414 Nicollet Mall
Minneapolis, Minnesota 55401

August 1, 2008

Burl W. Haar **- VIA ELECTRONIC FILING -**
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, Minnesota 55101

RE: APPLICATION TO THE MINNESOTA PUBLIC UTILITIES COMMISSION FOR A SITE PERMIT FOR THE PRAIRIE ISLAND NUCLEAR GENERATING PLANT FOR EXTENDED POWER UPRATE
Docket No. E002/GS-08-690

Dear Dr. Haar:

Northern States Power Company, a Minnesota corporation ("Xcel Energy" or "Company"), submits to the Minnesota Public Utilities Commission ("PUC" or "Commission") for consideration this Application for a Site Permit for the Prairie Island Nuclear Generating Plant for the Extended Power Uprate project. We filed the companion Certificate of Need with the PUC on May 16, 2008.requesting the Commission approve an increase in the electrical generating capabilities of the plant by 164 MW to meet our customers' growing energy needs. This Site Permit Application is submitted pursuant to Minn. Stat. § 216E and Minn. R. 7849.

The implementation of the extended power uprate at Prairie Island is predicated on the approval of the license renewal application submitted to the Nuclear Regulatory Commission on April 15, 2008. The license renewal application has been deemed complete and the public input process is currently underway, with the first environmental scoping meeting being held on July 30, 2008.

The Prairie Island Nuclear Generating Plant uses nuclear fuel in two, two-loop pressurized-water reactors to produce on average a nominal value of 575 megawatts of electrical power in each unit. To make the plant modifications with minimal disruption to regional energy supply, the power uprate is primarily scheduled to occur during two routine refueling outages, in 2012 (Unit 1) and 2015

(Unit 2). Based on power uprates performed at other similar nuclear facilities, we anticipate the NRC will agree sufficient safety and design margins exist to increase the rated core thermal power at Prairie Island from 1650 to 1805 megawatts thermal (MWt) without any adverse impact on the health and safety of the public and without any significant impact on the environment.

While no operating pressure or core flow changes are necessary to support the power uprate, a number of balance-of-plant improvements are necessary to take advantage of the increased steam output and additional generation capacity.

Additionally, pursuant to Minn. R. 7849.5005 Subp. 3, the Company also believes that the general public may be benefit if the OES and PUC consider the preparation of one environmental document covering the Site Permit (Docket No. E001/GS-08-690), the Extended Power Uprate CON (Docket E002/CN-08-509), and the Additional Dry Cask Storage CON (Docket E002/CN-08-510).

Please note that we are sending an initial fee payment of $10,000 to your attention under separate cover pursuant to Minn. Stat. 216E.18, subd. 2 and Minn. R. 7849.5210.

We are providing hard copies of this filing to the Office of the Attorney General and other parties on the attached service list. Copies of our Site Permit Application can be obtained from the Xcel Energy web site at www.xcelenergy.com

Please contact Brian R. Zelenak at: brian.r.zelenak@xcelenergy.com, or (612) 330-5641 if you have any questions regarding this filing.

SINCERELY,

/s/

DAVID M. SPARBY
EXECUTIVE VICE PRESIDENT & ACTING PRESIDENT & CEO
NSP MINNESOTA

Enclosure

c: Service List

# APPLICATION TO THE MINNESOTA PUBLIC UTILITIES COMMISSION

# FOR A GENERATING PLANT SITE PERMIT

# PRAIRIE ISLAND NUCLEAR GENERATING PLANT EXTENDED POWER UPRATE PROJECT

PUC DOCKET NO. E002/GS-08-690

AUGUST 1, 2008

PREPARED BY XCEL ENERGY AND NUCLEAR MANAGEMENT COMPANY LLC.

Xcel Energy®

# Application for a Generating Plant Site Permit
# Prairie Island Extended Uprate Project

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Attachment A Record of Successfully Completed Uprate Projects in U.S.

Attachment B Copy of Response Letter from Minnesota Department of Natural Resources Natural Heritage and Nongame Research Program

# Application Content Requirement

| Rule Citation | Regulatory Requirement | Application Section |
|---|---|---|
| Minn. R. 7849.5040, Subp. 3(C) | Except as provided in part 7849.5060 or 7849.5980, no person shall increase the generating capacity or output of an existing large electric power generating plant without a permit from the commission. | All Sections |
| 7849.5220, subp. 1 (per Minn. R. 7849.5530) | **Site Permit Application Contents** | |
| | (a) a statement of proposed ownership of the facility at the time of filing the application and after commercial operation | Section 2 |
| | (b) the precise name of any person or organization to be initially named as permittee or permittees and the name of any other person to whom the permit may be transferred if transfer of the permit is contemplated | Section 2 |
| | (c ) at least two proposed sites for the proposed large electric power generating plant and identification of the applicant's preferred site and the reasons for preferring the site; | N/A |
| | (d) a description of the proposed large electric power generating plant and all associated facilities, including the size and type of the facility; | Section 3 |
| | **(e) environmental information required under Subp. 3 (Listed Below)** | |
| | (f) the names of the owners of the property for each proposed site; | Section 2 |
| | (g) the engineering and operational design for the large electric power generating plant at each of the proposed sites; | Section 3 |
| | (h) a cost analysis of the large electric power generating plant at each proposed site, including the costs of constructing and operating the facility that are dependent on design and site | Section 3.10 |

| Rule Citation | Regulatory Requirement | Application Section |
|---|---|---|
| | (i) an engineering analysis of each of the proposed sites, including how each site could accommodate expansion of generating capacity in the future | Section 3.11 |
| | (j) identification of transportation, pipeline, and electrical transmission systems that will be required to construct, maintain, and operate the facility; | Section 3.0 |
| | (k) a listing and brief description of federal, state, and local permits that may be required for the project at each proposed site; and | Section 2.3 |
| | (l) a copy of the Certificate of Need for the project from the Public Utilities Commission or documentation that an application for a Certificate of Need has been submitted or is not required. | CON application submitted on May 16, 2008<br>See Docket E002/CN-08-509 |
| Minn. R. 7849.5220, subp. 3 | **Environmental Information Requirements** | |
| | (a) a description of the environmental setting for each site or route | Section 4 |
| | (b) a description of the effects of construction and operation of the facility on human settlement, including, but not limited to, public health and safety, displacement, noise, aesthetics, socioeconomic impacts, cultural values, recreation, and public services | Section 4.7 |
| | (c ) a description of the effects of the facility on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining; | Section 4.7 |
| | (d) a description of the effects of the facility on archaeological and historic resources | Section 4.6 |

| Rule Citation | Regulatory Requirement | Application Section |
|---|---|---|
| | (e) a description of the effects of the facility on the natural environment, including effects on air and water quality resources and flora and fauna | Section 4 |
| | (f) a description of the effects of the facility on rare and unique natural resources | Section 4.5 |
| | (g) identification of human and natural environmental effects that cannot be avoided if the facility is approved at a specific site or route | Section 4 |
| | (h) a description of measures that might be implemented to mitigate the potential human and environmental impacts identified in items A to G and the estimated costs of such mitigative measures | Section 4.8. |

# 1 Introduction

## 1.1 Overview

Northern States Power Company, a Minnesota corporation (Xcel Energy or the Company), hereby applies to the Minnesota Public Utilities Commission ("PUC" or "Commission") for a Site Permit to increase the total electrical generation capacity at our Prairie Island Nuclear Generating Plant by 164 net megawatts electric (MWe).

The Prairie Island Nuclear Generating Plant consists of two 575 MW gross (550-MW net), two-loop, pressurized-water nuclear reactors. The 560-acre plant site and the associated transmission and other facilities are in Red Wing, Minnesota, on the western bank of the Mississippi River in Goodhue County. The site is approximately 30 miles southeast of St. Paul. (See Figure 1-1).

The 164 MW power uprate (the "Project") consists of an 82 MW net capacity uprate at Unit 1 and an 82 MW net capacity uprate at Unit 2. We propose to complete the uprate on Unit 1 during the 2012 refueling outage and on Unit 2 during the 2015 refueling outage.

## 1.2 Site Permit Requirement

A Site Permit is required for the Project under the Minnesota Power Plant Siting Act, Minn. Stat. § 216E, and Minn. R. 7849, parts 7849.5010 through 7849.7010. Specifically, under Minn. R. 7849.5040, subpart 3(C) "…no person shall increase the generating capacity or output of an existing large electric power generation plant [LEPGP] without a site permit from the PUC."

## 1.3 Review of Site Alternatives

Typically a site permitting proceeding is undertaken to select a site for a new power plant proposal and includes the examination of alternative locations for the proposed facility. However, in this case we propose to increase the capacity of an existing plant by modifying its operation and

making conversions to existing plant equipment. The question is not where to locate the additional 164 megawatts of nuclear power, but rather, is plant expansion at Prairie Island the best addition to the company's fleet of generation resources? In essence there is no site selection decision to be made by the Commission. Instead the examination of alternatives to expanding plant production is being addressed in the Commission's Certificate of Need proceeding that accompanies this filing (MPUC Docket No. E002/CN-08-509). We have included an extensive discussion of our review of alternatives types of generation additions we could make to upgrading the Prairie Island plant in our application for Certificates of Need. Our analysis in the CON demonstrates that the proposed plant upgrade is the most economical option available to us and will result in fewer air emissions than the alternatives.

Similarly the environmental information typically contained in a site permit application is directed at demonstrating that the new plant can meet applicable environmental standards and examining the differences in land use and environmental impacts at alternative sites. Since the proposal to upgrade production at Prairie Island is not a siting question, there is no comparative analysis of siting impacts to be done. The Certificate of Need rules also require an examination of the environmental considerations associated with the proposal and the generation alternatives. Thus, we have provided considerable environmental information in our Certificate of Need application. Rather than repeat all of material from our Certificate of Need filings in this application we have attempted to provide an overview and enough depth to inform the reader along with references to additional documentation.

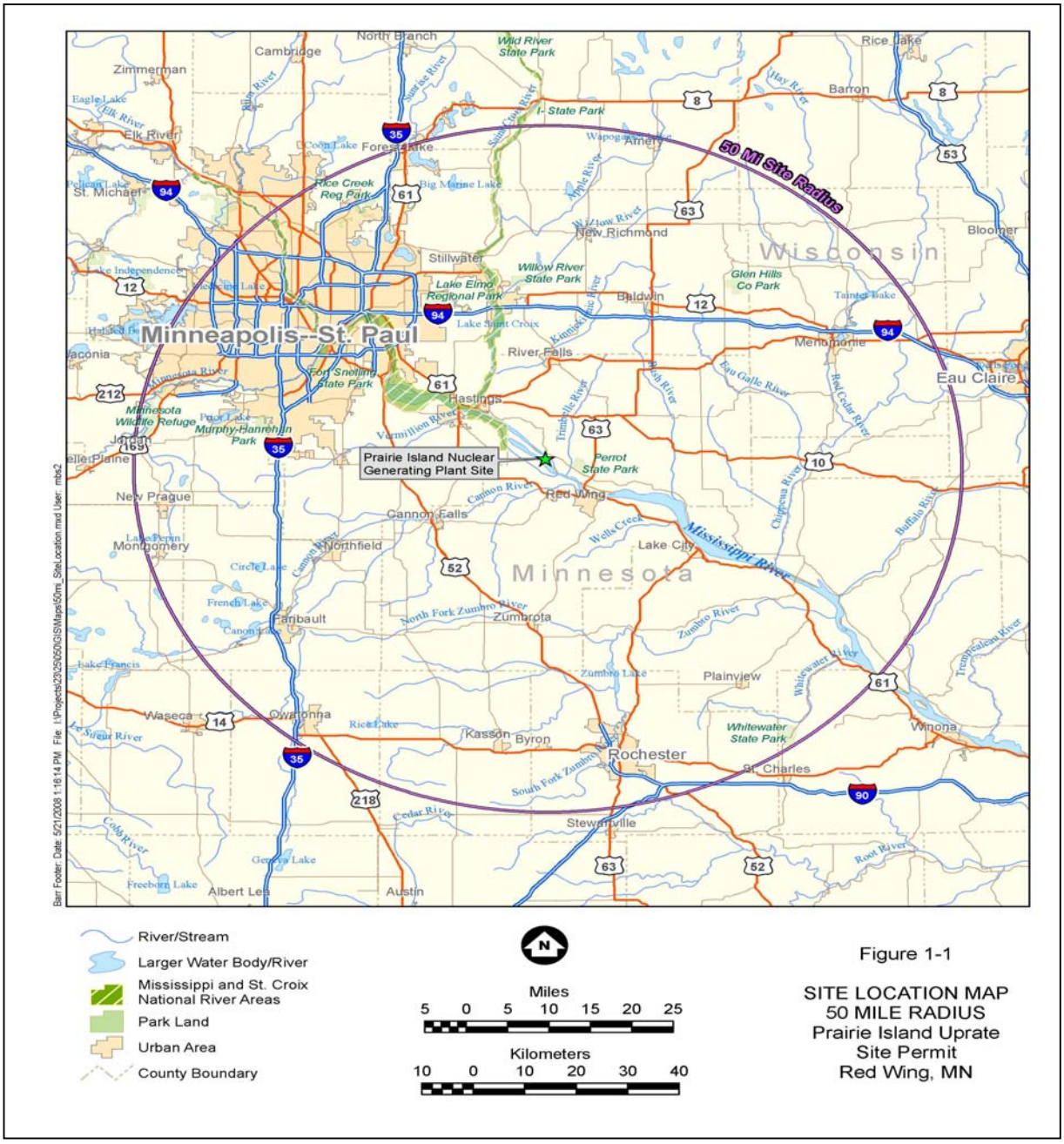


**Figure 1.1 Site Location Map 50 Mile Radius**

## 1.4 Purpose and Need

Prairie Island is a critical part of our effort to meet the ongoing, base load demand for electrical power; it currently produces about 20 percent of our customers' electric energy needs in the upper Midwest.

