ENCLOSURES 7 AND 8 TO ATTACHMENT 2 CONTAIN ~~PROPRIETARY INFORMATION WITHHOLD FROM PUBLIC DISCLOSURE IN ACCORDANCE WITH 10 CFR 2.390~~

Xcel Energy®

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

August 21, 2014

L-PI-14-075
10 CFR 72.42

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

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

Supplemental Information to Support Environmental Review of License Renewal Application for the Prairie Island Independent Spent Fuel Storage Installation (TAC No. L24592)

References:

1. Letter from M.A. Schimmel (NSPM) to Document Control Desk (NRC), "Prairie Island Independent Spent Fuel Storage Installation (ISFSI) License Renewal Application," L-PI-11-074, dated October 20, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML11304A068).
2. Prairie Island Indian Community's Request for Hearing and Petition to Intervene in License Renewal Proceeding for the Prairie Island Independent Spent Fuel Storage Installation, August 24, 2012.
3. Memorandum and Order, Ruling on Request for Hearing and Petition to Intervene, Northern States Power Co. (Prairie Island Nuclear Generating Plant Independent Storage Installation), LBP-12-24, ASLB No. 12-922-01-ISFSI-MLR-BD01, December 20, 2012.

Pursuant to 10 CFR 72.42, Northern States Power Company, a Minnesota corporation doing business as Xcel Energy (hereafter "NSPM"), submitted in Reference 1 an application to renew the site-specific license for the Prairie Island Independent Spent Fuel Storage Installation (ISFSI) for an additional 40 year period. In Reference 2, the Prairie Island Indian Community (PIIC) submitted a request for hearing and petition to intervene in the license renewal proceeding. In Reference 3, the Atomic Safety and Licensing Board (ASLB) admitted portions of the PIIC's Contention 4 related to potential impacts from skyshine radiation dose.

NMSS26

In Attachment 2 to this letter, NSPM provides the Declaration of Herbert Olaf Nelson related to potential impacts from skyshine radiation dose. Mr. Nelson is a testifying witness in the proceeding before the ASLB, and his Declaration was written in support of NSPM's Motion for Summary Disposition of the Skyshine Dose Portion of the Community's Contention 4. The Motion for Summary Disposition has not been submitted in the proceeding at this time pursuant to ongoing settlement discussions with the PIIC. The statement included in Attachment 2 is hereby submitted for consideration by the Nuclear Regulatory Commission (NRC) Staff during their environmental review of the Prairie Island ISFSI License Renewal Application (Reference 1).

Reference 3 also admitted portions of the PIIC's Contention 2 and Contention 4 related to potential impacts on archaeological resources as a result of the future expansion of the Prairie Island ISFSI. In support of that future expansion, NSPM will perform subsurface archeological surveys as described in the commitment below.

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

Attachment 2 to this letter contains the Declaration of Herbert Olaf Nelson as described above, and ten cited enclosures. Enclosures 7 and 8 to Attachment 2 are calculations that include information considered proprietary to AREVA Inc. Enclosure 7 is calculation TN40HT-0511, Revision 0, "Dose Rates Estimate for Prairie Island ISFSI Comprised with TN40HT Casks Loaded with WE 14x14 OFA and WE 14x14 STD Fuel Assemblies." Enclosure 8 is calculation TN40HT-0510, Revision 0, "Representative Source Terms for the Prairie Island ISFSI."

Attachment 3 to this letter contains an affidavit from AREVA Inc., which has been executed to support withholding Enclosures 7 and 8 to Attachment 2 from public disclosure. This affidavit sets forth the basis on which the information may be withheld from public disclosure by the NRC and addresses with specificity the considerations listed in 10 CFR 2.390(b)(4). NSPM respectfully requests that the proprietary information in Enclosures 7 and 8 to Attachment 2 be withheld from public disclosure in accordance with 10 CFR 2.390(a)(4), as authorized by 10 CFR 9.17(a)(4).

Correspondence with respect to the proprietary aspects of AREVA Inc. information or the supporting AREVA Inc. affidavit in Attachment 3 should be addressed to Jayant Bondre, Vice President and Chief Operating Officer, AREVA Inc., 7135 Minstrel Way, Columbia, MD 21045.

Attachment 4 to this letter contains a non-proprietary version of AREVA Inc. calculation TN40HT-0511, Revision 0, "Dose Rates Estimate for Prairie Island ISFSI Comprised with TN40HT Casks Loaded with WE 14x14 OFA and WE 14x14 STD Fuel Assemblies." This non-proprietary version of the calculation may be released for public disclosure.

Attachment 5 to this letter contains a non-proprietary version of AREVA Inc. calculation TN40HT-0510, Revision 0, "Representative Source Terms for the Prairie Island ISFSI." This non-proprietary version of the calculation may be released for public disclosure.

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

Summary of Commitments

This letter contains the following new commitment:

> NSPM will perform subsurface archeological surveys within the area where any new ISFSI pads will be located, to a depth expected to be excavated for construction of the new ISFSI pads. These subsurface archeological surveys will be performed consistent with the Cultural Resource Management Plan and implementing procedures, and will be completed prior to submittal of a License Amendment Request for the ISFSI expansion.

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

Attachments (5)

cc: Administrator, Region III, USNRC
SFST Project Manager, Prairie Island ISFSI, USNRC
Environmental Project Manager, Prairie Island ISFSI, USNRC
NRR Project Manager, Prairie Island, USNRC (letter only)
Resident Inspector, Prairie Island, USNRC
State of Minnesota (letter only)
President of the Prairie Island Indian Community Tribal Council (letter only)

ATTACHMENT 1

Oath or Affirmation Pursuant to 10 CFR 72.16

1 Page Follows

UNITED STATES NUCLEAR REGULATORY COMMISSION

NORTHERN STATES POWER COMPANY - MINNESOTA

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

LICENSE RENEWAL APPLICATION FOR
MATERIALS LICENSE No. SNM-2506

SUPPLEMENT TO LICENSE RENEWAL APPLICATION
INFORMATION TO SUPPORT ENVIRONMENTAL REVIEW

The Northern States Power Company, a Minnesota corporation, d/b/a Xcel Energy (hereafter "NSPM") provides additional information that supports the application to renew the Materials License for the Prairie Island Independent Spent Fuel Storage Installation.

This letter contains no restricted or other defense information.

NORTHERN STATES POWER COMPANY - MINNESOTA

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

State of Minnesota

County of Goodhue

On this 21 day of August, 2014 before me a notary public acting in said County, personally appeared Kevin Davison, Site Vice President, Prairie Island Nuclear Generating Plant, and being first duly sworn acknowledged that he is authorized to execute this document on behalf of NSPM, that he knows the contents thereof, and that to the best of his knowledge, information, and belief the statements made in it are true.

