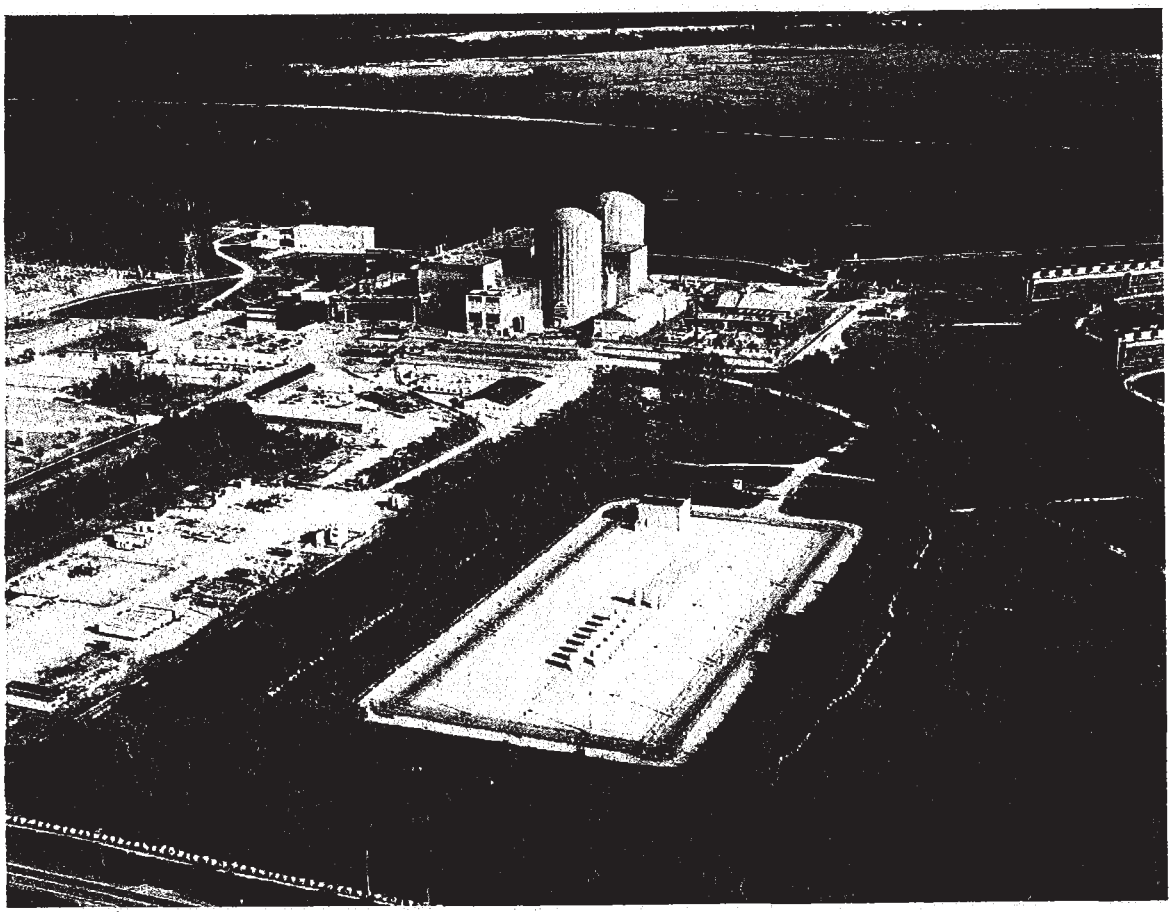
If you have any questions regarding this matter, please contact Mr. James Holthaus, NSPM's Environmental Project Manager, at 612-330-6635.

Sincerely,

Mark Schimmel
Prairie Island Nuclear Generating Plant
Site Vice President

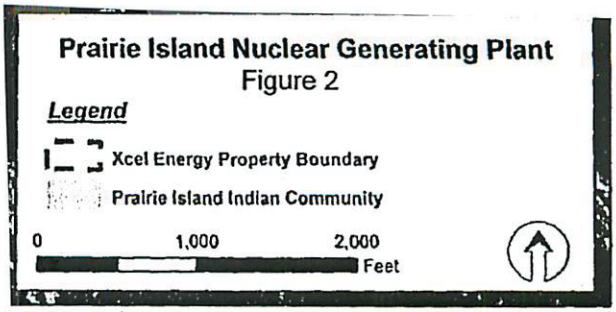
Attachments as noted

Cc: James Holthaus, Environmental Project Manager, NSPM



Prairie Island Nuclear Generating Plant: Independent Spent Fuel Storage Facility
Figure 1