The purpose of the proposed power uprate project is to provide an additional 164 MW of reliable base-load generation capacity and energy to Xcel Energy customers. The Project is necessary to ensure that Xcel Energy has adequate, low-cost generating capacity in 2012 and beyond. The purpose and need for the power uprate project is described in detail in the our May 16, 2008 Certificate of Need filing for the Extended Power Uprate (Docket No. E002/CN-08-509).

## 1.5 Power Uprate Background

Several decades of reactor safety technology improvements, plant performance feedback, and improved fuel and core designs have shown that nuclear reactors throughout the United States can operate at higher output than allowed under their original Nuclear Regulatory Commission ("NRC") license and still remain well within NRC calculated safe operational levels (safety analyses results).

Therefore, many nuclear plants have requested power increases above the original NRC approved thermal power level (Attachment A). Under NRC terminology, a power uprate of more than 7% over the Original Licensed Thermal Power ("OLTP") that requires significant balance of plant upgrades is called an "Extended Power Uprate." This project will increase the thermal power by 10%, thus classifying this project as an extended power uprate. (This filing refers to the project as "power uprate" for simplicity). The NRC's webpage address for power uprate approval status is http://www.nrc.gov/reactors/operating/licensing/power-uprates/approved-applications.html

As of April 2008, the NRC has approved extended power uprates for five pressurized-water reactors. Of those five, the Ginna Nuclear Power Plant located in upstate New York is most similar to Prairie Island.
As nuclear plants across the country go through the power uprate process, valuable information is gathered and disseminated to other

plant owners and operators. The information is available through the NRC, industry users groups, Institute of Nuclear Power Operations[1] (INPO) Operating Experience Reports, and other venues.

Awareness of historical and developing uprate industry issues is well established among the Xcel Energy staff. Xcel Energy staff has extensive experience with power uprate projects, having accomplished uprates at Monticello, and the Kewaunee and Point Beach plants as Nuclear Management Company employees. As power uprate issues at other plants become known, the Prairie Island Operating Experience Program identifies the issues, and the impacts are analyzed in light of the plant specific applicability to Prairie Island.

The plant's power uprate project plans include programmatic controls for implementing the power uprate. These controls are largely based upon lessons learned from power uprates at other plants. Examples of these controls are:

- Benchmarking trips to other plants that have implemented power uprates,
- Attendance at NRC reviews of pending power uprate applications,
- Participation in the Pressurized Water Reactor Owners Group,
- Requiring previous power uprate experience from key project contractors,
- Formal requirements for power uprate task owners to address Lessons Learned from previous power uprates as part of their work plans, and
- Independent project audits from industry experts with previous power uprate experience.

[1] The Institute of Nuclear Power Operations (INPO) is an organization established by the U.S. nuclear power industry in response to recommendations by the Kemeny Commission Report, following the investigation of Three Mile Island. INPO sets performance objectives, criteria, and guidelines industry-wide for nuclear power plant operations, and is intended to promote operational excellence and improve the sharing of operational experience between nuclear power plants.

The equipment effects and lessons learned from industry power uprate experiences are being carefully reviewed and documented at each stage of the power uprate project at Prairie Island, including the feasibility study, the evaluation phase, and the design and modification phase.

The detailed study phase of the Prairie Island power uprate project included the evaluation of 24 potential issues that must be addressed and dispositioned in order to successfully implement a power uprate at Prairie Island. Position papers for these issues address both analytical updates to the plant and equipment evaluations. Specific issues include the use of improved fuel assemblies, modification of secondary side equipment such as the main generator and turbine for increased power output, and enhanced safety system performance requirements. Industry experience specific to pressurized water reactors was researched and included in these evaluations.

In accordance with NRC guidance and good industry practice, generic issues such as vibration monitoring and erosion-corrosion control will be incorporated into and implemented through existing NRC-mandated plant programs. Specific equipment issues that require evaluation due to the proposed power uprate will be addressed as an integral part of the ongoing detailed engineering phase of the project.

Notwithstanding the processes described above, the safety consequences of all power uprate operating conditions are subject to the review and approval of the Nuclear Regulatory Commission. This includes an evaluation of Prairie Island's treatment of equipment operating conditions identified by previous extended power uprates implemented at other reactors.

## 1.6 Prairie Island Power Uprate

Power uprates in a pressurized water reactor ("PWR"), generally speaking, do not require significant modifications to the reactor, nuclear steam supply system, or emergency core cooling systems. Instead, the 164 MW total capacity uprate at Prairie Island will be achieved by:

1) Increasing the heat produced in the reactor and steam produced in

the steam generators and;

2) Improving the balance-of-plant equipment that converts the steam into electricity.

Higher steam flow from the reactors is obtained by operating the reactors at a higher thermal power level. Increasing the thermal output of the reactors will require more uranium in the reactor core to maintain the same fuel cycle length, e.g. eighteen to twenty months. This will be accomplished by using a fuel assembly that has slightly larger diameter fuel pellets. These larger fuel rods will also have more surface area for heat transfer offsetting some of the higher operating temperatures. To transfer the additional heat energy out of the fuel, the fuel assemblies themselves will operate at slightly higher temperatures.[2]

In addition to the increased heat output, the power uprate will require steam turbine replacements and a variety of other balance-of-plant improvements to take advantage of the increased steam production.

The major modifications to be completed during the two outages are:

A. Upgrade high-pressure turbines

B. Replace or rewind main generators

C. Replace generator step-up transformers

D. Replace moisture separator reheaters

E. Upgrade isophase bus duct cooling

Although few modifications are required for the reactor and its support systems, the reactor and support systems have been reanalyzed to demonstrate that their functions are unaffected by operation at power uprate conditions, with adequate margin remaining.

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[2] The new fuel design will be approved by the NRC prior to use, but is not required to achieve the MW increase of the power uprate. Additional MWs could be achieved with the existing fuel. The new fuel will allow us to keep a similar cycle length.

The requested increased thermal output, in combination with the extensive balance-of-plant improvements, will improve overall plant efficiency. Nominal heat rates would be reduced from about 10,476 btu/kWh currently to 9,936 btu/kWh. As a result, Prairie Island's thermal output will increase by about 10 percent, with an overall increase in generation capacity of 82 MW, for each unit, or a total capacity increase of 164 MW.

## 1.7 Environmental Impacts

We do not expect the power uprate to present any major environmental issues or impacts. It will not require new structures or buildings and so will not change the "footprint" of the existing site; nor will it substantively change the types of effluent from the plant. Post power uprate operation of the plant will be within all existing environmental (air, water, etc.) permit limits. In general, the percent effect on a medium will be proportional to the percent change in thermal output (10 percent). The primary environmental impacts associated with the power uprate are:

- Water consumption at Prairie Island will increase by no more than 10 percent due to the increased use of cooling towers; however, the resulting consumption level will remain below 1 percent of the lowest annual mean river flow.

- The temperature of cooling water discharges to the Mississippi River will increase slightly, (less than 3°F depending on season) but will remain within existing thermal discharge limits established in the Minnesota Pollution Control Agency ("MPCA") National Pollution Discharge Elimination System ("NPDES") permit. The temperature of the cooling water discharge will be maintained through increased use of cooling towers and adjustment of plant output.

- The amount of low-level radioactive process waste (e.g. filter sludge, spent resins) will increase by approximately 10 percent. The number of spent fuel assemblies

produced will not change.

- The power uprate project will cause a slight increase to the maximum projected annual effluent rates, off-site dose, and cumulative radiation dose. However, on-site and off-site radiological doses will remain well below federal regulatory limits.

## 1.8 Summary

- Prairie Island plays an important role in our energy supply and the energy reliability of the region. Our system continues to grow and the additional generation from the project is necessary to meet that growth. Power uprates, such as the one proposed, are common in the nuclear industry. Many nuclear plants have already implemented power uprates to gain more output from their existing plants. Our proposed project provides multiple and significant benefits to our customers and the region. As discussed in greater detail in our Certificate of Need filing(s) for this project (Docket No. E002/CN-08-509), the project will provide low-cost, carbon-free energy for many years. The project will expand generation capacity at an exiting site instead of developing a new greenfield site. The project will result in some impacts to the environment, but the impacts are minimal and will be well within existing permit limits – no operating permits will require any changes as a result of the Project.

- We believe the information in this Application will demonstrate that our proposed project meets the "… state's goals to conserve resources, minimize environmental impacts, minimize human settlement and other land use conflicts, and ensure the state's electric energy security through efficient, cost-effective power supply and electric transmission infrastructure." (See Minn. Stat. § 216E.03, subd. 7.) We therefore respectfully request that the Commission find that the proposed power uprate will ensure continuing system reliability and integrity, while environmentally and cost-effectively meeting and fulfilling our customers' energy needs in an orderly and timely fashion by granting a site permit for the project.

# 2 Applicant Information and Regulatory Requirements

## 2.1 Overview

The Prairie Island Nuclear Generating Plant is owned by Northern States Power Company, a Minnesota corporation (NSP-Minnesota), and is currently operated by Nuclear Management Company, LLC ("NMC").[3] NSP-Minnesota holds the current Site Permit for Prairie Island and is the applicant or permittee responsible for this Site Permit request.

Xcel Energy is Minnesota's largest electric utility based on generating capacity. We own and operate a number of generation facilities including coal, oil, natural gas, hydro, and refuse-derived fuel, as well as the Prairie Island and Monticello nuclear power plants. The company serves 1.5 million electric customers in our upper Midwest service territory (shown in Figure 2-1), which includes parts of Minnesota, Wisconsin, North Dakota, South Dakota, and Michigan.

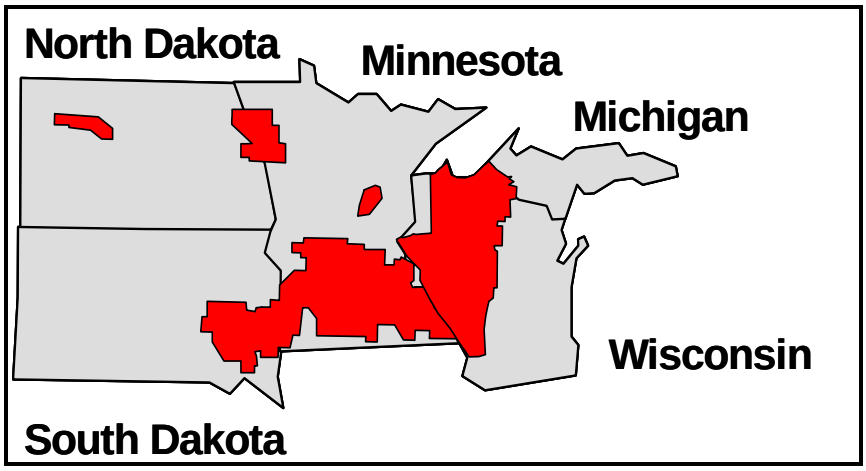


**Figure 2-1 Xcel Energy Service Territory Map**

[3] Due to the departure of the other NMC owners, we are currently in the process of reintegrating NMC into Xcel Energy. On April 14, 2008, we filed a Status Report with the PUC on our reintegration efforts. On April 16, 2008, we filed an application with the NRC to transfer the operating license from NMC back to NSP-Minnesota.

The contact person at Xcel Energy regarding this Project is:

Brian R. Zelenak
Manager, Regulatory Administration
414 Nicollet Mall, 7th Floor
Minneapolis, MN 55401
Phone 612-330-5641

## 2.2 Project Schedule

To make the plant modifications with minimal disruption to regional energy supply, the power uprate is primarily scheduled to occur during two routine refueling outages, in 2012 (Unit 1) and 2015 (Unit 2). Although few modifications are required for the reactor and its support systems, the power uprate will require a variety of balance-of-plant improvements to take advantage of the increased steam production.

## 2.3 Required Project Permits and Approvals

The proposed Prairie Island power uprate project requires the Minnesota Site Permit, as well as the following:

- A state Certificate of Need ("CON") from the Minnesota Public Utilities Commission, and;
- An amendment to the operating licenses from the NRC.

In conjunction with Prairie Island's contractor, Westinghouse, we are evaluating the safety-related effects of the proposed power uprate. Based on power uprates performed at other nuclear facilities, we anticipate this evaluation to conclude that sufficient safety and design margins exist and that the rated core thermal power at Prairie Island Unit 1 and Unit 2 can each be increased from 1650 to 1805 megawatts thermal (MWt) without any adverse impact on the health and safety of the public and without any significant impact on the environment. We intend to apply to the NRC for an amendment to the Prairie Island Operating License for the proposed power uprate in 2010.

None of Prairie Island's existing state operating permits will require amendments due to the power uprate project.

### 2.3.1 Minnesota Site Permit

Minn. Stat. § 216E.03 establishes the standards and criteria used by the Commission when issuing a site permit. As detailed in this application, the Commission is required to consider whether the project will support the state's environmental goals and secure its energy supply in making determinations about issuing site permits for large electric generating plant projects. (See also Minn. R. 7849.5900.)

### 2.3.2 Minnesota Certificate of Need

Under Minn. Stat. §216B.243, no large energy facility can be sited or constructed in Minnesota without the issuance of a Certificate of Need by the PUC. Under Minn. Stat. §216B.2421, subdivision 2, a "Large energy facility" is: "(1) any electric power generating plant or combination of plants at a single site with a combined capacity of 50,000 kilowatts or more and transmission lines directly associated with…." the plant that are necessary to interconnect the plant to the transmission system. The CON regulations are found in Minn. R. 7829 and 7849, parts 7849.0010 to 7849.0400. Therefore, in addition to the State Site Permit, we must apply for and receive a CON from the PUC. We applied for a CON on May 16, 2008. The PUC has assigned Docket No: E002/CN-08-509 to the Prairie Island Extended Power Uprate CON and Docket No: E002/CN-08-510 to Prairie Island's Additional Dry Cask Storage CON.