[signature]

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

ATTACHMENT 2

Declaration of Herbert Olaf Nelson

With Enclosures 1-10

Enclosures

Enclosure 1 – H. Oley Nelson Resume

Enclosure 2 – Request for Additional Information (RAI) to Support Environmental Review, February 5, 2013, NRC

Enclosure 3 – NSPM Response to RAI for Environmental Review, March 13, 2013

Enclosure 4 – Figures Showing Location of the ISFSI and the Prairie Island Indian Community (PIIC)

Enclosure 5 – Certificate of Need (CON) 08-510 Application

Enclosure 6 – ISFSI Safety Analysis Report (SAR) Dose Analysis Excerpts

Enclosure 7 – AREVA Inc. Calculation, TN40HT-0511, Rev. 0, "Dose Rates Estimate for Prairie Island ISFSI Comprised with TN40HT Casks Loaded with WE 14x14 OFA and WE 14x14 STD Fuel Assemblies," Proprietary

Enclosure 8 – AREVA Inc. Calculation, TN40HT-0510, Rev. 0, "Representative Source Terms for the Prairie Island ISFSI," Proprietary

Enclosure 9 – Minnesota Public Utilities Commission (MPUC) Final Environmental Impact Statement (FEIS), Excerpts for Skyshine Dose

Enclosure 10 – 2012 Radiological Environmental Monitoring Program (REMP) Report, Prairie Island Nuclear Generating Plant

516 pages follow

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	Docket No. 72-10-ISFSI-2
Northern States Power Co.	)	
	)	
(Prairie Island Nuclear Generating Plant,	)	ASLBP No. 12-922-01-ISFSI-MLR-
Independent Spent Fuel Storage Installation)	)	BRD01

DECLARATION OF HERBERT OLAF NELSON

Herbert Olaf Nelson states as follows under penalties of perjury:

I. PROFESSIONAL QUALIFICATIONS

1. My name is Herbert Olaf Nelson. My professional qualifications are provided in Enclosure 1. In brief, I graduated in 1981 with a Bachelor of Science degree in Nuclear Engineering from the University of Wisconsin - Madison. I have over thirty years of experience in nuclear safety analysis as a reactor engineer, supervisor, licensing engineer, and spent fuel storage project engineer. This experience included performing reactor core reload design and safety evaluations as well as reviewing and overseeing analyses performed by others.

2. Since 2005, I have worked under contract to Northern States Power Company - Minnesota ("NSPM") as a Project Engineer on projects related to storage of used nuclear fuel. I provided technical oversight and review of safety analyses supporting (1) the submittal for approval to the Nuclear Regulatory Commissions ("NRC") of a spent fuel transportation package in accordance with 10 C.F.R. Part 71 for the TN-40 cask; (2) the NRC license amendment request for use of the TN-40HT cask at the Prairie Island Independent Spent Fuel Storage Installation ("PI ISFSI" or "ISFSI"); and (3) the PI ISFSI license renewal application to the NRC ("Application"). I also prepared the technical information associated with the project description and onsite and offsite dose projections supporting the Certificate of Need ("CON") application to

the Minnesota Public Utilities Commission ("MPUC") for the future expansion of the PI ISFSI (described in paragraph 11).

3. In relation to the issues raised in Prairie Island Indian Community's ("PIIC") Contention 4, I was the technical reviewer for the vendor prepared offsite dose analysis calculation that supported the CON application for the future expansion of the PI ISFSI. I was also the technical reviewer for the vendor prepared design basis offsite dose calculations that supported the Safety Analysis Report ("SAR") for the TN-40HT license amendment. In this role, I ensured that the inputs and assumptions used in the analyses conservatively bounded the Prairie Island used fuel and ISFSI design.

II. BACKGROUND AND ISSUES RAISED IN CONTENTION 4 (ENVIRONMENTAL JUSTICE).

A. BACKGROUND

4. I am providing this Declaration in support of Northern States Power Company's Motion for Summary Disposition of the Skyshine Dose Portion of Prairie Island Indian Community's Contention 4 (Environmental Justice) ("Motion"). By application dated October 20, 2011, and supplemented by letters dated February 29, 2012 and April 26, 2012, NSPM requested renewal of Materials License No. SNM-2506 for the Prairie Island ISFSI.

5. In preparing this Declaration, I reviewed relevant pleadings of the parties, including the August 24, 2012, Prairie Island Indian Community Request for Hearing and Petition to Intervene in License Renewal Proceeding for the Prairie Island Independent Spent Fuel Storage Installation (the "Petition" or "Pet.").

6. I understand that the Petition included Contention 4 alleging that "NSPM's Environmental Report does not adequately assess the impacts of the PI ISFSI on the adjacent minority population." Pet. at 42. The Petition set forth a number of risks and costs that it claims

were associated with the Prairie Island Nuclear Generating Plant ("PINGP") and PI ISFSI continued operation that PIIC alleges it has borne disproportionately. Pet. at 45-49.

7. I further understand that, in its Order of December 20, 2012, the Atomic Safety and Licensing Board ("Board") narrowed and admitted Contention 4 as follows:

> PIIC has stated an admissible contention with respect to two disparate impacts on PIIC as a minority population (1) potential disturbance of historic and archaeological resources and (2) skyshine radiation. These impacts are similar to those asserted in Contention 2 in that they stem from the likely future expansion of the ISFSI that is not examined in the [Environmental Report].

My Declaration and NSPM's Motion focus on the second admitted basis for PIIC's Contention 4 – alleged disparate impacts on the PIIC resulting from skyshine radiation from the future ISFSI expansion.

8. I also reviewed the NRC's February 5, 2013 Request for Additional Information ("RAI") to Support Environmental Review of the Proposed License Renewal for the Prairie Island Independent Spent Fuel Storage Installation ("Environmental RAIs") (included as Enclosure 2) and NSPM's response to the Environmental RAIs ("RAI Response") (included as Enclosure 3). NSPM's RAI Response included a discussion of the cumulative environmental justice impacts related to skyshine dose. I assisted with preparing that Response.

9. Additionally, I reviewed the NRC Staff's Draft Environmental Assessment of the Proposed Renewal of U.S. Nuclear Regulatory Commission License No. SNM–2506 for Prairie Island Independent Spent Fuel Storage Installation, (ADAMS Accession No. ML13205A120) ("Draft EA"), which was issued on November 7, 2013. The Draft EA contains an environmental justice analysis that addresses the impacts of the ISFSI expansion on skyshine radiation dose to the public. Draft EA at 4-36 - 4-40.

B. ISFSI DESCRIPTION

10. The PI ISFSI is located within the owner controlled area of PINGP. Application at 1-2. The layout of the ISFSI, the location of the ISFSI on the PINGP site, and the location of the PIIC are shown in the figures in Enclosure 4. Two fences surround the protected area of the ISFSI, which is approximately 720 feet long by 340 feet wide, roughly 5-1/2 acres in size, and a gravel road surrounds the perimeter of the fenced area. Application at E-10. The ISFSI includes two concrete pads designed to provide for storage of 48 vertical dry storage casks. *Id.* The casks are arranged in two parallel rows of 12 casks per row on each pad. *Id.* The concrete pads are 216 feet long x 36 feet wide x 3 feet deep. *Id.* Outside the gravel road, there is a 17 foot earthen berm surrounding the ISFSI to provide for radiological shielding. *Id.* at 1-2.

11. The PI ISFSI is currently licensed by the NRC to store 1920 spent fuel assemblies in 48 casks. Application at E-8. Prior to 2009, NSPM had authorization from the State of Minnesota to store only 29 dry casks, which was insufficient to support reactor operation through the end of the PINGP period of extended operation. Thus, NSPM applied to the MPUC for a CON to store up to 35 additional dry casks, for a total of 64 casks. The CON application is included as Enclosure 5. The CON was granted in December 2009. Application at E-12. Of the 35 additional casks, 19 would be placed on the two existing pads and 16 casks would be placed on two new pads which, based on the conceptual design described in the CON, would be located immediately south of each of the existing pads. Application at E-12. The ISFSI expansion design remains in the conceptual stages and work is ongoing to solidify the design. However, any new pads will be within the existing ISFSI footprint, i.e., wholly within the perimeter of the fences. Enclosure 3 at Enclosure 2, p. 6. NSPM has not yet applied to the NRC for approval to expand the ISFSI beyond the current 48 cask licensed capacity.