Figure Withheld Under 10 CFR 2.390



PHASE I ARCHAEOLOGICAL RECONNAISSANCE SURVEY REPORT FOR THE PROPOSED UPGRADES TO THE INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) AT THE Xcel ENERGY PRAIRIE ISLAND NUCLEAR GENERATING PLANT, GOODHUE COUNTY, MINNESOTA

November 29, 2010

Prepared for
Northern States Power MN, d.b.a Xcel Energy
Prairie Island Nuclear Generating Plant
1717 Wakonade Drive East
Welch, MN 55089-9642

Prepared by
Dean T. Sather
Westwood Professional Services, Inc.
7699 Anagram Drive
Eden Prairie, MN 55344

INTRODUCTION

Westwood Professional Services, Inc. (Westwood) was retained by Northern States Power MN d.b.a Xcel Energy (Xcel) to conduct a Phase I Archaeological Reconnaissance Survey of the ground surface surrounding the Independent Spent Fuel Storage Installation (ISFSI) facility located on the Prairie Island Nuclear Generating Plant (PINGP) in Section 5, Township 113 north, Range 15 west, Goodhue County, Minnesota (**Exhibit 1**). The project area is located on property that has experienced a significant amount of industrial development.

The defined project area for this cultural resource investigation consists of a small strip of land situated between the secured storage yard within the ISFSI and the earthen embankment structure surrounding the ISFSI. This strip of land measures approximately 30 feet in width and is comprised of a 25 foot wide gravel access road. This road abuts to the immediate external edge of the security fencing of the ISFSI storage yard. Between the gravel access road and the earthen embankment structure is an approximately 5 foot wide drainage ditch. The road measures approximately 700 feet along the northern and southern sides, and approximately 300 feet along the eastern and western side.

The purpose of the survey is to access the nature of previous construction disturbance within the ISFSI facility and determine the potential for the presence of previously undocumented cultural resources within the proposed project's area of potential effect (APE). This "Due Diligence" investigation is being conducted in part as compliance with an established agreement with local Native American Tribes to ensure protection of both recorded and unrecorded cultural resources on lands managed by the PINGP.

METHODOLOGY

Westwood conducted a Cultural Resource Literature Review and Assessment of the proposed project area in November of 2010. Westwood Cultural Resource Specialist Dean T. Sather conducted background research and literature review at the Office of the State Archaeologist. On November 22, 2010, a Phase I Archaeological Survey was completed by Westwood Senior Cultural Resource Specialist Dean T. Sather and Cultural Resource Specialist Ryan P. Grohnke. The field survey consisted of visual inspection, pedestrian survey, and the screening of material recovered from sub-surface test pits through ¼ inch hardware mesh.

Due to governing policies established by Xcel, Westwood personnel were not allowed to excavate on-site. All test pits examined during this investigation were excavated by Xcel personnel. The test pits measured approximately 30 centimeters in diameter and were excavated to an average depth 1.8 meters (6 feet). The material removed from the excavated pits was stored in a series of containers numbered sequentially relative to depth of recovery. Archaeological investigations initiated with the visual inspection of the soil profiles exposed in the test pits followed by the screening of the removed matrix.

Due to proximity to several previously recorded archaeological sites the project area was considered to have moderate potential for prehistoric cultural resources. Survey methods consisted of a combination of visual inspection and subsurface (shovel) testing. Due to the high frequency of prehistoric earthworks in the surrounding area special interest was given to the identification of subsurface features. It was considered that, despite the obvious disturbance of the ground surface resulting from the construction and maintenance of the power facility, intact remnants of prehistoric earthworks may exist immediately below the surface.