### 2.3.3 NRC - Operating License Amendment

The United States NRC is responsible for overseeing the safe operation of nuclear generation facilities. The NRC regulates the radiological, engineering, health, and safety standards applicable to operating Prairie Island. The thermal power of the EPU will be greater than that originally permitted, thus the need to amend our license. Therefore, we must apply for and receive an amendment to Prairie Island's operating license prior to operating the facility up to the proposed uprate power level. The regulatory approval process to amend a nuclear facility's operating license and technical specifications is governed by Title 10 of the Code of Federal Regulations, Part 50.

Prairie Island Unit 1 began commercial operation in December 1973; Unit 2 began operation in December 1974. The initial United States NRC license for each unit was for 40 years. The original licenses are

currently scheduled to expire in 2013 and 2014 for Unit 1 and Unit 2, respectively. We applied to the NRC to renew the operating licenses for both units for an additional 20 years in April 2008. We plan to apply for NRC approval for the Prairie Island power uprate in 2010.

### 2.3.4 Other Approvals Required

In addition to the state and federal permits mentioned above, the project will require interconnection approval and an updated transmission service agreement with the Midwest Independent System Operator ("MISO"). However, pending completion by MISO of the formal power flow and stability studies, the full scope of modifications to the transmission grid required to accommodate the power uprate are not known with certainty. Preliminary studies have indicated that the steady state power flow is supported satisfactorily by the existing system, even taking into account additional generation in the MISO queue.

## 2.4 Site Permit Process

A Site Permit is required for the Project under the Minnesota Power Plant Siting Act, Minn. Stat. § 216E, and Minn. R. 7849, parts 7849.5010 through 7849.7010. Specifically, under Minn. R. 7849.5040, subpart 3(C) "…no person shall increase the generating capacity or output of an existing large electric power generation plant [LEPGP] without a site permit from the PUC.

The proposed power uprate project at Prairie Island is an expansion of a large electric power generating plant by more than 80 MW, requiring the project to follow the full site permitting process.

# 3 Engineering and Operational Design

## 3.1 Overview

The Prairie Island Nuclear Generating Plant uses nuclear fuel in two two-loop pressurized-water reactors to produce on average a nominal value of 575 megawatts of electrical power in each unit. Unit 1 began commercial operation in December 1973, and Unit 2 began operations in December 1974. The initial NRC license for each unit was for a period of 40 years. The original NRC licenses are currently scheduled to expire in 2013 and 2014 for Unit 1 and Unit 2, respectively. We applied to the NRC to renew the operating licenses for both units for an additional 20 years in April 2008.

## 3.2 Plant Operation

In a pressurized-water reactor, a nuclear reaction in the reactor core generates heat, which heats water in the primary loop. This heat is transferred to the secondary loop in the steam generators, and the steam produced inside the steam generators is directed to turbine generators to produce electrical power (Figure 3-1). The exhaust steam is cooled by a tertiary loop in a condenser and returned to the steam generators to be boiled again. The water in all three loops is force-circulated by electrically powered pumps. Emergency cooling water is supplied by other pumps, which can be powered by onsite diesel generators.

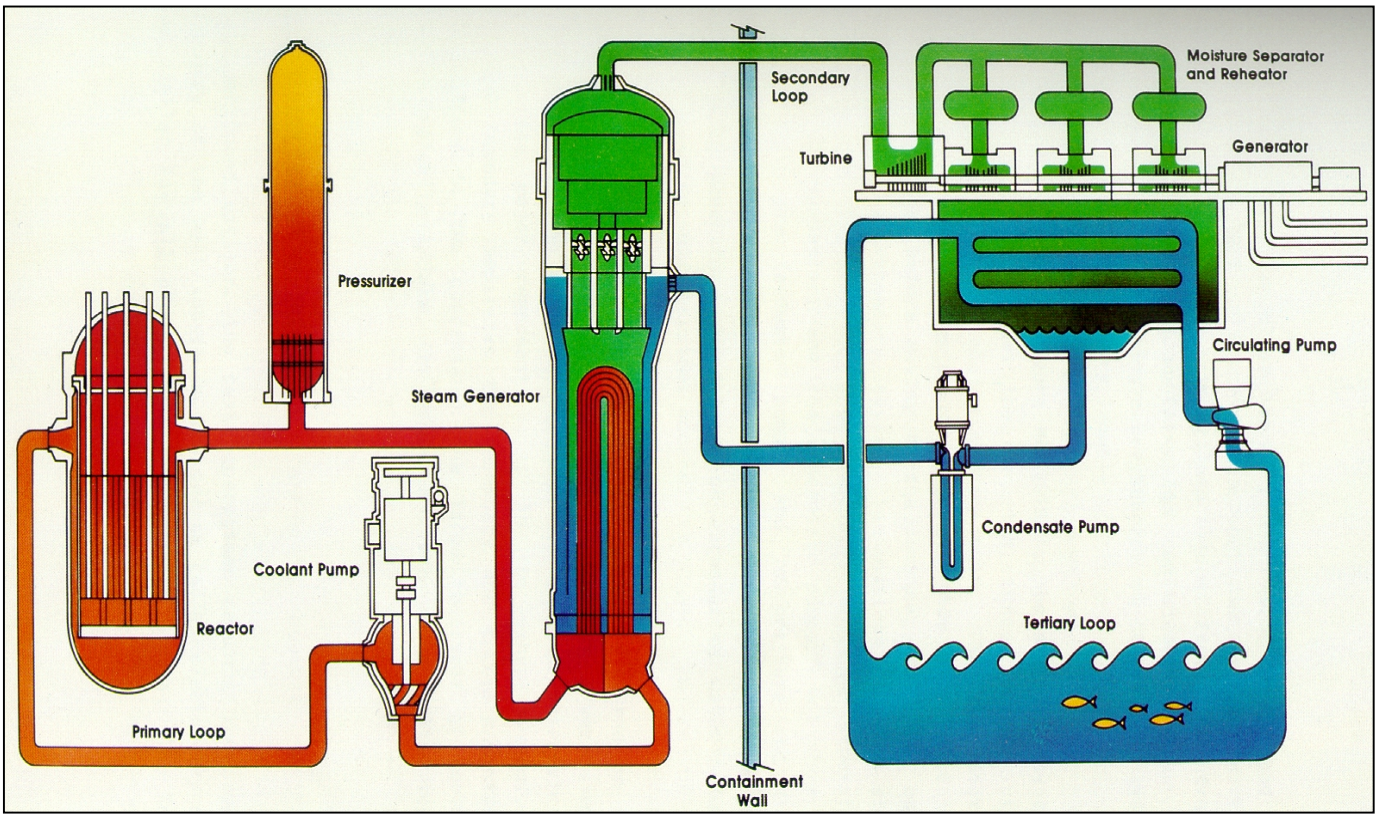


**Figure 3-1 Pressurized Water Reactor System**

## 3.3 Plant Performance

Over the past five years (2003 through 2007), Prairie Island has maintained an average capacity factor of 90.2 percent. In 2007, Prairie Island generated almost 9 million megawatt-hours of electricity, eclipsing its prior record set in 2003. For 2007, the capacity factor for the entire year was 93.85 percent.

## 3.4 Description of Fuel and Operating Cycle

Prairie Island is licensed for low-enriched uranium-dioxide fuel with enrichments to a nominal 5.0 percent by weight Uranium-235 and an average fuel burn-up for the peak rod of 45,000-megawatt days per metric ton of uranium (MWd/MTU). The reactor core of each unit is comprised of 121 fuel assemblies. A fuel assembly consists of 179 fuel rods in a 14x14 square array secured by means of stainless steel upper and lower tie plates. Each fuel rod within the assembly consists of high-density ceramic uranium-dioxide fuel pellets, each about the size of a thimble, stacked in a tube made of a special alloy of steel called Zircaloy. The air in the filled tube is evacuated, helium (an inert gas) is backfilled, and welding Zircaloy plugs in each end seals the fuel rod.

The nuclear fuel used at Prairie Island has, to date, been fabricated by the Westinghouse and Exxon companies and transported to the plant by truck. Westinghouse was the original plant designer; it has supplied the plant with most of its fuel and is anticipated to be the future fuel supplier.

Approximately every 18 to 20 months, a unit is shut down to refuel the reactor. Between refueling outages the unit typically operates at full output around the clock. During each refueling operation under current power levels, a little more than one third of the 121 total fuel assemblies (typically 48) in the reactor are replaced with new ones. These spent nuclear fuel assemblies are then removed from the reactor and stored in the plant in the spent fuel pool.

Currently, the Prairie Island ISFSI is licensed by the NRC for 48 TN-40 storage casks to store spent fuel on site. The Company has received state authorization for sufficient spent-fuel-storage capacity to operate through the end of the plant's current licenses, (29 casks). We applied for a Certificate of Need for Additional Dry Cask Storage

at Prairie Island on May 16, 2008 (PUC Docket No. E002/CN-08-510).

## 3.5 Power Uprate Plant Modifications

The power uprate at the Prairie Island plant will be achieved by: 1) increasing the amount of steam produced in the reactor; and 2) improving the balance-of-plant equipment that converts the steam into electricity. The goal of the current power uprate project is to increase the thermal power to about 110% percent of the OLTP.

Higher steam flow from the reactors is obtained by operating the reactors at a higher thermal power level. The increased thermal output is done without increasing the operating reactor pressure. Instead, the thermal output levels at each of the two units will be increased from the current NRC-licensed 1650 MWt to 1805 MWt by using a fuel assembly that has slightly larger diameter fuel pellets. These larger fuel rods will have more surface area for heat transfer. To transfer the additional heat energy out of the fuel, the fuel assemblies themselves will operate at slightly higher temperatures, but will allow us to maintain the fuel cycle length of eighteen to twenty months.

In addition to the increased heat output, the power uprate will require steam turbine replacements and a variety of other balance-of-plant improvements to take advantage of the increased steam production.

The increased thermal output and the planned balance of plant upgrades will improve overall plant thermal cycle efficiency under the new steam conditions and maximize megawatt output. Nominal heat rates will be reduced from about 10,476 btu/kWh currently to about 9,936 btu/kWh. As a result, Prairie Island's thermal output will increase by about 10 percent, for an overall increase in generation capacity of 82 MW for each unit, or a total capacity increase of 164 MW.

## 3.6 Balance-of-Plant Improvements

The balance-of-plant systems that convert the steam produced in the steam generators to electricity will need significant modifications. These will be completed on Unit 1 during the 2012 refueling outage

and on Unit 2 during the 2015 refueling outage.

In the secondary loop and electrical generation systems, several major equipment changes will be required to accommodate the additional steam and feedwater flows and to handle the extra megawatt output.

The major modifications and a short description of the work to be completed during the refueling outages are listed below. Additional smaller scope modifications will be identified during the detailed engineering phase of the project.

### 3.6.1 High-Pressure Turbines

The high-pressure turbine for each unit will be replaced with an improved turbine. The existing high-pressure turbines are double-flow, partial-arc admission, reaction-bladed design that have been in service since plant commissioning and are worn in several areas, contributing to reduced efficiency and reliability. One design under consideration is a full-arc admission, single-flow, impulse-bladed, balancing gland design. A single-flow turbine has only two exhausts versus four in the existing double-flow turbine, so a portion of the exhaust piping below the turbine will be replaced to work with the new configuration. The change would also require additional work to governor values and valve throats to minimize the pressure drop imposed on the steam.

### 3.6.2 Main Generator Rewinds

The existing main generators are incapable of handling the increased megawatt output due their insulation rating and cooling capability. At this time, both generator rewinds and retrofits are under consideration. A retrofit could include replacement of all of the stator conductors with water-cooled windings. A rewind of both the rotor and stator would be necessary to eliminate concerns over aging and to increase the nameplate rating from 659 MVA to over 700 MVA to support the power uprate.

### 3.6.3 Generator Step-up Transformers

The generator step-up transformers are reaching the end of their useful lives, and are underrated for the power uprate conditions. When they are replaced, we will add the necessary capacity to support

the power uprate.

### 3.6.4 Moisture Separator Reheaters

The moisture separator reheaters ("MSRs") at Prairie Island function to improve the steam quality of the high-pressure ("HP") turbine exhaust and superheat the steam before it enters the low-pressure ("LP") turbines. Replacing the MSRs with larger units with more flow area and heat-transfer surface could reduce the pressure drop substantially. This results in higher pressures to the inlet of the LP turbines and a corresponding increase in electrical generation.

### 3.6.5 Upgrade Isophase Bus Duct Cooling

The isophase bus conducts the electrical output of the main generator to the main transformer. Heat loads in the isophase bus duct will increase with the higher power levels that result from power uprate resulting in a need to increase the cooling capability of the isophase bus duct.

## 3.7 Impact on Spent Fuel Production

As described in Section 3.5 above, we are increasing the thermal output at Prairie Island by using larger-diameter fuel rods. Therefore, the number of fuel assemblies replaced each refueling outage is not expected to change under power uprate conditions.

## 3.8 Impact on Plant Operations

Operation of the facility generally will not change. The primary operational impact due to the power uprate will be increased operation of the cooling towers to supplement the Mississippi River cooling capacity more frequently over the course of a year. Currently, the cooling towers are typically used during low river flow and at times of the year when there are high ambient temperatures, normally during the summer. The cooling needs of the circulating water system will increase roughly in proportion to the increased thermal output due to the power uprate and thus require the use of the supplemental cooling system more frequently. If extreme conditions warrant, the facility will reduce power to remain within the constraints of existing permits. The efficiency of the plant will also improve as a result of the power uprate. The estimated nominal heat rate for Prairie Island plant following completion of the power uprate modifications will be 9.936 Mbtu/MWh as compared to 10,476 Mbtu/MWh.