12. The CON application requested approval for enough casks to support continued operation of the PINGP through the end of the period of extended operation, i.e., a total of 64 casks. At the end of this period of extended operation, there will be fuel assemblies remaining in the spent fuel pool. If this pool inventory is moved to dry storage to facilitate decommissioning, a total of 98 casks will be required to store all the spent fuel generated at PINGP. Enclosure 5 at 3A-13. NSPM has not requested approval from the MPUC or the NRC for an expansion to store 98 casks.

13. Two types of casks are used to store fuel in the PI ISFSI: TN-40 and TN-40HT. The TN-40 casks contain fuel with a maximum average burnup of 45 Gigawatt-days per Metric Ton Uranium (GWd/MTU) and the TN-40HT casks contain fuel with a maximum average burnup of 60 GWd/MTU. Application at 2-4. As of the end of 2013, there were 29 TN-40 casks and 6 TN-40HT casks stored in the ISFSI. Enclosure 3 at Enclosure 2, p. 3. NSPM's current plans are that all additional casks to be stored at the PI ISFSI will be TN-40HT.

III. OFFSITE DOSE TO THE PUBLIC FROM SKYSHINE RADIATION

14. The PIIC Reservation is located adjacent to the PINGP and the PIIC was identified as a minority population within the 50-mile radius of the PINGP as part of the PINGP license renewal. Application at E-36. The NRC Staff in its Draft EA also identified PIIC as a minority population for environmental justice purposes. Draft EA at 3-26. The closest resident to the PI ISFSI is a member of the PIIC and is located 0.45 miles northwest of the PI ISFSI site. Application at E-10.

15. Radiological dose limits for protection of the public have been developed by the EPA and NRC to address the cumulative impact of acute and long term exposure to radiation. EPA's dose limits are codified at 40 C.F.R. Part 190 and provide that the annual dose equivalent to any member of the public cannot exceed 25 millirem ("mrem") to the whole body, 75 mrem to the

thyroid, and 25 mrem to any other organ as the result of exposures to planned discharges from fuel cycle operations and radiation from these operations. The NRC's dose limits are codified in 10 C.F.R. § 20.1301(a), which provides an annual limit of 100 mrem/year for individual members of the public and limits the dose in any unrestricted area from external sources to less than 2 mrem/hour. Additionally, there are criteria specific to effluents and direct radiation from an ISFSI in 10 C.F.R. § 72.104(a). These ISFSI specific criteria specify that the annual dose equivalent to any real individual who is located beyond the controlled areas must not exceed 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other critical organ as a result of planned discharges, direct radiation, and any other radiation from uranium fuel cycle operations within the region.

16. Dose to members of the public, including the PIIC, from normal operations at the ISFSI results from gamma and neutron radiation. Application at E-50. Dose rates decrease rapidly as a function of distance from the PI ISFSI. *Id.* There are no effluent releases from the ISFSI. Therefore, offsite dose is limited to direct and scattered, or skyshine, radiation. *Id.* Skyshine radiation is the radiation that travels upwards from the storage casks and is reflected back down to the ground off the atmosphere and represents only a small fraction of the total radiation emitted from the cask. Enclosure 5 at 7-37. The dry storage casks at the PI ISFSI are heavily shielded and the ISFSI is surrounded by a berm, which is 17 feet high, and essentially eliminates the direct radiation component leaving only skyshine radiation for offsite dose impacts. *Id.*

17. The PI ISFSI SAR describes the design basis offsite dose analysis performed for the PI ISFSI as currently licensed, i.e., for storage of 48 casks. Excerpts from the SAR describing this analysis are included as Enclosure 6. This analysis calculated the dose for 48 TN-40HT casks stored in two 2x12 arrays. Enclosure 6 at A7A.7-1. The dose rate calculated for the TN-40HT

casks conservatively bounds the dose from the TN-40 casks because the TN-40HT casks are licensed to store higher burnup fuel, and in the analysis are assumed to be loaded with design basis fuel assemblies, both of which provides for a higher radiological source term. Thus, the analysis conservatively bounds actual ISFSI operation, which has both TN-40 and TN-40HT casks. In the analysis, the casks are loaded in sets of four casks every two years with each cask loaded with design-basis fuel at the time of initial loading. *Id.* A design basis fuel assembly is described by a set of attributes (*e.g.*, burnup of 60 GWd/MTU and a uranium loading of 0.410 MTU) that provide a radiological source term more limiting than the fuel to be loaded into a cask. This ensures that the analysis calculates a dose rate higher than what will physically occur. The calculation credits decay of the source terms for the time the casks are on the ISFSI pads. The analysis modeled the presence of the berm. Thus, the dose rates at distances greater than 100 meters from the center of the ISFSI are dominated by the skyshine component. *See id.* at A7A.7-3. The calculation conservatively predicts the annual exposure from both direct and skyshine radiation to the nearest resident located 0.45 mile (724 meters) from the ISFSI to be 2.20 mrem/year based on the resident remaining in place outside, exposed 24 hours per day 365 days per year. *Id.* at A7.5-1.

18. As part of its CON application for the ISFSI expansion, NSPM prepared a more realistic dose analysis, based on fuel attributes that better represent the fuel loaded into the casks, to quantify the cumulative impacts of dose to the public from normal operations of the existing ISFSI and the expansion of the PI ISFSI to accommodate a total of 65 casks. This calculation is included as Enclosure 7. At the time the calculation was performed, NSPM thought that it would need 65 casks to accommodate used fuel through the end of PINGP's period of extended operation. Subsequently, however, NSPM determined that 64 casks were needed and the dose

calculation for 65 casks was used to conservatively bound the dose from 64 casks. Enclosure 7 calculated the dose rates for 65 TN-40HT casks as a function of distance from the ISFSI. For simplicity in setting up the calculation, the calculation assumes that the nearest resident is 700 meters northwest of the ISFSI pads and takes credit for the shielding provided by the ISFSI berm. As described in paragraph 14, however, the nearest resident is a PIIC member, located at 0.45 miles (724 meters) northwest of the ISFSI. Application at E-10. Thus, the dose to this nearest resident would be somewhat lower than predicted by the Enclosure 7 calculation. As with the SAR dose calculation, the Enclosure 7 dose calculation results at the distance of the nearest resident are dominated by the skyshine component as a result of the shielding from the berm. To determine a more realistic skyshine dose to the public, instead of assuming that all casks were initially loaded with design basis fuel as described in the PI ISFSI SAR dose analysis, the calculation used more realistic, yet still conservative, fuel attributes that better represent the actual fuel loaded into the casks. This more realistic dose calculation modeled all casks as TN-40HT casks and assumed that the first fifty-six casks contained Optimized Fuel Assemblies ("OFA") while the remaining nine casks contained Standard Fuel ("STD"). Enclosure 7 at 7. The source term calculation, included as Enclosure 8, used as input to the dose calculation was based on STD with a burnup of 50 GWd/MTU and a uranium loading of 400 Kg U (or 0.400 MTU) and OFA fuel assemblies with a burnup of 53 GWd/MTU and a uranium loading of 360 Kg U (or 0.360 MTU). Enclosure 8 at 5. While these assumptions are less conservative than the assumptions used in the SAR analysis, they still bound the fuel already loaded, and also bound fuel planned to be loaded in the future. The Enclosure 7 calculation also assumed that the nearest resident was outside, exposed 24 hours a day 365 days a year. Enclosure 7 calculated the dose rate to the nearest resident from skyshine and direct radiation from the PI ISFSI expansion

to be 0.36 mrem/year. Enclosure 7 at 18. This calculated dose is far below the limits specified in 10 C.F.R. § 72.104(a), 40 C.F.R. Part 190, and 10 C.F.R. § 20.1301(a). Thus, the potential skyshine impacts of the ISFSI expansion are SMALL, and thus are not significant.