ENVIRONMENTAL BACKGROUND

The project study area is located in the Blufflands subsection of the Paleozoic Plateau Section of the Eastern Broadleaf Forest Province (MNDNR 2007). This subsection consists of an ancient plateau covered by loess deposits that has been significantly eroded near rivers and streams. Dissected landscapes are characteristic of the area with bluffs and stream valleys located in 500 – 600 foot deep valleys. The soils are derived from loess deposits. Presettlement vegetation consisted of a combination of tallgrass prairie and bur oak savanna on ridgetop settings. Red oak, white oak, hickory and basswood forests were located on the valley slopes. Red oak, basswood and black walnut forests were located in the protected valleys. Present vegetation consists of a combination of tilled agricultural land (ca 30%), maintained pasture (ca 20%) and wooded land (ca 50%). The project area lies in Anfinson's (1990) Archaeological Region 3, the Southeast Riverine. Woodland period subsistence resources would have included deer, elk, and occasional bison in the uplands with mussels, fish, and various waterfowl species in the bottom. Aquatic floral species, such as the water lily would have been available in the

bottomlands. Acorns would have been abundant in the forested areas while the prairie turnips would have been collected in the uplands (Anfinson 1990).

ARCHAEOLOGICAL LITERATURE REVIEW

Westwood conducted a Cultural Resources Literature Review for the proposed project area. The known cultural resources information, derived from previous professional cultural resources surveys and reported site information, was collected from the Office of the State Archaeologist in St. Paul, Minnesota. Collected data includes archaeological site files and previous cultural resources studies and reports. In addition, Westwood reviewed 19th-century Public Land Survey (PLS) maps and the Andreas' Atlas to identify potential historic-period cultural features that may yet exist in the project area.

The proposed project is located in a region where few cultural resources surveys have been executed. Archaeological properties related to American Indian occupation and activities are frequently found along lakes and streams, or former large permanent bodies of water on prominent topographic features (i.e. uplands or terraces). A total of 27 archaeological sites have been previously identified within two miles of the project area. Fourteen of the twenty-seven previously recorded archaeological sites are identified as either individual mounds or mound groups containing 147 earthwork features, collectively. The remaining 10 or the remaining sites area classed as artifact scatters, two are historic farmsteads, and one is a historic trading post.

FIELD INVESTIGATION RESULTS

A total of 8 test pits were excavated within the project area (**Exhibit 1**). No prehistoric or diagnostic historic artifacts were recovered as a result of the screening of the excavated materials. Visual inspection of the exposed soil profiles in all but one of the test pits suggested that the subsurface deposits in the project area are significantly disturbed and contain limited original integrity.

Test Pit #1 was excavated near the northern end of the western road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface. The soils beneath the road gravels consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #2 was excavated near the western end of the southern road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface. Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of very dark grayish brown (10YR 3/2) sand. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #3 was excavated near the center of the southern road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface.

Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of very dark grayish brown (10YR 3/2) sand. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #4 was excavated near the eastern end of the southern road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface. Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of very dark grayish brown (10YR 3/2) sand with a relatively high percentage of gravels. The soils beneath the very dark grayish brown sand consisted of 25 centimeter (10 inch) layer of coarse brown (10YR 4/3) sand and gravel. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand with limited gravels that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #5 was excavated near the southern end of the eastern road segment. The upper 10 centimeters (4 inches) consisted of the hard packed Class V gravel road surface. Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of dark brown (10YR3/3) sand. Beneath the sand layer was an 18 centimeter (7 inch) layer of Class V gravels. It was suggested at the time of the investigation that this may have been a remnant road segment from the construction phase of the ISFSI that had been subsequently covered during later landscaping events. Immediately beneath the second layer of road gravels was a 50 centimeter (20 inch) layer of dark grayish brown (10YR 3/3) sand. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #6 was excavated near the eastern end of the northern road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface. Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of very dark grayish brown (10YR 3/2) sand. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #7 was excavated near the center of the northern road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface. Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of very dark grayish brown (10YR 3/2) sand. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased.

Test Pit #8 was excavated near the western end of the northern road segment. The upper 15 centimeters (6 inches) consisted of the hard packed Class V gravel road surface. Immediately beneath the road gravels was a 10 centimeter (4 inch) layer of very dark grayish brown (10YR 3/2) sand. The soils beneath the very dark grayish brown sand consisted of a coarse brown (10YR 4/3) sand that extended to a depth of 180 centimeters (6 feet). The color of the sands lightened as depth increased. A total of five test pits

were initiated in the immediate vicinity of Test Pit #8. The other four tests were not completed to the required depth of 180 centimeters (6 feet) due to the presence of concrete fragments hindering progress. Concrete fragments were generally encountered at an approximate depth of 120 centimeters (4 feet).