## 3.9 Ancillary Infrastructure Upgrades

The power uprate will not require us to construct or modify any building footprint, access roads, parking areas, or lay down areas. Also, we do not anticipate that power uprate will result in the need to construct additional or new low-level radioactive waste storage buildings. The uprate does not affect the storage requirements for above-ground or below-ground tanks. Property outside the inner security fence will not be modified or changed.

## 3.10 Transmission Upgrades

Formal MISO studies of the power flow and stability are pending, so we do not yet know the full scope of modifications required to the transmission grid. However, preliminary studies have indicated that the steady state power flow is supported satisfactorily by the existing system, even taking into account additional generation in the MISO queue.

## 3.11 Cost Analysis

The estimated installed cost of the 164 MW of additional capacity at Prairie Island achieved by power uprate is approximately $322 million or $2,011/kW. This does not include costs for potential, as-yet-

unidentified transmission upgrades or for processing the site permit or Certificate of Need associated with this project. The cost also reflects only elective, uprate-specific costs, and not those for life-cycle-management efforts necessary to operate to the end of plant life.

The first full year after implementation (2016) of both power uprates will result in a fuel cost of 0.006833 dollars per kWh. The variable operating and maintenance costs in 2016 are 0.000416 dollars per kWh. The total costs in 2016 of a kWh hour from this capacity will be 0.038081 dollars per kWh. The estimated effect on rates system-wide and in Minnesota, assuming a test year beginning with the proposed in-service date will be .00103 dollars per kWh.

## 3.12 Future Expansion

Minn. R. 7849.5220, subpart 1(I) requires an applicant to describe the extent to which a proposed generating plant site can accommodate future expansion. The power uprate project does not "expand" the footprint of the existing site. We currently do not have any plans other than the proposed uprate project, for expanding generation capacity at the Prairie Island site.

# 4 Potential Environmental Impacts

## 4.1 Overview

Since the Prairie Island extended power uprate project is a change to an existing plant, the plant and the physical plant location have already undergone multiple environmental reviews. These include:

Environmental Impact Statement for original plant CON due

Federal Environmental Report for initial NRC plant licensing

Environmental Impact Statement for ISFSI CON

Federal Environmental Impact Statement for ISFSI licensing

Many of these existing documents were used as reference documents. As part of the License Renewal process, both an Environmental Report and a Supplemental Environmental Impact Statement will be prepared by the NRC and will be available in the Spring of 2009.

Due the vast amount of environmental information available on the existing site, the preparation of this site permit application focuses on the incremental impact the proposed extended power uprate will have on the site and its surrounding environment.

Section 4 is divided into the following nine subsections:

| | |
|---|---|
| Section 4.2 | Land Use, Physical, and Ecological Setting |
| Section 4.3 | Radiology and Health |
| Section 4.4 | Groundwater and Surface Water Resources |
| Section 4.5 | Water Quality and Temperature |
| Section 4.6 | Rare and Unique Natural Resources |
| Section 4.7 | Historic and Archaeological Resources |
| Section 4.8 | Human Settlement (Demography and Socioeconomics, Recreation, Land Based Economics, Air Quality, Noise, Aesthetics, Traffic, Other Impacts) |
| Section 4.9 | Mitigation Measures |
| Section 4.10 | Potential Environmental Impact Summary |

## 4.2 Land Use, Physical and Ecological Setting

Prairie Island Nuclear Generating Plant is on an approximately 560-acres site in Goodhue County, on the west bank of the Mississippi River, within the city limits of Red Wing, Minnesota (See Figure 1-1, above). The City of Hastings is approximately 13 miles northwest (upstream) of the plant. Minneapolis is approximately 39 miles northwest and St. Paul is approximately 32 miles northwest of the plant. Goodhue County and the adjacent counties of Dakota and Pierce (in Wisconsin) remain predominantly rural but are rapidly developing. Principal crops include soybeans, corn, oats, hay, and some cannery crops. Several federally-owned recreation areas and wildlife refuges are within 50 miles.

Figure 4-1 is a map of the area within six miles of the site. At the plant site, the Mississippi River serves as the boundary between Minnesota and Wisconsin. Prairie Island is on the western shore of Sturgeon Lake, a backwater area one mile upstream from the U.S. Army Corps of Engineers (USACE) Lock and Dam No. 3. The Vermillion River lies just west and flows into the Mississippi River approximately two miles downstream of Lock and Dam No. 3. The Cannon River is to the south. Gore's Pool #3 is located three miles north of the Plant. Gore's Pool #3 is a 6,449-acre site consisting of flood plain marshes, forest, and backwater marshes associated with the Mississippi and Vermillion Rivers.

Directly north of Xcel Energy property lies the Prairie Island Indian Reservation, a federally recognized Indian Tribe organized under the Indian Reorganization Act. The Prairie Island Indian Community owns and operates the Treasure Island Resort and Casino, a 250-room hotel and convention center. The nearest dairy farm is more than two miles southwest of the site. There are 20 to 30 residences or summer cottages within a one-mile radius of the plant; the closest occupied offsite residence is approximately 3,000 feet north-northwest from the plant. Figures 4-2 and 4-4 show oblique aerial views of the site and the nearby area.

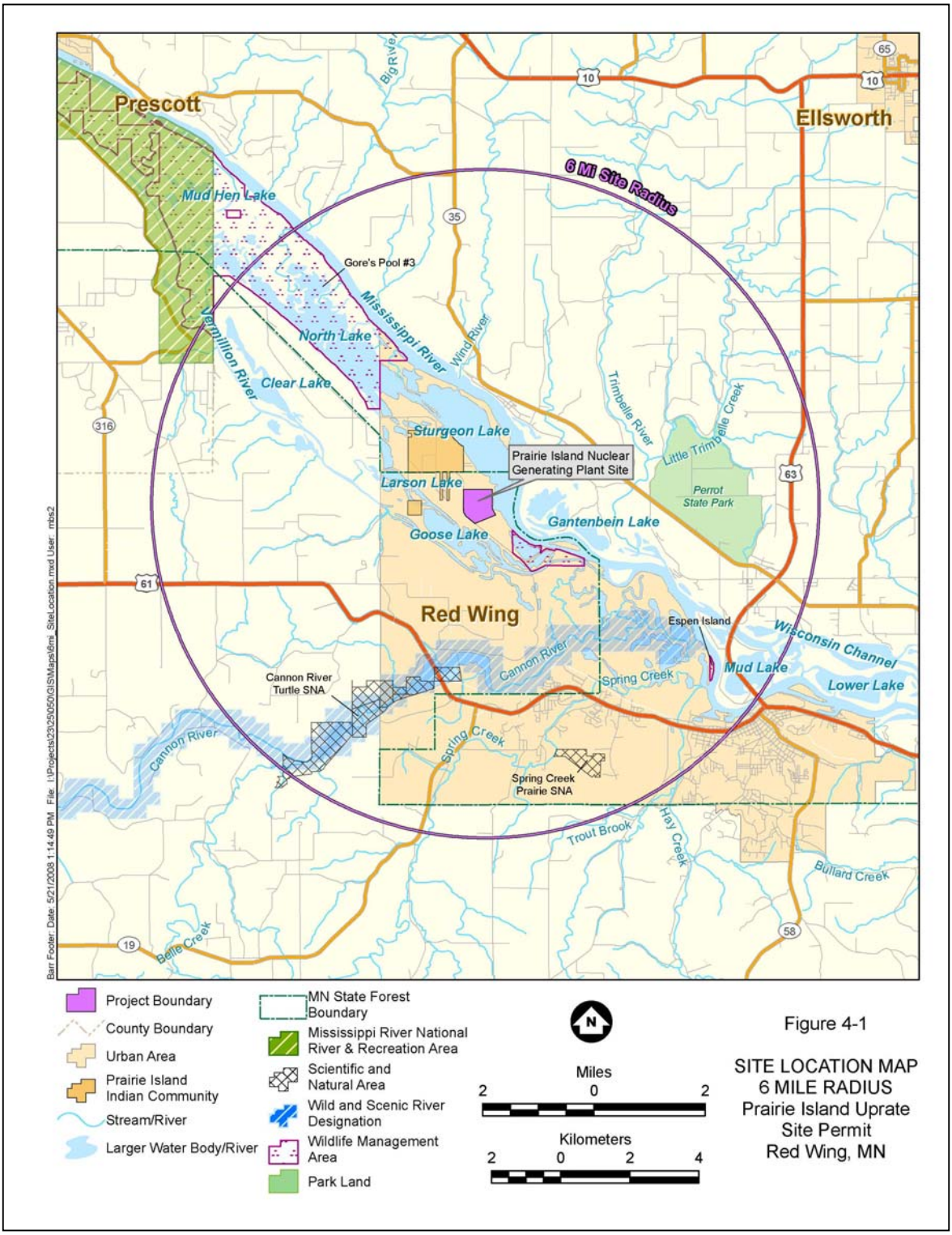


**Figure 4-1 Site Location Map 6-Mile Radius**

**Figure 4-2 Oblique aerial photograph of Prairie Island Nuclear Generating Plant, view looking toward east. Cooling towers are in the upper center; reactor building is to the left of the cooling towers.**

Figure 4-3 shows the general site layout and surrounding topography. The plant is on the southeastern portion of Prairie Island, an outwash terrace above the Mississippi River about 690 feet above mean sea level (msl) and about 15 feet above the normal pool elevation of the river. The general area is nearly level, with a local relief ranging from about 675 feet above msl (along the river frontage) to about 700 feet above msl.