19. The NRC Staff evaluated the offsite dose impacts associated with expansion of the ISFSI to accommodate a total of 98 casks. Draft EA at 4-36. In support of this analysis, the NRC Staff reviewed the MPUC dose calculations supporting the CON. Excerpts from the MPUC Final Environmental Impact Statement ("FEIS") are included as Enclosure 9. The MPUC calculated a conservative offsite dose rate of 4.4 mrem/year for 96 casks by doubling the dose rate calculated by NSPM using design basis fuel attributes (2.2 mrem/year) for 48 casks. Enclosure 9 at 36 n.121. Based on this calculation, the MPUC projected that the offsite dose for storing 98 casks would be no greater than 5 mrem/year to the nearest residence. *Id.* at 36. This result is far less than the limits specified 10 C.F.R. § 72.104(a), 40 C.F.R. Part 190, and 10 C.F.R. § 20.1301(a). The NRC Staff concluded that the methodologies used in support of the CON dose calculations were acceptable. Draft EA at 4-36. Based on this analysis, the NRC Staff concluded that the potential radiological impacts to members of the public from expansion of the ISFSI to accommodate 98 casks would not have a significant incremental contribution to cumulative impacts. *Id.* I agree with the NRC Staff's assessment that the MPUC's calculations are acceptable to demonstrate that potential dose impacts to members of the public from expansion of the PI ISFSI to accommodate 98 casks are not significant. Furthermore, the MPUC's analysis is a conservative estimate of the skyshine dose to members of the PIIC because it is based on design basis fuel attributes rather than the attributes of the fuel actually loaded into the casks and does not account for the reduction in dose that occurs over time from the decay of radionuclides

in the used fuel stored in the first 48 casks. The calculation also conservatively assumed that the nearest resident was outside, exposed 24 hours a day 365 days a year.

20. As part of its Radiological Environmental Monitoring Program ("REMP"), NSPM monitors ambient radiation using thermoluminescent dosimeters ("TLDs") inside the ISFSI berm, outside the ISFSI berm and at two special interest locations between the PI ISFSI and the PIIC ("PIIC TLDs"). NSPM reports the results of this monitoring annually to the NRC as part of its Annual REMP Report. The 2012 Annual REMP report, which was submitted in 2013, is included as Enclosure 10. The results of data gathered from the ISFSI monitoring locations are compared to a control location, which is a location that is distant, i.e., 11.1 miles from the plant, and upwind. Enclosure 10 at 3, 4, 17. An effect from skyshine from the ISFSI would be indicated if the radiation level at the PIIC TLDs was measurably larger than at the control location. *Id.* at 3. Enclosure 10 shows that the cumulative average of the two special PIIC TLDs measured an ambient gamma dose rate of 14.9 and 14.3 mrem/91 days. *Id.* at 8. In comparison, the dose rate at the control location was 16.2 mrem/91 days ambient gamma dose rate. *Id.* These results show that the 29 casks in storage at the ISFSI in 2012 had no discernable effect on the ambient gamma radiation near the PIIC. In its Draft EA, the NRC Staff reviewed the REMPs and concluded that all radiological levels are below regulatory limits. Draft EA at 4-23. NSPM will be required by its ISFSI Technical Specifications to continue the REMP program during the ISFSI period of extended operation, which would encompass any future ISFSI expansion.

21. NSPM is obligated to comply with regulatory dose requirements during the ISFSI period of extended operation and subsequent expansion of the ISFSI. Therefore, radiological impact to human health would be SMALL. Enclosure 3 at Enclosure 2, p. 20.

22. Because the impact to the PIIC from skyshine will be SMALL, the PIIC will not be subject to a high and adverse impact from skyshine radiation.

23. While the NRC Staff found that placement of up to 98 casks at the PI ISFSI would increase skyshine radiation exposure to the public above that for the currently licensed 48 casks, the exposure would be far below NRC regulatory limits and thus there would be no significant impacts. Draft EA at 4-39 - 4-40. Since there are no significant impacts, the NRC Staff concluded that there would be no disproportionately high and adverse impacts. *Id.* I agree with the NRC Staff's conclusion.

I, Herbert Olaf Nelson, swear under penalties of perjury that the foregoing declaration is true and correct to the best of my knowledge and belief.

Herbert Olaf Nelson
Demark, Inc.
715 South Oaks Drive
Hastings MN 55033
Phone: 651 267-7341
Email: Oley.Nelson@xenuclear.com

August 13, 2014

H. Oley Nelson

715 South Oaks Drive, Hastings MN 5503

Education

BS, Nuclear Engineering, 1981
University of Wisconsin - Madison

Experience

Prairie Island Spent Nuclear Fuel Projects – Project Engineer

DeMark, Inc.

2005 –present

- Technical oversight and review of vendor analyses associated with Part 71 Transportation submittal for the TN-40 cask design, the Part 72 Storage License Amendment Request ("LAR") for the TN-40HT cask design, and Prairie Island Independent Spent Fuel Storage Installation ("ISFSI") License Renewal.
- Prepared LARs for submittal to Nuclear Regulatory Commission ("NRC").
- Provided presentations to the NRC staff on the technical substance of the LARs and subsequent request for information.
- Prepared technical input for the Certificate of Need Application to the State of Minnesota for increasing the allowed storage at the Prairie Island ISFSI.
- Provided support to site personal during dry cask loading campaigns including the performance of 72.48 screenings and evaluations.

Prairie Island Replacement Steam Generator Project – Licensing Engineer

DeMark, Inc.

2002 – 2004

- Reviewed safety analyses for accuracy and consistency with the licensing basis.
- Prepared LARs for submittal to NRC
- Provided presentations to the NRC staff.
- Prepared 50.59 screenings and evaluations of calculations and analyses
- Identified affected procedures and revised plant procedures.

Nuclear Analysis and Design – Prairie Island Project Manager

Northern States Power Co.

1998 – 2002

- Direct supervisor for 6 engineers and associates
- Responsible for all Nuclear Analysis and Design services provide to Prairie Island Nuclear Generating Plant. This included resource allocation and overall project management to ensure that the plant's analytical needs were met. Analyses included reload core designs, safety analyses and analyses to support operational issues.
- Primary interface between the Prairie Island Nuclear Generating Plant and the Nuclear Analysis and Design Department.

Nuclear Analysis and Design – Process Manager

Northern States Power Co.

1993 – 1998

- Member of supervisory/management team of the Nuclear Analysis and Design department (21 employees). Responsibilities included supervision of all analysis services (core and transient reload analyses as well as other special analyses) for the Prairie Island and Monticello Nuclear Generating plants.

Nuclear Analysis Department, Superintendent Prairie Island Core Analysis

Northern States Power Co.