The soil profile encountered in **Test Pit #8** is comparable to those found at the other test locations. The presence of concrete fragments at the 120 centimeter level suggests that significant prior disturbance has occurred in this location. The continuity of profiles in the area; discounting the minor variations near the immediate surface) suggests a comparable deposition history for the area. It is likely that the majority of the deposits in the vicinity of the ISFSI have been significantly modified by past construction and landscaping events.

RECOMMENDATIONS

Due to the significant degree of previous disturbance of the current ground surface and the fact that no cultural materials were identified during this survey, Westwood recommends that a determination of No Historic Properties be made for the project area and no additional cultural resource investigations are warranted. However, if during construction activities unrecorded buried cultural resources are identified, an archaeologist should be consulted. Further, if human remains are encountered during construction activities, all ground disturbing activity must cease and local law enforcement must be notified. *Minnesota Statute 307.08, the Private Cemeteries Act, prohibits the intentional disturbance of human burials.*

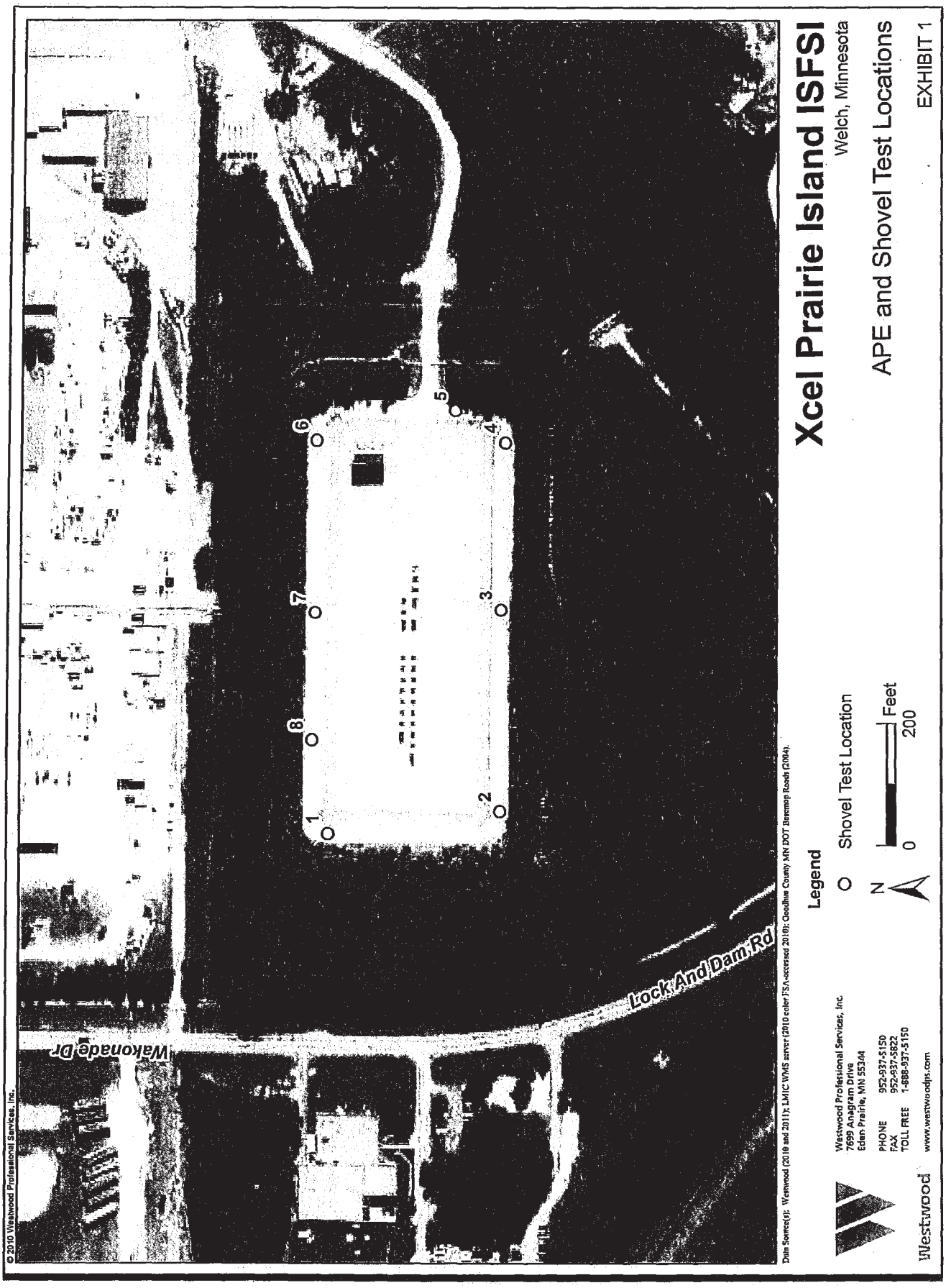
REFRENCES

Anfinson, Scott F.