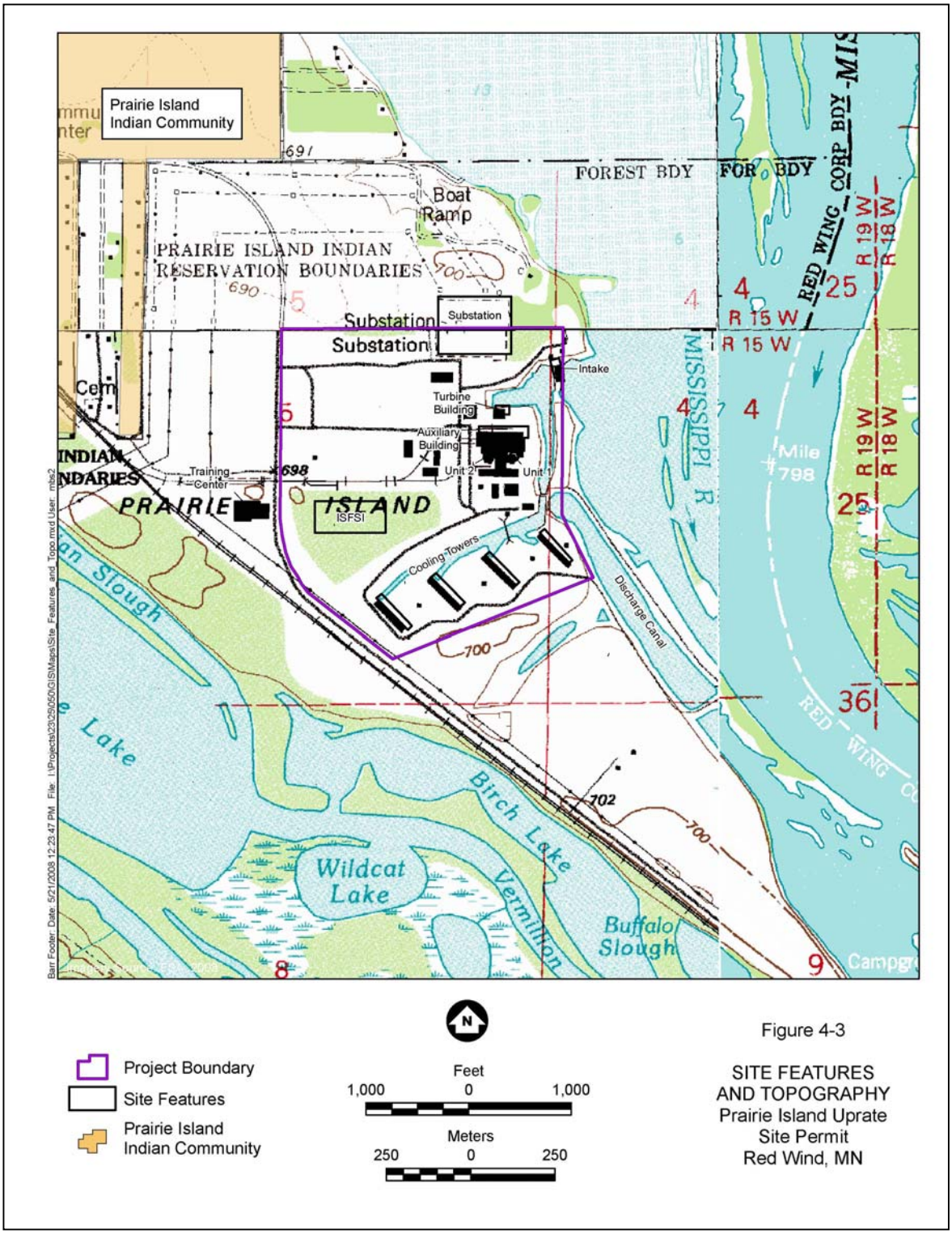


**Figure 4-3 Site Features and Topography**

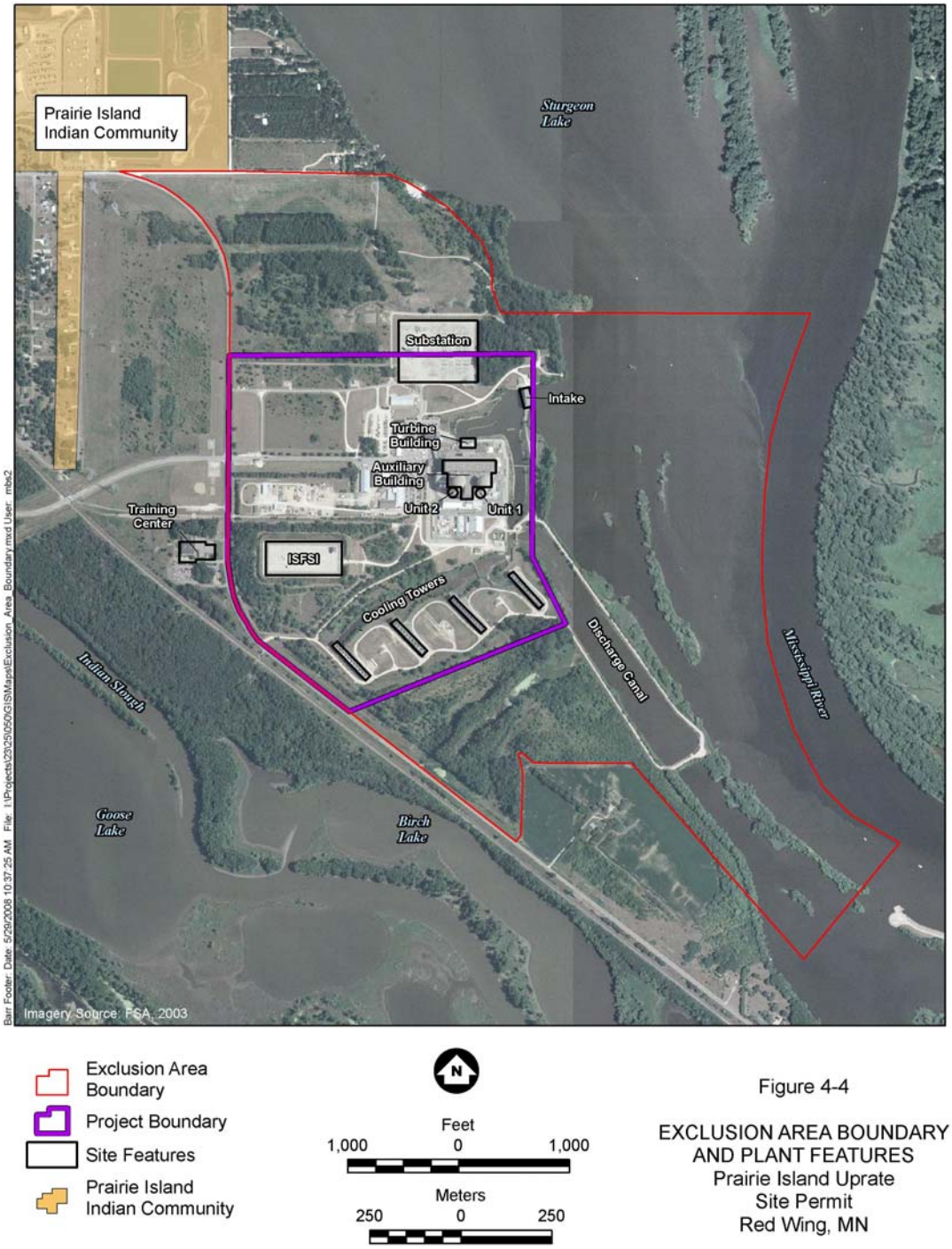


**Figure 4-4 Exclusion Area Boundary and Plant Features**

### 4.2.1 Soils, Geology, and Hydrogeology

The plant site occupies a glacial outwash terrace formed on the west bank of the Mississippi River. The bedrock beneath the outwash is composed of sedimentary rock of the St. Lawrence and Franconia formations, both within the Upper Cambrian system. An aerial view of the plant and surrounding area are shown in Figure 4-4.

The prevalent soil types in the northern and southern parts of the site are Sparta loamy sand, 0 to 3 percent slopes. The prevalent soil type in the central area is Plainfield loamy sand. These soils are permeable, have limited available water capacity, have the potential for groundwater contamination, and are susceptible to wind erosion.

Generally, the movement of groundwater is toward the Mississippi River and its main tributaries. The groundwater slopes from the higher, glaciated areas toward these surface streams, generally at low gradients. Groundwater enters the river valley from along the base of the bordering bluffs in the form of springs or as subsurface flow. Beneath the flood plains and low terraces that border the Mississippi River, groundwater levels closely coincide with the elevations of the river surface and vary with river fluctuations. The average groundwater gradient in these bottom lands is essentially parallel to the stream gradient. The Prairie Island Indian Community draws its groundwater for domestic uses through these wells from the Mt. Simon-Hinckley aquifer, a confined sedimentary bedrock aquifer.

### 4.2.2 Aquatic Communities

Mississippi River aquatic communities upstream of Lock and Dam No. 3 have been monitored since 1970 to determine if Prairie Island operation was having an effect on distribution, abundance, and overall health of aquatic biota. Since the mid-1970s, fish have been the focus of monitoring and study. Although big river ecosystems show a high degree of natural variability and aquatic populations in these rivers can experience dramatic changes between years, fish populations in the area of Prairie Island show a high degree of stability. Fish populations in the vicinity of Prairie Island today look remarkably like fish populations in the 1970s. A relatively small number of native species (carp, planted in the Mississippi River in the 19th century, are the

exception) has dominated collections for 35 years. All indications are that these populations are healthy, composed of fish in good condition, and are reproducing successfully year after year. However, the Minnesota Pollution Control Agency listed the portion of the Mississippi River between the St. Croix and the Chippewa Rivers in Wisconsin as impaired waters for 2006 for aquatic consumption, due to the presence of mercury and polynuclear chlorinated biphenyls (PCBs), and for aquatic life due to turbidity (MPCA 2006a).

### 4.2.3 Riparian Habitats

There are no wetlands on the Prairie Island site that are designated as protected under Minnesota Statute 103G.005, subd. 15. There are limited riparian wetlands along the Mississippi River in the vicinity, but they occur on river islands and generally in small isolated tracts, along or near the river channel in the floodplain near the plant. The uprate will not affect the hydrology or populations in this habitat.

### 4.2.4 Terrestrial Habitats and Populations

Approximately 240 acres of the Prairie Island site were disturbed and modified by plant construction activities in the early 1970s. Approximately 60 acres of the 240 disturbed acres support the generating facility and associated buildings, maintenance facilities, parking lots, and roads (AEC 1973). After plant construction was completed, the remaining 180 acres of disturbed land were landscaped (AEC 1973) and today most of this is mowed grass or unmowed prairie-like grassland. The remainder of the site (approximately 338 acres) consists primarily of scattered wooded areas.

Wildlife species in the forested and the open grassy portions of the Prairie Island site are those typically found in similar habitats of southeastern Minnesota. Upland areas tend to be dominated by burr oak (Quercus macrocarpa), red oak (Q. rubra), bitternut hickory (Carya cordiformis), and Eastern red cedar (Juniperus virginiana). Common trees in lower areas along the Mississippi River, Sturgeon Lake, the Vermillion River, and river sloughs include silver maple (Acer saccharinum), cottonwood, green ash (Fraxinus pennsylvanica), American elm (Ulmus americana), box elder (Acer negundo), river birch (Betula nigra), and willows (Salix spp.) The topography of the

site is level to slightly rolling, and elevations range from about 690 to 700 feet above mean sea level (msl).

## 4.3 Radiology and Health

Offsite doses due to operation of a nuclear power plant result from three primary release paths: liquid effluent releases to the river, gaseous effluent releases to the air, and direct radiation.

The Prairie Island Nuclear Generating Plant releases small amounts of radionuclides during normal operation in the form of gaseous and liquid effluents. As discussed in Section 4.3.3 below the doses attributable to these releases are small and well below established guidelines. Doses attributable to plant operations from direct radiation have been low and not distinguishable from background radiation. Figure 4-5 is a map indicating the environmental monitoring stations maintained by the Minnesota Department of Health.

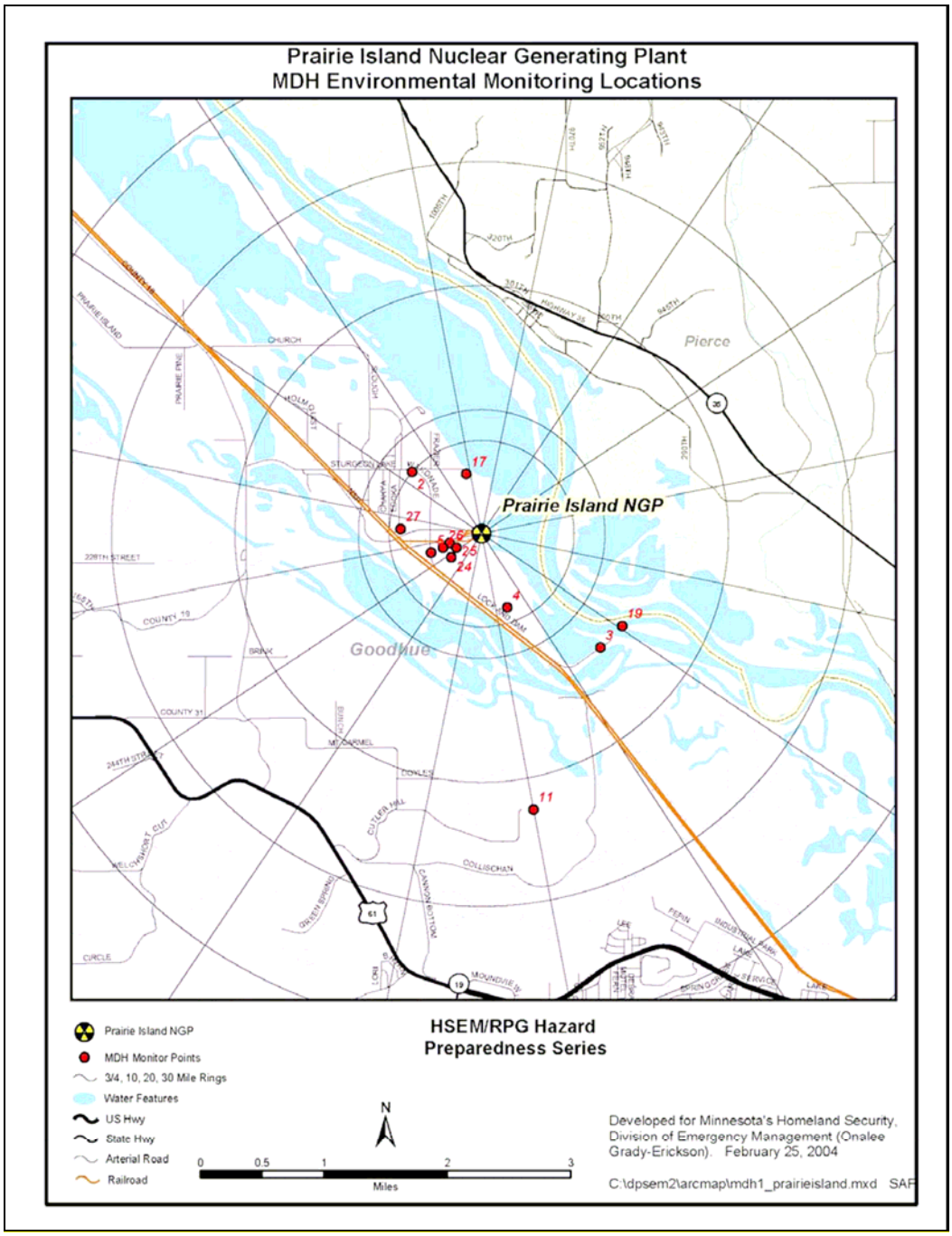


**Figure 4-5 Minnesota MDH Monitoring Environmental Monitoring Stations at Prairie Island**

### 4.3.1 Radioactive Liquid Waste and Effluents

The liquid-radioactive-waste systems at Prairie Island are designed to process the waste through filtration and ion exchange, measure and

evaluate all radionuclide concentrations and, based on results, reprocess it through the radioactive-waste system for further purification or discharge it to the environment as liquid-radioactive-waste effluent in accordance with state and federal regulations.

During normal operation, the liquid-effluent-treatment systems process and control the release of liquid radioactive effluents to the environment so that the radioactivity associated with the liquid effluent and doses to individuals offsite are maintained well below the limits of 10 CFR Part 20 and 10 CFR Part 50, Appendix I limits.

The power uprate will not significantly increase the inventory of liquid normally processed by the liquid-waste-management system because the system functions are not changing and the volume inputs remain the same.

Prairie Island expects that the discharge liquid effluent radioactivity level would increase no more than approximately 10 percent as a result of the power uprate. Even assuming a full 10 percent increase over the 5-year average release, Table 4-1indicates that the maximum liquid effluent radioactivity level will remain bounded by the quantities originally considered in the Final Environmental Statement ("FES") Final Environmental Statement ("FES"), issued by U. S. Atomic Energy Commission (predecessor agency to NRC) in May of 1973.

**Table 4-1: Annual Liquid Effluent Releases**

| | Activity<br>Curie (Ci) | Tritium<br>Curie (Ci) |
|---|---|---|
| Actual releases<br>Average over 5 years<br>2001-2005 | 0.0984 | 626 |
| 10 Percent Increase | 0.00984 | 62.6 |
| Total | 0.1082 | 688.6 |
| FES | 10 | 2000 |

### 4.3.2 Releases to Air

Because of the highly effective effluent-treatment systems at the Prairie Island plant, there are almost no releases of radioactive gaseous effluent to the air during normal operation. However, during refueling and maintenance operations, when the primary system is open to the building atmosphere, small quantities of noble gases, halogens, tritium, and particulate material are removed by the ventilation systems.