1991 – 1993

- Supervised the development and performance of all core analysis services for the Prairie Island Nuclear Generating Plant including calculations for reload core design, reload safety evaluations, and other special analyses to answer operational needs and NRC concerns.
- Direct supervisor for 5 engineers and associates

Production Training, Prairie Island Training Department – Senior Engineer

Northern States Power Company

1989 – 1991

- Classroom & simulator instructor for Operations training section.
- Conducted training, maintained training material and conducted performance feedback.
- Coordinated Senior Reactor Operator certification program and the Nuclear Fundamentals course.

Prairie Island Nuclear Plant, Production Engineer

Northern States Power Co.

1981 – 1989

- System & Reactor Engineer in the Prairie Island Nuclear Generating Plant Reactor Engineering group. Responsibilities included assisting operators during startups, load follows, physics testing, and fuel handling.
- Responsible engineer for various projects and modifications such as, wear resistant Rod Control Cluster Assemblies ("RCCA"), radiochemistry analysis, fuel inspections & repairs, and incore flux thimble replacement.
- Authored/responsible for the RCCA, incore thimble, and boraflex inspection programs as wells as Prairie Island's Fuel Integrity Program.

University of Wisconsin Reactor Lab – Part time reactor operator

1977 – 1981

- Logged over 4000 hours as duty reactor operator with over 400 significant reactivity changes,
- Instructor for various labs and neutron activation analysis.

Kewaunee Nuclear Power Plant, Summer Intern

Summer 1980

- Assisted Nuclear Engineering Department during refueling, startup, and operation.

General Electric, Summer Intern
Summer 1979

- Assisted Nuclear Operations Department in tracking performance of Boiling Water Reactors.

Licenses

- NRC Reactor Operating License – University of Wisconsin, 1979
- NRC Senior Reactor Operating License, Prairie Island Nuclear Generating Plant April 30, 1985

February 5, 2013

Mr. Mark A. Schimmel
Site Vice President
Prairie Island Nuclear Generating Plant
1717 Wakonade Drive East
Welch, MN 55089

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION TO SUPPORT ENVIRONMENTAL REVIEW OF THE PROPOSED LICENSE RENEWAL FOR THE PRAIRIE ISLAND INDEPENDENT SPENT FUEL STORAGE INSTALLATION (Docket 072-00010)

Dear Mr. Schimmel:

By letter dated October 20, 2011, as supplemented February 29, 2012, Northern States Power Company d/b/a Xcel Energy (NSPM) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew Special Nuclear Materials (SNM) License Number SNM–2506 for the Prairie Island Nuclear Generating Plan Site-Specific Independent Spent Fuel Storage Installation (ISFSI). NSPM is requesting that its license be renewed for a 40-year period.

On March 30, 2012, the NRC staff found NSPM's application to be acceptable for detailed review. On November 7, 2012, the NRC staff participated in a site visit at the Prairie Island ISFSI.

As part of its review, the NRC staff is assessing the potential environmental impacts of NSPM's proposed license renewal and has determined that additional information is required to complete our environmental review. Enclosed are the staff's requests for additional information (RAIs) that identify the information needed for the continued review of your license renewal application.

Please provide the information requested within 30 days, or a schedule for providing this information within 15 days, after the receipt of this letter. Please, note that significant delays in responding to this RAI could delay completion of the staff's environmental review.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

If you have any questions, please contact Ms. Jean Trefethen by telephone at 301-415-7000 or by email at Jean.Trefethen@nrc.gov.

Sincerely,

/RA/

Kevin Hsueh, Chief
Environmental Review Branch
Environmental Protection and
Performance Assessment Directorate
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

Docket No.: 72-10
TAC No.: L24592

cc: PINGP Service List

If you have any questions, please contact Ms. Jean Trefethen by telephone at 301-415-7000 or by email at Jean.Trefethen@nrc.gov.

Sincerely,

Kevin Hsueh, Chief
Environmental Review Branch
Environmental Protection and
Performance Assessment Directorate
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

Docket No.: 72-10
TAC No.: L24592

cc: PINGP Service List

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ML13017A295

OFC	DWMEP	DWMEP	DWMEP	OGC	DWMEP
NAME	JTrefethen	AWalker-Smith	DDiaz-Toro	CHair	KHsueh
DATE	1/17/13	1/17/13	1/22/13	1/24/13	2/5/13

OFFICIAL RECORD COPY

Prairie Island Nuclear Generating Plant,
Units 1 and 2

cc:

Manager, Regulatory Affairs
Prairie Island Nuclear Generating Plant
Northern States Power Co. - Minnesota
1717 Wakonade Drive East
Welch, MN 55089

Manager - Environmental Protection
Division
Minnesota Attorney Generars Office
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St. Paul, MN 55101-2127

U.S. Nuclear Regulatory Commission
Resident Inspector's Office
1719 Wakonade Drive East
Welch, MN 55089-9642

Regional Administrator, Region III
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lisle, IL 60532-4351

Administrator
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Tribal Council
Prairie Island Indian Community
A TIN: Environmental Department
5636 Sturgeon Lake Road
Welch, M N 55089

Paula Anderson
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Minneapolis, MN 55401

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Mark A. Schimmel
Site Vice President
Prairie Island Nuclear Generating Plant
Northern States Power Co. - Minnesota
1717 Wakonade Drive East
Welch, MN 55089

REQUEST FOR ADDITIONAL INFORMATION ON THE PROPOSED LICENSE RENEWAL APPLICATION FOR THE PRAIRIE ISLAND NUCLEAR GENERATING PLANT INDEPENDENT SPENT FUEL STORAGE INSTALLATION

LICENSE NO. SNM–2506
DOCKET NO. 072-00010

Request for Additional Information

RAI 1:

Northern States Power Company d/b/a Xcel Energy (NSPM) supplemental Environmental Report (ER) dated October 20, 2011, indicates that in May 2008, NSPM applied for a Certificate of Need (CON) from the Minnesota Public Utilities Commission (MPUC). This CON requested approval for additional storage of up to 64 casks at the Prairie Island (PI) Independent Spent Fuel Storage Installation (ISFSI). In December 2009, the MPUC issued an Order, "Order Accepting Environmental Impact Statement and Granting Certificates of Need and Site Permit with Conditions," which approved the storage of 16 additional casks (64 casks total) within the PI ISFSI boundary. Although the expansion is not part of the license renewal application but is reasonably foreseeable, it will be evaluated in the cumulative effects analysis of the environmental review. Provide the following additional information with respect to cumulative impacts.

- Clarify the planned schedule for placing up to 64 casks within the PI ISFSI and indicate their cask design type (TN-40 and TN-40HT).

- Discuss the potential cumulative impacts of this expansion for all resource areas to include past impacts on historic and cultural resources and socioeconomic resources. Provide a description of and quantify, where possible, the factors considered in evaluating the potential cumulative impacts. Provide mitigation measures that have been or would be taken to reduce or avoid potential cumulative impacts.

- In addition to this expansion, discuss any past, present, or reasonably foreseeable future actions which could result in cumulative impacts when combined with the proposed action. Provide a description of the potential cumulative impacts of these actions for all resource areas, quantifying the factors considered where possible, and provide a description of associated mitigation measures that have been or would be taken to reduce or avoid potential cumulative impacts.

This information is necessary for the U.S. Nuclear Regulatory Commission (NRC) staff to assess the environmental impacts of the proposed action as required by 10 CFR 51.30.