1990 Archaeological Regions in Minnesota and the Woodland Period. In The Woodland Tradition in the Western Great Lakes: Papers Presented to Elden Johnson, edited by G.E. Gibbon, pp. 135-166. University of Minnesota Publications in Anthropology No. 4, Minneapolis.

Minnesota Department of Natural Resources.

2007 The Minnesota Department of Natural Resources Web Site (online). Accessed 2007-5-29 at http://www.dnr.state.mn.us/sitetools/copyright.html


Xcel Prairie Island ISFSI
Welch, Minnesota
APE and Shovel Test Locations
EXHIBIT 1
Legend
Shovel Test Location
N
0
200
Feet
Lock And Dam Rd
Wakonade Dr
1
2
3
4
5
6
7
8
Westwood Professional Services, Inc.
7699 Anagram Drive
Eden Prairie, MN 55344
PHONE 952-937-5150
FAX 952-937-5822
TOLL FREE 1-888-937-5150
www.westwoodps.com
Westwood
Data Source(s): Westwood (2010 and 2011); LMIC WMS server (2010 color FSA-accessed 2010); Goodhue County MN DOT Basemap Roads (2004).
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Map Document: (P:\2010\1260\gis\20101260doc01A.mxd)
1/3/2011 -- 4:22:46 PM

JUN 2 0 2011

Minnesota Historical Society

STATE HISTORIC PRESERVATION OFFICE

June 15, 2011

Mr. Mark Schimmel
Xcel Energy – Prairie Island Nuclear Generating Plant
1717 Wakonade Drive East
Welch, MN 55089

RE: Independent Spent Fuel Storage Installation at Prairie Island Nuclear Generating Plant
T113 R15 S5, Goodhue County
SHPO Number: 2011-2448

Dear Mr. Schimmel:

Thank you for the opportunity to review and comment on the above project. It has been reviewed pursuant to the responsibilities given the State Historic Preservation Officer by the National Historic Preservation Act of 1966 and the Procedures of the Advisory Council on Historic Preservation (36CFR800).

Based on available information, we conclude that **no properties** listed in or eligible for listing in the National Register of Historic Places will be affected by this project.

Please contact our Compliance Section at (651) 259-3455 if you have any questions regarding our review of this project.

Sincerely,

Britta L. Bloomberg
Deputy State Historic Preservation Officer

Minnesota Historical Society, 345 Kellogg Boulevard West, Saint Paul, Minnesota 55102
651-259-3000 • 888-727-8386 • www.mnhs.org

Minnesota Department of Natural Resources
Division of Ecological and Water Resources, Box 25
500 Lafayette Road
St. Paul, Minnesota 55155-4025
Phone: (651) 259-5107 Fax: (651) 296-1811 E-mail: heidi.cyr@state.mn.us

June 30, 2011 **Correspondence # ERDB 20110539**

Mr. James Holthaus
Xcel Energy
414 Nicollet Mall, MP-4
Minneapolis, MN 55401

RE: Natural Heritage Review of the proposed Prairie Island Nuclear Generating Plant, T113N R15W Section 5, Goodhue County

Dear Mr. Holthaus,

As requested, the Minnesota Natural Heritage Information System has been queried to determine if any rare species or other significant natural features are known to occur within an approximate one-mile radius of the project site. Based on this query, several rare features have been documented within the search area (for details, please see the enclosed database reports; please visit the Rare Species Guide at http://www.dnr.state.mn.us/rsg/index.html for more information on the biology, habitat use, and conservation measures of these rare species). I am providing the database reports only and have not evaluated the potential for the proposed site to negatively impact these rare features.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. Locations of the gray wolf (*Canis lupus*), federally-listed as threatened and state-listed as special concern, and the Canada lynx (*Lynx canadensis*), federally-listed as threatened, are not currently tracked in the NHIS. As such, the Natural Heritage Review does not address these species.