The gaseous-waste-management systems include the off-gas system and various building ventilation systems. This air is monitored for radioactivity before it is released. Whenever radioactivity is present, the ventilation air is passed through absolute filters to remove particulate material. The air effluent releases are a very small fraction of the applicable federal limits in 10 CFR Part 20. (See Table 4-2).

Implementation of the proposed power uprate does not significantly increase the total inventory of gas normally processed in the gaseous-waste-management system because the plant system functions are not changing and the volume inputs remain the same. We expect that annual gaseous-radioactive-effluent releases at Prairie Island would, at most, increase proportionally with the increase in power level due tot eh power uprate - approximately 10 percent. Even with a 10 percent increase, the radioactivity associated with the gaseous discharge would remain well below the estimates provided in Prairie Island's Updated Safety Analysis Report ("USAR") and FES. In addition, as described below in Section 4.3.3, the radioactive dose to individuals from normal gaseous-effluent releases at Prairie Island will remain within the applicable guidelines.

**Table 4-2 Prairie Island Annual Gaseous Releases**

| | Noble Gases Curie (Ci/year) | Particulate & Iodines Curie (Ci/year) |
|---|---|---|
| Actual releases Average over 5 years (2001 -2005) | 11.15 | 163.8 E-06 |
| Estimate with Uprate (10% increase maximum) | 12.3 | 179 E-06 |
| USAR | 3400 | 0.528 |
| FES | 7200 | 0.330 |

Given the increases presented in Table 4-2, it is reasonable to conclude that the effect of power uprate on gaseous radioactive effluents is negligible, and that continued compliance with the release limits of 10 CFR 20 and the design objectives of Appendix I to 10 CFR Part 50 is maintained with significant margin.

### 4.3.3 Impact on Offsite Doses from Gaseous and Liquid Effluents

While radiation releases are measured in Curies (Ci) (See Table 4.1 and 4.2, above), human radiation exposures (dose rates) are generally reported in units called Roentgen Equivalent Man (rem). One-thousandth of a rem is a millirem, or mrem.

As shown in Table 4-3 below, over a recent five-year period (2001 through 2005), the average "total body" and "organ" doses to offsite members of the general public near Prairie Island, as reported in the Annual Radiological Environmental Monitoring Program Report ("REMP"), are bounded by the FES and original plant Environmental Report estimates, as well as the limits of 10 CFR 50.

**Table 4-3 Radiological Effluent Doses**

| | Gaseous Effluent | | Liquid Effluent | |
|---|---|---|---|---|
| | **Total Body Mrem/year** | **Organ Mrem/year** | **Total Body Mrem/year** | **Organ mrem/year** |
| Average over recent five years 2001 to 2005 | 0.0026 | 0.073 | 0.0026 | 0.0043 |
| FES | 0.6 | 2.8 | 0.65 | 0.7 |
| NSP 1971 Environmental Report | 14.46 | 24.36 | 5.18 | 6.82 |
| 10CFR 50 appendix-I | 30 | 30 | 6.0 | 20 |

### 4.3.4 Impact on Offsite Doses From Direct Radiation

Direct radiation exposure results from gamma radiation produced as a result of plant operation. However, members of the public also receive radiation from naturally occurring sources of radiation. This is commonly referred to as background radiation. To measure the impact of direct radiation from plant operations to members of the public, thermoluminescent dosimeters ("TLD") are placed at various locations around the plant. These TLDs are compared to control TLDs located away from the plant and are for the purpose of detecting background radiation in the area. This is also done as part of the Radiation Environmental Monitoring Program required by the Nuclear Regulatory Commission and the results are reported annually. Currently the TLDs located in the area of the site boundary and five miles from the plant show no significant differences to the control TLDs located away from the plant that detect background radiation only. While the extended power uprate could potentially raise the amount of direct radiation attributable to plant operation by up to 10 percent, it is expected that direct radiation from plant operations after power uprate will continue to be indistinguishable from background radiation.

### 4.3.5 Operating and Shutdown In-Plant Radiation

The collective annual dose of in-plant radiation at the plant has been steadily decreasing from 1975 through 2006. The average annual collective dose rate from 1975 (first full year of 2-unit operation) through 2006 was 175 rem. The average annual collective dose from 2002 through 2006 was 110.8 rem. A bounding 10-percent increase would raise the 2002-2006 average by 11 rem for a total of approximately 122 rem. This is still well below the lifetime average annual collective in-plant dose rate of 175 rem. The impact of the increase in radiation dose to workers is minimized by monitoring radiation levels, controlling access to radiation areas, and by implementation of the As-Low-As-Reasonably-Achievable ("ALARA") principles. These practices are already in place at Prairie Island and will continue after power uprate.

### 4.3.6 Groundwater Radionuclides

Prairie Island also monitors groundwater as part of the REMP program, and no contamination has been detected in any of the wells. Power uprate will not affect the radioactive or non-radioactive contamination levels of these wells. Power uprate does not affect groundwater resources and does not involve significant increases in the consumptive use of these resources at Prairie Island.

### 4.3.7 Radioactive Solid Waste

The solid radioactive waste system collects, processes, packages, and temporarily stores radioactive dry and wet solid wastes before they are shipped off-site for permanent disposal. Prairie Island produces dry active waste (paper, plastic, wood, rubber, glass, floor sweepings, cloth, and metal), sludge, oily waste, bead resin and filters. Any increase in the volume of solid waste due to the uprate would be insignificant because the uprate would neither alter installed equipment performance nor require changes in system operation or maintenance.

With power uprate, any increase in volume of solid waste would be expected to be due to increases in disposal of bead resins and filters. This volume increase would not be significant, although the amount

of radioactivity in the waste would be expected to proportional to the increase in thermal power level (i.e. approximately 10 percent). In recent years (2004 and 2005), the solid waste volume generated at Prairie Island has been above the quantity considered in the FES. This short-term increase in solid waste volume was temporary. It was a direct result of the disposal of the retired equipment associated with the Unit 1 Steam Generator Replacement and the Unit 1 and 2 Reactor Vessel Head Replacement projects.

In spite of temporary increases in waste volumes above the estimated values in FES, the associated level of radioactivity (343 Ci), when increased by 10 percent (34.3 Ci) for a total of 377.3 Ci, remains well bounded by the assumed value (16,450 Ci) in the FES.

## 4.4 Groundwater and Surface Water Resources

This section of the application summarizes the available surface and groundwater sources for Prairie Island. The power uprate will not involve significant increases in groundwater or surface water consumption and thus will not affect the respective permit limits.

### 4.4.1 Groundwater Use

Prairie Island uses ground water for potable and industrial use from six wells installed within the alluvial aquifer located on the Plant property. Five of these wells are permitted by the MDNR (appropriation permit numbers 69-171-G, 78-5153, 86-5114, and 96402). The sixth well does not require a water appropriation permit because it is below the minimum flow requirements of 10,000 gallons per day or 1,000,000 gallons per year set by MDNR. Although the maximum combined pumping rate of the five wells equals approximately 850 gpm, ground water limits the usage to a total of 354.7 million gallons per year.

The average annual groundwater usage for the past four years was 52.3 million gallons per year. Even if groundwater use increased by 10 percent due to the power uprate, the expected usage would increase from 52.3 million gallons per year to 57.5 million gallons per year, which is still significantly less than the 355 gallon per year limit.

### 4.4.2 Surface Water Use

Prairie Island uses surface water from the Mississippi River to cool and condense the steam leaving the turbine. The heat from the steam is transferred to circulating water flowing through the condenser tubes. Based on seasonal limitations, this heat is transferred to the environment either by the use of the cooling towers, discharge to the river, or a combination of both. The cooling towers are used primarily in the summer in order to reduce the temperature of the water discharge to the Mississippi River and meet other operating restrictions in the National Pollutant Discharge Elimination System ("NPDES") permit. Increased use of the cooling towers due to the uprate will result in, at most, an additional 10 percent increase in water consumption at the plant.

Surface water use at Prairie Island is limited by the MnDNR water appropriation limits as well as operating restrictions in the MPCA NPDES permit. (MPCA 2006b) Under MnDNR surface water appropriation permit (69-0172 amended in June 1995) the facility may withdraw up to 215,000 Million Gallons of water per year from the Mississippi river. In a five year period, 2001 through 2005, a maximum of 207,650 million gallons of water was withdrawn in one year, which occurred in 2001. The proposed uprate will not require any changes to the DNR water appropriation requirements under the current permit.

The NPDES operating restrictions vary depending on a range of temperature and flow conditions. (For example, in addition to temperature-based restrictions, there are restrictions to protect fish and other aquatic organisms during low flow. See Section 4.4.3.)

Assuming that the all the additional heat generated by the power uprate is dissipated in the cooling towers, and the water evaporative rate is proportional to the proposed 10 percent thermal power increase, the power uprate could increase in evaporation rate from 39 cubic feet per second (CFS) to 43 cfs. This increased total water use after the power uprate still represents only about 0.23% of the 18,380 cfs of the average Mississippi River flow and approximately 1% of the lowest annual mean of 4,367 cfs. Thus, no changes to the current NPDES permit will be required due to the power uprate.

## 4.5 Water Quality and Temperature

The Prairie Island plant operations require a number of wastewater discharges, which are regulated by the state of Minnesota through the facility's NPDES permit. The present NPDES permit for the plant, permit number MN0004006, was issued June 30, 2006 and expires August 31, 2010. (MPCA 2006b) This permit authorizes intakes and discharges and imposes limits and/or monitoring/reporting requirements for the discharges as found in Table 4-4 below:

**Table 4-4 Surface Water Discharge Streams**

| Stream | Description |
|---|---|
| SD 001 | Condenser/circulating water and Cooling Water |
| SD 002 | Steam Generator blowdown |
| SD 003 | Radioactive waste Effluent |
| SD 004 | Reverse Osmosis Effluent (Monitoring and Reporting requirements only) |
| SD 005 | U 1 Turbine Building sump |
| SD 006 | U 2 Turbine Building sump |
| SD 010 | Misc Plant Floor Drains |
| SD 012 | Intake Screen wash (Monitoring and Reporting Requirements Only) |
| SW 001 | Mississippi River Lock and Dam #3 |
| SW 002 | Plant Intake Channel (Monitoring and Reporting Requirements Only) |
| SW 003 | Main River Channel Upstream Pt. (Monitoring and Reporting Requirements Only) |
| SW 004 | Sturgeon Lake-upstream Pt. (Monitoring and Reporting Requirements Only) |
| WS 001 & SW 002 | Combined U 1/U 2 Cooling water |

Specific limits and monitoring requirements for each discharge are described in detail in the NPDES permit and are summarized in our Certificate of Need application of May 16, 2008. Although the power uprate may require nominal increases in some discharges, none of the permit limits will require modification.

### 4.5.1 Increase in Circulating Water Discharge Temperature

Mississippi River water is used in the circulating water system to cool and condense the steam leaving the Prairie Island turbines. The heat in the cooling water must then be dissipated in the cooling towers, discharged to the river, or a combination of both ("helper mode"). See Figure 4-4 for location of intake and discharge structures. The power uprate project will slightly increase the temperature of the circulating water discharged to the Mississippi River (3°F maximum). Discharge temperatures will be maintained within current NPDES limits by increasing the use of cooling towers, which can operate in various modes or, if necessary, by derating the plant to meet permit requirements for water appropriations and thermal discharge. No physical modifications or operational changes are required for these systems to implement the power uprate.

More specifically, the plant can be operated in any one of three modes: open cycle (once-through flow, with no cooling towers in operation), helper cycle (once-through flow with cooling towers in operation), and closed cycle (recirculation of up to 95 percent of the cooling water flow). Operation of Prairie Island's circulating water system is governed by spring and fall "trigger points." The spring trigger point is the point in time that the daily average ambient river temperature increases to 43° Fahrenheit ("F") or above for five consecutive days, or April 1, whichever occurs first. The fall trigger point is the point at which the daily average upstream ambient river temperature falls below 43° F for five consecutive days.

In addition, from the spring trigger point to the fall trigger point, Prairie Island is required to operate the cooling towers as necessary to meet the following requirements: (1) the temperature of the receiving water immediately below Lock and Dam No. 3 cannot be raised by more than 5° F above ambient, (2) the cooling-water discharge can not exceed a daily average temperature of 86° F, and (3) if the daily average ambient river temperature reaches 78° F for two consecutive days, all cooling towers must be operated to the maximum extent practicable (NPDES Permit No. MN0004006).

From the fall trigger point through March 31, the temperature of the receiving water immediately below Lock and Dam No. 3 cannot be

raised above 43° F for an extended period of time. If the receiving water temperature exceeds this limit for two consecutive days, we must notify the Commissioner and the MN DNR. The Commission may require us to operate the cooling towers or take alternative action to meet the 43° F criterion (NPDES Permit No. MN0004006).

The maximum 3°F increase in surface-water-discharge temperature of due to the uprate would occur when the circulating cooling-water system is operated in open-cycle mode. Open-cycle mode is used primarily in the winter when cooling tower operation is not required to meet NPDES permit temperature requirements. In contrast, during closed-cycle and modified helper-cycle operation, the temperature of water entering the discharge canal is expected to increase by less than 0.5°F, due to increased heat removal in the cooling towers. Therefore, the temperature increase is lowest in summer and during periods of low river flow, when NPDES permit limits require cooling tower use. The resultant increase in downstream river temperature in the modified helper-cycle mode is expected to be less than approximately 0.2° F, even under low river flow conditions.