RAI 2:

According to the NRC's "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 39, Regarding Prairie Island Nuclear Generating Plant, Units 1 and 2 — Final Report" (NUREG-1437, Supplement 39), NSPM implements a Storm Water Pollution Prevention Plan (SWPPP). Clarify whether the ISFSI is discussed within the SWPPP and provide a copy of the following document:

> Nuclear Management Company, LLC, Prairie Island Nuclear Generating Plant Operations Manual, Section D14.6, "Storm Water Pollution Prevention Plan." March 2006.

RAI 3:

The environmental review for the proposed license renewal will include an environmental justice analysis. Discuss any mitigation measures that have been or would be taken to reduce environmental justice concerns.

This information is necessary for the NRC staff to conduct an environmental justice analysis for the proposed action consistent with NRC's "Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions" (69 *Federal Register* 52040, August 24, 2004).

RAI 4:

By letter dated May 18, 2011, NSPM wrote to the U.S. Fish and Wildlife Service (FWS) requesting concerns and data related to the potential impact of the proposed ISFSI license renewal to threatened and endangered species. Provide copies of any further correspondence between NSPM and the FWS related to the proposed ISFSI renewal.

This information is necessary to support NRC's determinations with respect to the Endangered Species Act of 1969, as amended.

RAI 5:

NRC staff reviewed FWS's most recent online occurrence data report and found that the Eastern massasauga rattlesnake (*Sistrurus catenatus*) was listed as a Federal candidate species as of October 2011 (76 *Federal Register* 66369) and may be present in Goodhue County, Minnesota. Its presence may not have been evaluated in the supplemental ER because the June 30, 2011, index report provided by the Minnesota Department of Natural Resources to NSPM did not list this species (see supplemental ER pages EA–39 to EA–41). Provide additional information regarding the potential occurrence of the Eastern massasauga rattlesnake in the vicinity of the site to support NSPM's statement that "[it] is aware of no activities during the period of extended operations that would adversely affect threatened or endangered species" (see supplemental ER page E–51).

This information is necessary to support NRC's determinations with respect to the Endangered Species Act of 1969, as amended.

References:

U.S. Fish and Wildlife Service. "Species by County Report, Goodhue, MN." 2013. http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=27049 (11 June 2013).

U.S. Nuclear Regulatory Commission. "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 39, Regarding Prairie Island Nuclear Generating Plant, Units 1 and 2, Final Report." NUREG–1437 Supplement 39. Washington, DC. May 2011.

Xcel Energy®

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

March 13, 2013

L-PI-13-022
10 CFR 72.42

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

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

Response to Request for Additional Information To Support Environmental Review Of The Proposed License Renewal For The Prairie Island Independent Spent Fuel Storage Installation (TAC No. L24592)

References:

1. Letter from Northern States Power Company, a Minnesota corporation, to the Nuclear Regulatory Commission, "Prairie Island Independent Spent Fuel Storage Installation (ISFSI) License Renewal Application," L-PI-11-074, dated October 20, 2011, ADAMS Accession Number ML11304A068.

2. Letter from Kevin Hsueh (NRC) to Mark A. Schimmel (NSPM), "Request for Additional Information to Support Environmental Review of the Proposed License Renewal for the Prairie Island Independent Spent Fuel Storage Installation," dated February 5, 2013, ADAMS Accession Number ML13017A295.

In Reference 1, Northern States Power Company, a Minnesota corporation, d/b/a Xcel Energy (hereafter "NSPM"), submitted a License Renewal Application (LRA) to renew Prairie Island's site-specific ISFSI license for a 40 year period. The current license expires on October 31, 2013. In Reference 2, the U.S. Nuclear Regulatory Commission (NRC) Staff requested additional environmental information to support its continued review of the license renewal application.

Enclosure 1 to this letter contains NSPM's oath or affirmation statement required pursuant to 10 CFR 72.16(b).

Enclosure 2 to this letter contains NSPM's responses to the Request for Additional Information (RAI) to support the NRC staff's environmental review of the LRA.

Attachment 1 of Enclosure 2 contains the Storm Water Pollution Prevention Plan per Request for Additional Information 2.

If there are any questions or if additional information is needed, please contact Mr. Brian R. Zelenak, Prairie Island ISFSI Licensing Lead, at 612-330-5641.

Summary of Commitments

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

Joel P. Sorensen
Acting Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota

Enclosures (2)

cc: Administrator, Region III, USNRC
NMSS Project Manager, Prairie Island ISFSI, USNRC
NRR Project Manager, PINGP, USNRC
Senior Resident Inspector, PINGP, USNRC
State of Minnesota

ENCLOSURE 1

OATH OR AFFIRMATION PURSUANT TO 10 CFR 72.16

1 Page Follows

UNITED STATES NUCLEAR REGULATORY COMMISSION

NORTHERN STATES POWER COMPANY - MINNESOTA

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

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
TO SUPPORT ENVIRONMENTAL REVIEW
OF THE
PRAIRIE ISLAND INDEPENDENT SPENT FUEL STORAGE INSTALLATION
LICENSE RENEWAL APPLICATION

Northern States Power Company, a Minnesota corporation, d/b/a Xcel Energy (hereafter "NSPM"), submits these responses to the U.S. Nuclear Regulatory Commission's (NRC) Requests for Additional Information to support NRC Staff's environmental review of NSPM's license renewal application to renew the site-specific material license for the Prairie Island Independent Spent Fuel Storage Installation 40 years beyond its current license, which expires on October 31, 2013.

NORTHERN STATES POWER COMPANY - MINNESOTA

By [signature]
Joel P. Sorensen
Acting Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota

State of Minnesota

County of Goodhue

JANET LOUISE SWANSON
NOTARY PUBLIC - MINNESOTA
My Commission Expires Jan. 31, 2017

On this 13 day of March 2013 before me a notary public acting in said County, personally appeared Joel P. Sorensen, Acting Site Vice President, Prairie Island Nuclear Generating Plant, and being first duly sworn acknowledged that he is authorized to execute this document on behalf of NSPM, that he knows the contents thereof, and that to the best of his knowledge, information, and belief the statements made in it are true.

Janet Louise Swanson

ENCLOSURE 2

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

27 Pages Follow (Excluding Attachment)

PRAIRIE ISLAND
APPLICATION FOR RENEWAL OF THE INDEPENDENT SPENT FUEL STORAGE MATERIALS LICENSE

This enclosure includes responses from Northern States Power Company, a Minnesota corporation, d/b/a Xcel Energy (hereinafter "NSPM"), to a Request for Additional Information (RAI) regarding the renewal of the Prairie Island site-specific Independent Spent Fuel Storage Installation (ISFSI) Materials License.

The RAIs are associated with the environmental review of NSPM's Prairie Island (PI) ISFSI License Renewal Application (LRA) submitted on October 20, 2011 (ADAMS Accession Number ML11304A068) which requested Materials License SNM-2506 be extended an additional 40 years. The RAIs were included in a letter from the U.S. Nuclear Regulatory Commission (NRC), dated February 5, 2013 (ADAMS Accession Number ML13017A295).

Request for Additional Information RAI 1:

Northern States Power Company d/b/a Xcel Energy (NSPM) supplemental Environmental Report (ER) dated October 20, 2011, indicates that in May 2008, NSPM applied for a Certificate of Need (CON) from the Minnesota Public Utilities Commission (MPUC). This CON requested approval for additional storage of up to 64 casks at the Prairie Island (PI) Independent Spent Fuel Storage Installation (ISFSI). In December 2009, the MPUC issued an Order, "Order Accepting Environmental Impact Statement and Granting Certificates of Need and Site Permit with Conditions," which approved the storage of 16 additional casks (64 casks total) within the PI ISFSI boundary. Although the expansion is not part of the license renewal application but is reasonably foreseeable, it will be evaluated in the cumulative effects analysis of the environmental review. Provide the following additional information with respect to cumulative impacts.