The enclosed results include an Index Report and a Detailed Report of records in the Rare Features Database, the main database of the NHIS. To control the release of specific location information, which might result in the destruction of a rare feature, both reports are copyrighted. The Index Report provides rare feature locations only to the nearest section, and may be reprinted, unaltered, in an environmental review document (e.g., EAW or EIS), municipal natural resource plan, or report compiled by your company for the project listed above. If you wish to reproduce the index report for any other purpose, please contact me to request written permission. **The Detailed Report is for your personal use only as it may include specific location information that is considered nonpublic data under *Minnesota Statutes*, section 84.0872, subd. 2. If you wish to reprint or publish the Detailed Report for any purpose, please contact me to request written permission.**

This letter does not constitute review or approval by the Department of Natural Resources as a whole. Instead, it identifies issues regarding known occurrences of rare features and potential effects to these rare features. Additional rare features for which we have no data may be present in the project area, or there may be other natural resource concerns associated with the proposed project. For these concerns, please contact your DNR Regional Environmental Assessment Ecologist (contact information available at http://www.dnr.state.mn.us/eco/ereview/erp_regioncontacts.html). Please be aware that additional site assessments or review may be required.

Thank you for consulting us on this matter and for your interest in preserving Minnesota's rare natural resources. For environmental review purposes, the results of this Natural Heritage Review are valid for one year, for the project location (noted above), and for the project description provided on the NHIS Data Request Form. Please contact me if project details change or if an updated review is needed. An invoice will be mailed to you under separate cover.

Sincerely,

Heidi Cyr
Natural Heritage Review Specialist

enc. Rare Features Database: Index Report
Rare Features Database: Detail Report
Rare Features Database Reports: An Explanation of Fields

Printed June 2011
Data valid for one year

Minnesota Natural Heritage Information System
Index Report of records within 1 mile radius of:
ERDB #20110539 - Prairie Island Nuclear Generating Plant
T113N R15W Section 5
Goodhue County

Rare Features Database:

Element Name and Occurrence Number	Federal Status	MN Status	State Rank	Global Rank	Last Observed Date	EO ID #
Vertebrate Animal						
Dendroica cerulea (Cerulean Warbler) #41 T113N R15W S16, T113N R15W S8, T113N R15W S9; Goodhue County		SPC	S3B	G4	1990-07-05	17189
Emydoidea blandingii (Blanding's Turtle) #718 T114N R15W S32, T113N R15W S6, T113N R15W S5, T114N R15W S31; Goodhue County		THR	S2	G4	1989-07	17731
Falco peregrinus (Peregrine Falcon) #66 T113N R15W S5; Goodhue County	No Status	THR	S2B	G4	2010-06-09	2788
Haliaeetus leucocephalus (Bald Eagle) #984 Just outside Minnesota in adjacent jurisdiction(s).; Non-MN County - Located just outside Minnesota in adjacent jurisdiction(s).		SPC	S3B,S3N	G5	1991	13047
Haliaeetus leucocephalus (Bald Eagle) #1264 Just outside Minnesota in adjacent jurisdiction(s).; Non-MN County - Located just outside Minnesota in adjacent jurisdiction(s).		SPC	S3B,S3N	G5	1994	17000
Haliaeetus leucocephalus (Bald Eagle) #1532 T113N R15W S8; Goodhue County		SPC	S3B,S3N	G5	2000	21811
Polyodon spathula (Paddlefish) #1 T28N R20W S12, T28N R20W S14, T114N R16W S36, T113N R15W S5, T [...]; Dakota, Goodhue, Washington County		THR	S2	G4	2008-09-28	16529
Reithrodontomys megalotis (Western Harvest Mouse) #7 T114N R16W S25, T114N R15W S30, T113N R15W S6, T114N R16W S35, T [...]; Goodhue County		NON	SNR	G5	1958-02-23	3074
Scaphirhynchus platorynchus (Shovelnose Sturgeon) #47 T113N R15W S4, T114N R15W S33; Goodhue County		NON	S4	G4	1991-10	16519
Invertebrate Animal						
Actinonaias ligamentina (Mucket) #158 T113N R15W S4, T113N R15W S9, T113N R15W S8, T113N R15W S5, T [...]; Goodhue County		THR	S2	G5	1980-09-17	25515
Arcidens confragosus (Rock Pocketbook) #17 T113N R15W S10, T113N R15W S9, T113N R15W S14, T113N R15W S12, T [...]; Goodhue, Pierce County		END	S1	G4	2009-06-(09-11)	25720
Ellipsaria lineolata (Butterfly) #59 T114N R16W S13, T113N R14W S36, T113N R13W S31, T114N R15W S32, T [...]; Goodhue County		THR	S2	G4	1944-PRE	35374