### 4.5.2 Thermal Plume Impacts and Thermophilic Pathogens

The thermal plume is normally formed by the cooling tower discharge during spring, summer, and fall. During the winter, helper-cycle operation is typically used, subject to permit limitations on downstream river temperature and the need to deice intake screens and other associated equipment (see previous comments, plant does not typically operate open cycle during the winter). Thus, the size and characteristics of the thermal plume vary over the course of the year, depending on the mode of operation of the circulating water system. The current permit limits act to minimize the size of the plume and resultant stress to aquatic biota when the ambient river temperatures are high.

Mississippi River aquatic communities upstream of Lock and Dam No. 3 have been monitored since 1970 to determine if Prairie Island operations were having an effect on distribution, abundance, and overall health of aquatic biota.

Operational monitoring of the fish populations in the vicinity of Prairie Island have continued, after the Plant's section 316(a) and 316(b) studies were completed, to gauge the effectiveness of the intake and discharge modifications in reducing entrainment, impingement, and cold shock impacts. The monitoring has demonstrated that the thermal discharge resulting from past operation of Prairie Island has not caused appreciable harm to any aquatic organisms, and that the protection and propagation of a balanced, indigenous biota has been maintained.

Thermophilic bacteria generally occur at temperatures from 77°F to 176°F, with maximum growth at 122°F to 140°F. Water at these temperatures could, in theory, allow limited survival of thermophilic microorganisms, but are well below the optimal temperature range for growth and reproduction of thermophilic microorganisms. The probability of the presence of thermophilic microorganisms due to plant operations is low.

During the early 1980s, Prairie Island identified the presence of the parasitic amoeba *Naegleria* at high population densities within the plant's circulating water system. In cooperation with the Minnesota Pollution Control Agency and Minnesota Department of Natural Resources, Prairie Island conducted chlorination and subsequent dechlorination of the circulating water system in August 1980, September 1981, and August 1983. The chlorination processes were successful in controlling and reducing the populations of the organisms; however, the dechlorination process does impact the fish populations in the Mississippi River. Although the Minnesota Department of Health did not consider the presence of the organism to be a public health threat, it was recognized as an occupational health hazard and plant personnel were instructed to wear protective equipment when in contact with the circulating water system components. Prairie Island continues to periodically chlorinate the circulating water system to control microbiological organisms and zebra mussels in accordance with the NPDES permit requirements.

Given the thermal characteristics at the Prairie Island discharge and the fact that Xcel Energy periodically chlorinates the circulating water system, we do not expect a less than 3° F inlet temperature increase to result in any significant increase in harmful thermophylic organisms in the discharge canal. Under certain circumstances, these organisms

might be present in limited numbers in the station's discharge, but would not be expected in concentrations high enough to pose a threat to recreational users of the Mississippi River.

The uprate will not significantly alter the water volume requirements for the heat dissipation system, and operation will continue to be within the temperature limits established by the NPDES permit. Therefore, after power uprate, the discharge plume is expected to continue to not impact aquatic biota downstream from the plant.

### 4.5.3 Impingement and Entrainment

Fish and other aquatic organisms can be killed or harmed when they are pulled into power plant cooling water intake systems. Section 316(b) of the Clean Water Act ("CWA") requires the location, design, construction, and capacity of cooling water intake structures to reflect the best technology available for minimizing adverse environmental impacts.

The current Prairie Island NPDES permit already reflects major modifications in design and operation of the Cooling Water Intake Structure ("CWIS") made in the early 1980s to minimize entrainment and impingement mortality and constitutes the current CWA Section 316(b) determination for the Plant. In addition to the hardware changes to the CWIS structure, the NPDES permit also imposes limits on Plant withdrawal of cooling water over the April 15 to June 30 period:

April 15 – 30 97 mgd when river flow < 15,000 cfs
April 15 – 30 194 mgd when river flow > 15,000 cfs
May 01 – 31 194 mgd
June 01 – 15 259 mgd
June 16 – 30 517.5 mgd

The design changes and flow/withdrawal restrictions in spring and early summer are intended to reduce both impingement and entrainment mortality. NPDES permit No. MN 0004006, Chapter 6, Section 4.1, contains specific requirements related to intake screen operation. The Plant is allowed to operate with a 3/8-inch mesh screen from September 1 – March 31, but must employ fine mesh (0.5

mm) screens over the April 1 – August 31 period to "minimize mortality of fish and other organisms".

Operational monitoring of the fish populations in the vicinity of plant have continued, after the Plant's section 316(a) and 316(b) studies were completed, to gauge the effectiveness of the intake and discharge modifications in reducing entrainment, impingement, and cold shock impacts.

The monitoring has demonstrated that the thermal discharge resulting from past operation has not caused appreciable harm to any aquatic organisms, and that the protection and propagation of a balanced, indigenous biota has been maintained.

The power uprate will not affect impingement and entrainment significantly. Therefore, there is not expected to be any significant increases in the mortality of fish or other aquatic organisms above present levels due to the power uprate. The power uprate does not introduce any significant changes to the screen wash, service water, or circulating water flow requirements and does not involve any changes to the water appropriation requirements of the NPDES permit.

### 4.5.4 Cold Shock

Cold shock is caused by an unplanned shutdown. The probability of an unplanned shutdown is independent of the power uprate. The projected increase in discharge-canal-inlet temperature of less than 3°F does not result in a significant increase in the overall discharge canal temperature; thus, the magnitude of the temperature decrease in a cold shock situation is not significantly changed. The cold shock concerns of river fish species have been reduced at Prairie Island by the construction of a discharge structure at the end of the discharge canal and by the construction and operation of the intake screenhouse. The discharge structure and intake screens limit the number of fish in the discharge canal and reduce the impact of cold shock on aquatic species of the river.

## 4.6 Rare and Unique Natural Resources

The proposed uprate will be limited to the existing plant footprint. Therefore, no incremental impacts to native plant communities or terrestrial organisms, including birds, are anticipated. The only impact to natural resources will be the off-site impact of the slight increase in the temperature of the cooling water discharged to the Mississippi River (up to 3° F) primarily during the fall and winter, when "once through" cooling is used.

Minnesota DNR was contacted to obtain records from the Natural Heritage Information System ("NHIS") database of known locations of sensitive species. The NHIS database includes known locations of endangered, threatened and special concern species, as well as occurrences of unique or uncommon plant communities and habitat types. (The MnDNR database response is provided in Attachment B).

The species indicated in the October 2007 DNR response include birds, fish, mollusks, plants, and amphibians. All six species that are state-listed as endangered are mollusks; each of these species has been observed in the Mississippi River within one mile downstream of the plant. The Higgins' eye pearly-mussel (*Lampsilis higginsii*) is also listed as endangered at the federal level and the sheepnose (*Plethobasus cyphyus*) is a federal candidate species. The Higgins' eye pearly-mussel has been observed both upstream (~0.3 miles) and downstream of the Prairie Island plant (just under one mile). The sheepnose has been documented approximately one mile downstream of the plant.

Of the remaining species, there are three state-threatened species – the paddlefish (*Polyodon spathula*), Blanding's turtle (*Emydoidea blandingii*) and the peregrine falcon (*Falco peregrinus*). The remaining species on the NHIS records for the area are special concern species.

**Table 4-5**
**Listed State and Federal Threatened and Endangered Species**

| Species Type | Total Number of Species Type | Total Occurrences of Species Type |
|---|---|---|

| Species Type | Total Number of Species Type | Total Occurrences of Species Type |
|---|---|---|
| Mollusks | 14 | 16 |
| Fish | 6 | 9 |
| Birds | 4 | 8 |
| Amphibians/Reptiles | 2 | 2 |
| Plants | 1 | 1 |
| Native Plant Communities | 2 | 4 |
| **TOTAL** | 29 | 40 |

Impacts to mollusks and other aquatic organisms would be related to changes in water quality, such as increases in thermal discharge from the plant into the Mississippi River. The potential for these power uprate impacts is only relevant downstream of the Prairie Island plant. Water temperature can influence the timing of certain aspects of the mollusk life cycle, including the timing and length of release of the immature form of mollusks to attach to host fish species. A detailed review of potential impacts of the currently plant operation generally on these species is provided in our application to the NRC for license extension (NMC, 2008). The slight increase in the temperature of cooling water discharge due to the power uprate should not affect mollusk species or other aquatic organisms.

In addition, Prairie Island is located in the Mississippi flyway, a major route for migratory bird species. A variety of birds follow this route when migrating to and from their breeding or wintering grounds. State-threatened peregrine falcons (*Falco peregrinus*) have been observed nesting within the site since 1997. A nesting box was mounted to a ledge on the containment dome of the power plant in 2006. Bald eagles *(Haliaeetus leucocephalus)*, a state-listed species of special concern and previously listed as threatened at the federal level, have been observed in the vicinity of the Prairie Island plant. In addition, the original Prairie Island FES (AEC 1973) stated that trumpeter swans (*Cygnus buccinator*), which are state-listed as threatened, might migrate through the plant area. The MN DNR database shows this species in Dakota County and records maintained

by the Minnesota Ornithologists' Union indicate that trumpeter swans are occasionally observed in Goodhue County (MOU 2006). The slight increase in discharge temperature to the Mississippi River in the area will not affect these bird species.

## 4.7 Historic and Archaeological Resources

The Prairie Island plant is located adjacent to the Prairie Island Indian Community Reservation (see Figure 4-4). In 1936, the federal government officially recognized Prairie Island Indian Community as a reservation for the Mdewakanton, awarding them 534 acres. There are six National Register historic sites located within five miles of the Plant: five of the historical sites are in Goodhue County, Minnesota and one is in Pierce County, Wisconsin.

As described in detail in our application to the NRC for the Prairie Island license extension (NMC 2008), we conducted a cultural resource assessment in September 2007 to identify all previously recorded archaeological sites and architectural history properties, as well as previously conducted cultural resource investigations within plant boundaries. This review included records from the Minnesota State Historic Preservation Office ("SHPO") and the Wisconsin Historic Preservation Database.

According to the records on file at SHPO, four professional archaeological surveys and one testing project have been conducted within the study area to date. Within the boundaries of the Prairie Island site, seven archaeological sites have been recorded. (The 106 Group 2008).

The proposed power uprate will be limited to the footprint of the existing buildings, thus no impacts to archaeological artifacts are anticipated as a result of the power uprate project. We continue to conduct ongoing work at some of the identified sites and will follow standard procedures during power uprate implementation to avoid potential impacts to artifacts that may have not yet been discovered on the site.

To avoid impacts to potential archaeological artifacts during any construction projects on the site, we have developed a corporate procedure ("Excavation and Trenching Controls," number FP-IH-

EXC-01) that protects cultural resources at all our plant sites and have instituted those procedures at Prairie Island. The procedure requires a review of any planned excavation (greater than 6 inches deep) to ensure the protection of archaeological and historical resources.

The Site Environmental Coordinator is responsible for determining if proposed land-disturbing activity will occur in the vicinity of a culturally significant site, and if so, consulting with the SHPO to mitigate potential impacts. The Site Environmental Coordinator is also responsible for evaluating any cultural artifacts inadvertently discovered during construction to determine if the material discovered has potential archaeological or historic significance and thus should be reported to the SHPO. In any case, the discovery of cultural artifacts at our nuclear plants requires employees to stop work until the Site Environmental Coordinator has evaluated the situation. Work can resume only after the situation had been addressed, disposition of any material or artifacts has been documented, and the Site Environmental Coordinator agrees that culturally significant material is not at risk.

We continue to work with the Prairie Island Indian Community to address any concerns regarding historic or archaeological impacts.

## 4.8 Human Settlement (Demography and Socioeconomics Air Quality, Traffic, Noise, Aesthetics, Other Impacts)

### 4.8.1 Demographics

Red Wing (approximately 3 miles southeast) is the nearest population center, with a 2000 population of 16,116 (USCB 2000). Minneapolis (approximately 39 miles northwest), St. Paul (approximately 32 miles northwest), and Rochester (approximately 50 miles southeast) are the largest population centers within the 50-mile radius, with 2000 populations of 382,618, 287,151, and 85,806, respectively (USCB 2000).

From 1990 to 2000, the population of the Red Wing increased from 40,690 to 44,127, an increase of 8.4 percent. The population of the Minneapolis-St. Paul-St. Cloud, MN-WI CSA increased from 2,809,713 to 3,271,888, an increase of 16.4 percent (USCB 2003).

Because approximately 83 percent of employees at Prairie Island reside in Goodhue and Dakota Counties, MN and Pierce County, WI, they are the counties with the greatest potential to be economically affected by the power uprate.

Over the last couple of decades, all three counties and both states have experienced positive growth rates and are projected to continue to grow. By far, Dakota County experienced the greatest growth from 1980 to 2000. While Dakota County's growth rates are somewhat larger than those of the other counties and states, Minnesota demographers project that growth to slow as 2030 approaches.

#### 4.8.1.1 Minority Populations

Within a 50-mile radius of the plant, the majority of the census block groups with minority populations over 20 percent are located in Hennepin and Ramsey counties, part of the Minneapolis-St. Paul metropolitan area. Therefore, the minority populations in the 50-mile radius are concentrated in areas of the Twin Cities with a high population density. These areas are approximately 30 or more miles from the plant.

The Prairie Island Indian Community; which consists of approximately 534 acres is located next to the plant (See Figure 4-1, Figure 4-3, and Figure 4-4.) This community is home to the descendants of Mdewakanton Band of the Eastern Dakota, also known as the Mississippi or Minnesota Sioux. The Shakopee-Mdewakanton Sioux (Dakota) Indian Reservation, located in Scott County, also lies within the 50-mile radius. Neither the Prairie Island nor Shakopee Reservations were identified through analysis of census data, but are designated Federal American Indian reservations.