- *Clarify the planned schedule for placing up to 64 casks within the PI ISFSI and indicate their cask design type (TN-40 and TN-40HT).*
- *Discuss the potential cumulative impacts of this expansion for all resource areas to include past impacts on historic and cultural resources and socioeconomic resources. Provide a description of and quantify, where possible, the factors considered in evaluating the potential cumulative impacts. Provide mitigation measures that have been or would be taken to reduce or avoid potential cumulative impacts.*
- *In addition to this expansion, discuss any past, present, or reasonably foreseeable future actions which could result in cumulative impacts when combined with the proposed action. Provide a description of the potential cumulative impacts of these actions for all resource areas, quantifying the*

factors considered where possible, and provide a description of associated mitigation measures that have been or would be taken to reduce or avoid potential cumulative impacts.

This information is necessary for the U.S. Nuclear Regulatory Commission (NRC) staff to assess the environmental impacts of the proposed action as required by 10 CFR 51.30.

NSPM Response to RAI 1:

CASK SCHEDULE

In response to the first bullet of RAI 1, Table RAI 1-1 shows the tentative schedule for placing casks within the PI ISFSI. All casks loaded prior to 2013 were of the TN-40 design and all future casks are planned to be of the TN-40HT design. The physical construction of the additional PI ISFSI pads is tentatively scheduled to occur in 2019.

Table RAI 1-1 Tentative Schedule for PI ISFSI Cask Loading		
Year	**Number of Casks added to PI ISFSI**	**Total Number of Casks within PI ISFSI**
TN-40 Design		
Prior to 2013	-	29
TN-40HT Design		
2013	6	35
2014	3	38
2015	2	40
2016	3	43
2017	2	45
2018	0	45
2019*	0	45
2020	2	47
2021	0	47
2022	3	50
2023	2	52
2024	0	52
2025	2	54
2026	3	57
2027	0	57
2028	3	60
2029	2	62
2030	0	62
2031	2	64
* Physical construction of the additional pads (tentative).		

CUMULATIVE IMPACTS OVERVIEW

In response to the second and third bullets of RAI 1, NSPM has analyzed the cumulative impacts of the expansion of the PI ISFSI to store up to 64 casks and other past, present, or reasonably foreseeable future actions. Cumulative impacts are defined in the Council on Environmental Quality (CEQ) regulations at 40 CFR 1508.7 as "...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency...or person undertakes such other actions." The cumulative impact analysis for the proposed action, i.e. PI ISFSI License Renewal, was conducted in the following manner:

- Projects and activities included in this analysis are NSPM projects having impacts on resources that overlap with the predicted impacts of the PI

ISFSI License Renewal. Generally, these projects are located in the vicinity of the PI ISFSI, i.e., on the Prairie Island Nuclear Generating Plant (PINGP) site.

- The analysis includes NSPM projects that have already occurred, are occurring, or are reasonably foreseeable to occur in a time frame commencing with construction of the PI ISFSI through 2031, or when the 64th cask is tentatively scheduled to be loaded and placed on the PI ISFSI.

- Potential cumulative impacts are discussed for each resource area analyzed in the Environmental Report Supplement (ER) (Ref. 1), as summarized in ER Table 7-1. First, impacts from past, present, or reasonably foreseeable future projects on that resource are described. Then, the impacts of the proposed action when combined with the other actions are summarized. Finally, mitigation measures that have been or would be taken to reduce or avoid potential cumulative impacts are discussed.

- Information on future projects has been quantified to the extent feasible; however, details about future projects are subject to change. The issuance of authorizations and licenses necessary to construct or complete a project, project financing, and a project's construction schedule can all affect how a project impacts resources.

- Conclusions regarding the cumulative impacts on each resource area that result from the proposed action are based upon NSPM's judgment of the impacts of the proposed project and the stated impacts of the various other projects on the given resource area.

NSPM analyzed the following past, present, and reasonably foreseeable future NSPM actions in its cumulative impact analysis (presented in chronological order, followed by the proposed action). NSPM has not included a discussion of the PINGP extended power uprate project that was included in NRC's cumulative impacts analysis for PINGP license renewal (Ref. 2, p. 4-61) because NSPM is no longer pursuing this action.

PROJECTS CONSIDERED

PI ISFSI Construction and Operations (1992-present)

Construction of the PI ISFSI involved construction of the berm, security features, an alarm monitoring building, and two concrete pads – each 216 feet long, 36 feet wide, and 3 feet thick (Ref. 3). Before PINGP was constructed, the majority of the site's land was cultivated (Ref. 2, p. 4-58). The PI ISFSI was constructed on an open area within the PINGP site, a portion of which served as the site of the concrete batch plant for construction of Units 1 and 2. Prior to the PI ISFSI construction, portions of the PI ISFSI site were used for the disposal of dredged material taken periodically from the station

intake channel. At the time of construction, the area was covered with prairie grass, weeds, and trees (Ref. 3, p. 28). The area for the concrete pads and duct bank was excavated to a depth of six feet. After the pads and duct bank were constructed, the remainder of the PI ISFSI site was graded using excavated soil and Class 5 Aggregate. The berm surrounding the ISFSI is approximately 17 feet tall. (Ref. 1, p E-20) Casks are added to the PI ISFSI on a routine basis. Twenty-nine casks are currently stored within the PI ISFSI.

License Amendment for TN-40HT Cask Design (2010)

On March 28, 2008, NSPM submitted an application to the NRC to amend the PI ISFSI license to include the TN-40HT cask design. The modified cask design accommodates storage of fuel with a higher initial enrichment and higher burnup. No construction or modification to the PI ISFSI pads or facilities was necessary to support use of the new cask design. The NRC issued an Environmental Assessment for the amendment of the PI ISFSI license, which concluded that the approval of the license amendment (and the use of the TN-40HT cask design) would not cause any significant impacts to the human environment and would be protective of human health (Ref. 4).

PINGP License Renewal and Operations (2011-2033/2034)

On April 11, 2008, NSPM submitted an application to the NRC to issue renewed operating licenses for PINGP for an additional 20 year period (Ref. 5). On June 27, 2011, the NRC issued renewed operating licenses for PINGP Units 1 and 2 extending the license terms to August 9, 2033 and October 29, 2034, respectively. NRC published Supplement 39 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Prairie Island Nuclear Generating Plant, Units 1 and 2 (SEIS) in May 2011 (Ref. 2). The SEIS evaluated the environmental impacts of renewing the licenses for an additional 20 years. In the SEIS, the NRC noted that NSPM had no plans at this time to alter the site in connection with license renewal. However, the NRC noted that in the event that site alterations were conducted, NSPM had corporate procedures and practices that would mitigate impacts of land disturbing activities (Ref. 2 p. 4-62). NSPM has engaged in a number of construction activities related to PINGP operations (construction of a warehouse, security upgrades, etc.) since the operating licenses were renewed. Future construction activities are likely over the PINGP period of extended operations. All excavation activities within the period of extended operations have been and will continue to be carried out according to NSPM's corporate procedures to protect archaeological resources, including informing the Prairie Island Indian Community (PIIC) of excavation activities. These activities are further discussed in the Historical and Cultural Resources section below.