Printed June 2011
Data valid for one year

Minnesota Natural Heritage Information System
Index Report of records within 1 mile radius of:
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T113N R15W Section 5
Goodhue County

Rare Features Database:

Element Name and Occurrence Number	Federal Status	MN Status	State Rank	Global Rank	Last Observed Date	EO ID #
Invertebrate Animal						
Elliptio crassidens (Elephant-ear) #4 T113N R14W S20, T113N R14W S19, T113N R15W S10, T114N R16W S13, T [...]; Goodhue County		END	S1	G5	1944-Pre	21139
Elliptio dilatata (Spike) #129 T113N R15W S4, T113N R15W S9, T113N R15W S8, T113N R15W S5, T [...]; Goodhue County		SPC	S3	G5	1980-09-17	25514
Elliptio dilatata (Spike) #202 T113N R15W S9, T114N R15W S30, T113N R15W S4, T113N R15W S10; Goodhue County		SPC	S3	G5	2000-07-PRE	33669
Fusconaia ebena (Ebonyshell) #11 T113N R15W S11, T113N R15W S12, T113N R15W S13, T113N R15W S14, T [...]; Goodhue County		END	S1	G4G5	2004-07-PRE	21138
Lampsilis higginsi (Higgins Eye) #28 T113N R14W S19, T113N R15W S10, T114N R16W S13, T113N R13W S32, T [...]; Goodhue County	LE	END	S1	G1	2004-07-08	31904
Lampsilis higginsi (Higgins Eye) #36 T113N R15W S5, T113N R15W S4, T114N R15W S32, T114N R15W S33; Goodhue County	LE	END	S1	G1	2005-09-29	33180
Lampsilis teres (Yellow Sandshell) #19 T113N R15W S4, T114N R15W S30, T114N R16W S13, T113N R15W S10, T [...]; Goodhue County		END	S1	G5	2004-08-02	31366
Ligumia recta (Black Sandshell) #405 T114N R15W S30, T113N R15W S4, T115N R17W S25, T115N R17W S23, T [...]; Dakota, Goodhue, Pierce, Washington County		SPC	S3	G5	2009-06-(09-11)	33850
Megalonaias nervosa (Washboard) #19 T114N R15W S32, T113N R15W S5, T113N R15W S4, T114N R15W S33; Goodhue, Pierce County		THR	S2	G5	2009-06-(09-11)	31491
Obovaria olivaria (Hickorynut) #138 T115N R17W S22, T114N R16W S4, T114N R15W S29, T114N R15W S30, T [...]; Dakota, Goodhue, Pierce, Washington County		SPC	S3	G4	2009-06-(09-11)	33655
Plethobasus cyphyus (Sheepnose) #2 T113N R14W S19, T113N R13W S33, T113N R15W S10, T114N R16W S13, T [...]; Goodhue County	C	END	S1	G3	1944-Pre	21137
Pleurobema coccineum (Round Pigtoe) #123 T114N R16W S13, T114N R15W S30; Goodhue County		THR	S2	G4G5	2004-08-02	31707
Quadrula metanevra (Monkeyface) #62 T114N R15W S30; Goodhue County		THR	S2	G4	2000-Pre	31546

Printed June 2011
Data valid for one year

Minnesota Natural Heritage Information System
Index Report of records within 1 mile radius of:
ERDB #20110539 - Prairie Island Nuclear Generating Plant
T113N R15W Section 5
Goodhue County

Rare Features Database:

Element Name and Occurrence Number	Federal Status	MN Status	State Rank	Global Rank	Last Observed Date	EO ID #
Invertebrate Animal						
Quadrula nodulata (Wartyback) #28 T26N R20W S9, T113N R15W S4, T115N R17W S25, T114N R16W S13, T [...]; Dakota, Goodhue, Pierce, Washington County		END	S1	G4	2008-10-05	31400
Tritogonia verrucosa (Pistolgrip) #63 Just outside Minnesota in adjacent jurisdiction(s).; Non-MN County - Located just outside Minnesota in adjacent jurisdiction(s).		THR	S2	G4G5	2000-Pre	31493
Vascular Plant						
Panax quinquefolius (American Ginseng) #84 T113N R15W S8, T113N R15W S7; Goodhue County		SPC	S3	G3G4	1991-09-17	12946
Native Plant Community (This may not represent a complete list. Also see MCBS Native Plant Communities at http://deli.dnr.state.mn.us.)						
Dry Sand - Gravel Oak Savanna (Southern) Type #36 T113N R15W S5; Goodhue County	(NPC Code: UPs14b)	N/A	S2	GNR	1992	14964
Spikerush - Bur Reed Marsh (Northern) Type #1058 T113N R15W S6; Goodhue County	(NPC Code: MRn93b)	N/A	S4	GNR	1992-08-19	14959
Sugar Maple - Basswood - (Bitternut Hickory) Forest Type #1860 T113N R15W S8, T113N R15W S7; Goodhue County	(NPC Code: MHs39a)	N/A	S3	GNR	1991-09-17	13269

Records Printed = 31

Minnesota's endangered species law (*Minnesota Statutes*, section 84.0895) and associated rules (*Minnesota Rules*, part 6212.1800 to 6212.2300 and 6134) prohibit the taking of threatened or endangered species without a permit. For plants, taking includes digging or destroying. For animals, taking includes pursuing, capturing, or killing.

APPENDIX F

ADDITIONAL INFORMATION

TABLE of CONTENTS

APPENDIX F: ADDITIONAL INFORMATION

F1.0 Training and Qualifications (10 CFR 72.28)

F1.1 Technical Qualifications

Northern States Power Company, a Minnesota corporation, d/b/a Xcel Energy (hereafter "NSPM"), has decades of experience in the nuclear energy field. NSPM's longest operating commercial nuclear power plant, Monticello Nuclear Generating Plant (MNGP), started operation in 1970. NSPM also operates Prairie Island Nuclear Generating Plant (PINGP), Units 1 and 2. Reactor operations have provided extensive experience in the receipt, handling, storage, and shipping of nuclear fuel. Operations activities of the Prairie Island Site-Specific Independent Spent Fuel Storage Installation (ISFSI) are conducted by the operating staff of the PINGP. Additional experience in fuel storage has been obtained by operation of the Prairie Island ISFSI since initial cask loading in 1995.

A discussion of technical qualifications was submitted with the initial license application for the Prairie Island Site-Specific ISFSI in Chapter 2 (Reference F2.1). Additionally, discussion of personnel qualifications is available in Section 9.1.3 of the Prairie Island ISFSI Safety Analysis Report (SAR) (Reference F2.2) and in Section 13.2.3 of the PINGP Updated Safety Analysis Report (USAR) (Reference F2.3). Both of these documents are updated in accordance with regulatory requirements.

A commitment to staff the project (i.e., the Site-Specific ISFSI) with adequate personnel possessing the required skill throughout all phases of the project was contained in Chapter 2 of the initial license application for the Prairie Island ISFSI (Reference F2.1). The commitment remains throughout the renewed license period to provide continued assurance of the safety of the public and operating personnel.

F1.2 Personnel Training

A discussion of operator training was submitted with the initial license application for the Prairie Island Site-Specific ISFSI in Chapter 2 (Reference F2.1). Additionally, discussion of the training programs is provided in Section 9.3 of the Prairie Island ISFSI SAR (Reference F2.2) and in Section 13.3 of the PINGP USAR (Reference F2.3). Both of these documents are updated in accordance with regulatory requirements.

F1.3 Operating Organization

Operation of the Prairie Island ISFSI is integrated with the operation of the PINGP. A description of the operating organization of PINGP is contained in Section 13.2 of the PINGP USAR (Reference F2.3). This document is updated periodically in accordance with regulatory requirements.

F2.0 References (Appendix F, Additional Information)

F2.1 Letter from T.M. Parker, Northern States Power Company to R.E. Cunningham (NRC), *Application for a License to Construct and Operate a Dry Cask Independent Spent Fuel Storage Installation*, dated August 31, 1990.

F2.2 *Prairie Island Independent Spent Fuel Storage Installation Safety Analysis Report* (ISFSI SAR), Revision 14.

F2.3 *Prairie Island Updated Safety Analysis Report* (USAR), Revision 31.