#### 4.8.1.2 Low Income Residents

A total of 89 census block groups within the 50-mile radius meet the 20 percent criteria for low-income populations. Similar to minority population concentrations, most low-income population census blocks are located in Hennepin and Ramsey County 30 miles or more from the plant.

### 4.8.2 Socioeconomic Impacts

On a local economic level, the construction activities for the power uprate project are expected to occur primarily during refueling outages in 2012 for Unit-1 outage and 2015 for Unit 2 outage. The size of the workforce during the two refueling outages when power uprate is implemented is not expected to change significantly from the size of the workforce during a normal refueling outage. In addition, the size of the Plant's workforce during periods of normal operation will be the same before and after the power uprate.

### 4.8.3 Public Services and Recreation

No impacts to public activities including recreation are anticipated because the power uprate activities will be confined to within the plant boundaries and the existing plant buildings. Although minor changes in thermal discharge are anticipated, these changes are unlikely to have any noticeable effect on recreation (e.g. sport fishing).

No additional demands will be placed on public services because significant changes to the site, workforce, and infrastructure are not anticipated as part of the project. The power uprate is not anticipated to result in additional traffic generated beyond normal levels currently experienced at Prairie Island during periods of power generation and refueling outages. Plant modifications to accomplish the power uprate will be completed primarily during refueling outages and equipment deliveries for power uprate will not involve deliveries that are materially different from those required during past refueling outages. Post power uprate traffic patterns will not differ from levels currently experienced during normal operations.

### 4.8.4 Impact on Land-Based Economies

None of the project-related activities represent any changes in land use or displace other land uses because the site is already developed for power generation. Resources such as groundwater or surface water will be utilized within established appropriation limits. There are no anticipated changes to the distribution or demand for these resources that could affect other economic activities. Tourism, forestry, and mining activities are not dependent on the site or its immediate environs and therefore are unlikely to be increased or decreased as a result of the power uprate.

### 4.8.5 Human Displacement

Since the footprint of Prairie Island will not change and the power uprate will not affect nearby infrastructure, there will be no displacement of nearby residents or business.

### 4.8.6 Non-radiological Air Quality Impacts

The region surrounding Prairie Island is an "attainment area" that currently meets all federally allowed air concentration limits for criteria air pollutants (as does all of Minnesota). The power uprate project will not affect air quality in the area. Non-radiological air emissions are not expected to increase or decrease as a result of the uprate. Diesel engines, a boiler, and other sources currently associated with the Prairie Island site emit various nonradioactive air pollutants to the atmosphere, such as $NO_X$, $S0_2$ and CO. Air emissions from these sources are subject to the terms and conditions of a Title V air pollution control operation permit issued by the MPCA. No changes to the MPCA air permit are required due to the uprate.

### 4.8.7 Noise

The power uprate will not result in any significant changes to the character, sources, or energy of noise generated at Prairie Island. The majority of new equipment necessary to implement power uprate will

be installed within existing plant buildings – the new transformers being the exception. All equipment will be installed within the existing plant footprint. No new significant noise-generating equipment is planned as part of the power uprate project. No significant increases in ambient noise levels are expected within the plant.

### 4.8.8 Visual Aesthetics

The power uprate project will not change the visual appearance of plant features from outside the facility boundaries; therefore there is no anticipated impact to aesthetics. Cooling tower operation involves the discharge of water vapor that is potentially visible from outside the plant boundaries. Although the number of days that the cooling towers are used may increase by about 20 days per year, the appearance of cooling tower operation will not change as a result of the power uprate. Other lands located outside the inner security fence will not be modified or changed to support power uprate activities. The Project will not involve changes to any aesthetic resources and will not impact lands with historical or archaeological significance.

### 4.8.9 Traffic

Construction will be completed during planned refueling outages in 2012 and 2015 for Unit 1 and Unit 2 respectively. We do not expect the number of workers at the Plant to be significantly higher during the refueling outages when power uprate is implemented than during non-power uprate refueling outages. There are approximately 500 additional workers on-site during a typical refueling outage. It is estimated the power uprate construction will increase that by a few dozen more. Since the power uprate project will only minimally increase the number of workers at Prairie Island during the outages, the additional traffic generated is negligible. Power uprate equipment deliveries will involve similar types of equipment deliveries as have been made for past refueling outages. After the project has been implemented, the on-going operation of the plant will not require additional employees and traffic will not differ from current levels.

## 4.9 Mitigative Measures and Costs (7849.5220 Subp. 3 H)

Mitigation measures implemented for each potential impact are provided above in the preceding applicable subsections.

## 4.10 Potential Environmental Impact Summary

The primary impact of the proposed 164 MW uprate is a small increase in the temperature of the circulating water (3 F° maximum) leaving the main condenser, due to the increase in thermal power output. Cooling-water-discharge temperature will be maintained through increased use of the cooling towers or other methods. The thermal discharge will remain within the limits of the current NPDES permit. No changes are planned for the Prairie Island plant-intake system or intake-flow velocity; therefore, no change in permitted water appropriation is needed. Increased use of the evaporative cooling towers will slightly increase the amount of water used at the plant, but water consumption will remain approximately 1 percent of the lowest annual mean Mississippi River flow.

The proposed uprate will also slightly increase gaseous radionuclide emissions, but will not measurably change the maximum projected annual off-site radiation dose or on-site cumulative radiation dose. On-site and off-site radiological doses will remain well below federal regulatory limits.

# 5 References

Note: This list of references identifies web pages and associated URLs where reference data was obtained. Some of these web pages may likely no longer be available or their URL addresses may have changed. NMC has maintained hard copies of the information and data obtained from the referenced web pages.

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The 106 Group. 2008. Cultural Resources Assessment for the Prairie Island Nuclear Generating Plant, Goodhue County, Minnesota. Submitted to Nuclear Management Company. January.

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USCB (U.S. Census Bureau). 2003. "Table 7. Population in Combined Statistical Areas (CSAs) and Their Component Metropolitan and Micropolitan Statistical Areas in Alphabetical Order and Numerical and Percent Change for the United States and Puerto Rico: 1990 and 2000."

Xcel Energy. 2004 Resource Plan. November. Available at http://www.xcelenergy.com/XLWEB/CDA/0,3080,1-1-1_1875_12180_17838-16204-5_538_969-0,00.html. Accessed October 11, 2006.

# Appendix I: Power Uprates Approved by the NRC

## I.1 Power Uprates Experience

### E.1.1 Power Uprate Approved Applications:

- Calvert Cliffs, Units 1 and 2
- Millstone, Unit 2
- H.B. Robinson Nuclear Plant[1]
- Fort Calhoun Station
- St. Lucie, Units 1 and 2
- Duane Arnold[2]
- Salem, Units 1[3] and 2
- North Anna, Units 1 and 2
- Callaway
- Three Mile Island, Unit 1
- Fermi, Unit 2
- Vogtle, Units 1 and 2
- Wolf Creek
- Susquehanna, Units 1 and 2[4]
- Peach Bottom, Units 2 and 3[5]
- Limerick, Units 1 and 2
- Nine Mile Point, Unit 2
- Washington Nuclear Plant, Unit 2
- Surry, Units 1 and 2
- Hatch, Units 1 and 2 [6]
- V.C. Summer Nuclear Station
- Palo Verde Units 1 thru 3[7]
- Turkey Point Nuclear Plant, Units 3 and 4
- Brunswick, Units 1 and 2[8]
- James A FitzPatrick
- Farley, Units 1 and 2

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[1] Approval for 4.5% in 1979 and 1.7% in 2002.

[2] Approval received for 4.1% uprate in 1985 and 15.3% in 2001.

[3] Unit 1 was approved for a 2% uprate in 1986 and 1.4% in 2001.

[4] Two different applications in 1994, 1995 for Units 2 and 1 respectively and then in 2001. The first request was for a 4.5 % uprate and the second for a 1.4% uprate.

[5] Approval was granted in 1994 for 5% at Unit 2 and in 1995 for Unit 3. Both Units were also approved for 1.62% in\2002.

[6] Three applications: 1995 (5%), 1998 (8%), 2003 (1.5%).

[7] All Units approved at 2% in 1996 and Unit 2 at 2.9% in 2003 and Units 1 and 3 for 2.9% in 2005.

[8] Approval for 5% in 1996 and 15% in 2002.

- Browns Ferry, Units 1, 2 and 3
- Prairie Island
- Comanche Peak, Units 1 and 2[9]
- LaSalle, Units 1 and 2
- Perry
- River Bend[10]
- Diablo Canyon, Unit 1
- Watts Bar
- Byron, Units 1 and 2
- Braidwood, Units 1 and 2
- San Onofre, Units 2 and 3
- Hope Creek
- Beaver Valley, Units 1 and 2[11]
- Shearon Harris
- Dresden, Units 2 and 3
- Quad Cities, Units 1 and 2
- Waterford[12]
- Clinton
- South Texas, Units 1 and 2
- ANO-2
- Grand Gulf Nuclear Station
- Sequoyah, Units 1 and 2
- Indian Point, Units 2 and 3[13]
- Crystal River Nuclear Generating Plant, Unit 3
- Point Beach, Units 1 and 2
- D.C. Cook, Units 1 and 2
- Kewaunee Power Generating Station[14]
- Pilgrim
- Palisades
- Seabrook[15]
- Vermont Yankee
- Ginna

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[9] Unit 2 received approval for a 1% uprate in 1999 and approval for 0.4% in 2001.

[10] Approved for 5% in 2000 and 1.7%in 2003.

[11] Approved for 1.4% in 2001 and 8% in 2006.

[12] Unit 3 1.5% in 2002 and all units for 8% in 2005.

[13] Approvals for 1.4% for Units 3 and 2 in 2002 and 2003, respectively and 3.26% in 2004 and 2005, respectively

[14] Approved for 1.4% in 2003 and 6% in 2004.

[15] Approved for 5.2% in 2005 and 1.7% in 2006.

# Minnesota Department of Natural Resources

Natural Heritage and Nongame Research Program, Box 25
500 Lafayette Road
St. Paul, Minnesota 55155-40__
Phone: (651) 259-5109 Fax: (651) 296-1811 E-mail: lisa.joyal@dnr.state.mn.us


October 15, 2007

Mr. Jim Aiken
Barr Engineering Company
4700 West 77th Street
Minneapolis, MN 55435-4803

Re: Request for Natural Heritage information for vicinity of proposed Prairie Island Nuclear Generating Plant Uprate Project, T113N R15W Sections 4 & 5, Goodhue County
NHNRP Contact #: ERDB 20080253

Dear Mr. Aiken,

Please note that the Township, Range, or Section information that was listed on the Data Request Form appeared incomplete based on the project area as outlined on the map that was submitted with the form. The enclosed search results are for the area indicated on the map. Please contact me if the location description of your project area, as listed in the subject line of this letter, is in error.

The Minnesota Natural Heritage database has been reviewed to determine if any rare plant or animal species or other significant natural features are known to occur within an approximate one-mile radius of the area indicated on the map enclosed with your information request. Based on this review, there are 40 known occurrences of rare species or native plant communities in the area searched (for details, please see the enclosed database printouts and the explanation of selected fields). However, provided that the proposed uprate will not result in changes that negatively affect the water quality of the Mississippi River, I do not believe the project will affect any known occurrences of rare features.

The Natural Heritage database is maintained by the Natural Heritage and Nongame Research Program, a unit within the Division of Ecological Resources, Department of Natural Resources. It 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. Its purpose is to foster better understanding and protection of these features.

Because our information is not based on a comprehensive inventory, there may be rare or otherwise significant natural features in the state that are not represented in the database. A county-by-county survey of rare natural features is now underway, and has been completed for Goodhue County. Our information about native plant communities is, therefore, quite thorough for that county. However, because survey work for rare plants and animals is less exhaustive, and because there has not been an on-site survey of all areas of the county, ecologically significant features for which we have no records may exist on the project area.

The enclosed results of the database search are provided in two formats: short record report and long record report. To control the release of locational information, which might result in the damage or destruction of a rare element, both printout formats are copyrighted.

The short record report provides rare feature locations only to the nearest section, and may be reprinted, unaltered, in an Environmental Assessment Worksheet, municipal natural resource plan, or report compiled by your company for the project listed above. If you wish to reproduce the short record report for any other purpose, please contact me to request written permission. **The long record report includes more detailed locational information, and is for your personal use only. If you wish to reprint the long record report for any purpose, please contact me to request written permission.**

Please be aware that review by the Natural Heritage and Nongame Research Program focuses only on *rare natural features*. It does not constitute review or approval by the Department of Natural Resources as a whole. If you require further information on the environmental review process for other natural resource-related issues, you may contact your Regional Environmental Assessment Ecologist, Wayne Barstad, at (651) 772-7940.

An invoice in the amount of $77.13 will be mailed to you under separate cover within two weeks of the date of this letter. You are being billed for the database search and printouts, and staff scientist review. Thank you for consulting us on this matter, and for your interest in preserving Minnesota's rare natural resources.

Sincerely,

Lisa Joyal

Lisa A. Joyal
Endangered Species Environmental Review Coordinator

encl: Database search results
Rare Feature Database Print-Outs: An Explanation of Fields

## CERTIFICATE OF SERVICE

I, Carole Wallace, hereby certify that I have this day served copies of the foregoing document on the attached list of persons.

xx by depositing a true and correct copy thereof, properly enveloped with postage paid in the United States Mail at Minneapolis, Minnesota

xx electronic filing

**SERVICE LIST: DOCKET NOS. E002/CN-08-509 & E002/CN-08-510**

Dated this 4th day of August 2008

/s/

Carole Wallace

Xcel Energy CON for Prairie Island Nuclear
Plant Extended Power Uprate

ArshiaJavaherian@alliantenergy.com

E002/CN-08-509
E002/CN-08-510
7-23-2008 OES

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