Unit 2 Steam Generator Replacement Project (2012-2013)

During the environmental review for the PINGP license renewal, NRC determined that the upcoming Unit 2 Steam Generator Replacement (SGR) Project qualified as a refurbishment activity expected to take place during the period of extended operations. The NRC therefore conducted a thorough environmental review of the SGR Project in the SEIS (Ref. 2, Chapter 3). The SGR Project will occur in the fall of 2013 and will take approximately 80 days to complete. The steam generators will arrive at PINGP via a

barge on the Mississippi River, be offloaded onto the existing PINGP barge landing, and moved to a temporary on-site storage building before being installed at PINGP. Construction related to the SGR Project includes erection of temporary buildings, a warehouse, and expansion of the PINGP parking lot. Construction of the temporary buildings and warehouse are complete; the parking lot will be expanded during the summer of 2013. The SGR Project will be completed in the fall 2013 with the installation of the steam generators during the outage.

PI ISFSI Expansion (anticipated 2019)
In May 2009, NSPM applied to the Minnesota Public Utilities Commission (MPUC) for a Certificate of Need to store up to 64 casks in the PI ISFSI (Ref. 6). The MPUC granted the Certificate of Need in December 2009 (Ref. 7). The PI ISFSI is currently constructed with pads designed to store up to 48 casks. Construction to support 16 additional casks is estimated to start in 2019 and is estimated to be completed within 1 month (Ref. 6, p. 7-51). ISFSI expansion will involve construction of two concrete pads, each 18 feet wide by 216 feet long by 3 feet thick. In addition, NSPM will install underground concrete duct banks and associated electrical conduit from the existing Cask Monitoring Building to the new pads. Work will include excavation of the pad area, trenching of the duct bank path, pouring the concrete pad and duct bank, and replacing the structural fill. Site preparation will involve using earth moving equipment such as bulldozers, scrapers, backhoes, and graders to excavate and level the pad and duct bank areas. Following the leveling of the area, reinforced steel, conduit and forms will be put in place and concrete will be poured forming the storage pads and duct banks. The area around the pads and trench over the duct bank will be back-filled and returned to the 2 percent grade when complete. The new pads will be placed within the existing boundaries of the current PI ISFSI, i.e., wholly within the area surrounded by the PI ISFSI security fence and berm.

PI ISFSI License Renewal (Proposed Action, Present)
On October 20, 2011, NSPM submitted an application to the NRC to renew the PI ISFSI license for an additional 40 years. Subject to the timely renewal provisions of 10 CFR 72.42(c), the current license will expire on October 31, 2013. If the license is renewed for the requested term, the PI ISFSI's license would be extended to October 31, 2053. The PI ISFSI is licensed to store up to 48 casks. The application included an Environmental Report Supplement that addressed the environmental impacts of the proposed action. The license renewal request did not request additional or modified storage, and no construction activities will be undertaken as a part of the proposed action (Ref. 1).

RESOURCE AREA CUMULATIVE IMPACT DISCUSSIONS

Land Use

Construction of the PI ISFSI, including the site area, berm and access road, impacted approximately 10 acres of the 560 acre PINGP site. The principal terrain alterations to the site area came from clearing, excavation, grading, and berm construction. Cleared

areas and exposed earth were then seeded, graveled or paved to stabilize and control runoff, and to minimize soil erosion. After construction of the concrete slabs was complete, the area immediately surrounding the slabs was covered with well-compacted crushed rock. The construction did not impact offsite land use (Ref. 3, p. 28). Activities related to the TN-40HT license amendment did not result in any onsite or offsite land use changes. Operation of PINGP over the period of extended operations will result in construction of additional buildings or other site modifications as deemed necessary by NSPM. The NRC determined that the SGR Project will have little noticeable effect on land use in the region (Ref. 2, p. 3-7 and 3-8), and all work (e.g., construction of warehouses, temporary buildings, parking lot expansions) will take place within the existing PINGP site boundaries. Expansion of the PI ISFSI will not result in any on-site or off-site land use impacts, as the additional casks will fit within the footprint of the existing PI ISFSI (Ref. 6, p. 7-1).

The proposed action will not result in any additional land use impacts, as it will not involve any construction or operations outside of the existing PI ISFSI footprint (Ref. 1, p. E-51 and E-59). Construction of the PI ISFSI resulted in a change in land use for approximately 10 acres of the PINGP site. PINGP has engaged in construction projects that have changed on-site land use within PINGP boundaries, and it is likely that PINGP will complete other construction projects over the period of extended PINGP operations. The remainder of the projects considered by NSPM will have little or no impacts to land use in the PI ISFSI vicinity, therefore, there will be no incremental impacts of the proposed action when added to other past, present, and reasonably foreseeable future actions.

NSPM has implemented no mitigation measures for cumulative land use impacts.

.Transportation and Social Services

Construction of the PI ISFSI resulted in a temporary increase in traffic to accommodate construction equipment, supplies, and personnel. The TN-40HT amendment did not result in any impacts to transportation and social services. NSPM has no plans to add non-outage employees during the PINGP license renewal period; therefore, there will be no noticeable change in traffic volume, levels of service on roadways in the area, or impacts to public water and sewer services (Ref. 2, p. 4-33 and 4-34). Construction projects related to PINGP operations could result in small increases in traffic for short periods of time. For the SGR Project, the NRC determined that due to the small amount of additional workers required for the SGR Project, there will be no noticeable impact on public utilities (Ref. 2, p. 3-7). The NRC also determined that past outages have impacted the level of service capacity on Sturgeon Lake Road for short periods of time, and that there could be small to moderate impacts on transportation during shift changes. Construction of the two new pads for expansion of the PI ISFSI will consist of earthwork, structural fill and concrete materials being brought to the site, delivery of equipment and supplies, and daily construction workers commuting to the sites in the morning and afternoon at least five days per week for a few weeks. NSPM estimates that a maximum of 24 additional construction vehicles per day and 6 additional

commuter vehicles per day will be necessary for PI ISFSI expansion. During operation, there will be no increase in traffic since expansion will not result in additional full time workers at the PI ISFSI (Ref. 6, p. 7-49 and 7-50). No additional public access roads will be required for expansion of the PI ISFSI facility (Ref. 6, p. 7-52). The NRC determined that members of the PIIC residing along site access roads could experience increased commuter vehicle traffic during shift changes, and that there will be temporary increases in the demand for public services related to PI ISFSI expansion (Ref. 2, p. 4-61). The NRC determined that these impacts will be short-term and limited (Ref. 2, p. 4-63). NSPM believes that the small amount of additional construction and commuter vehicles needed for PI ISFSI expansion (30 vehicles a day over a 1-month period) will not result in any noticeable impact to the PIIC.

The proposed action will not result in any additional transportation or social service impacts, as it will not require additional employees (Ref. 1, p. E-51 and E-59). The SGR Project and the expansion of the PI ISFSI will result in minimal, short-term impacts on vehicle traffic and public services; however, these activities will not take place at the same time, and the periods of impact will not overlap. The remainder of the projects considered by NSPM will have no impacts to transportation or social services in the PI ISFSI vicinity. Therefore, there will be no incremental impact of the proposed action on transportation and social services when added to other past, present, and reasonably foreseeable future actions.

NSPM has already constructed a private access road that bypasses the PIIC casino and reservation property. This road is used by the majority of vehicles that enter the PINGP site. To further mitigate transportation and social services, NSPM agreed to work with the PIIC to coordinate and implement appropriate measures to mitigate transportation impacts resulting from the SGR Project (Ref. 11, p. 29, FN 19).

Geology and Soils

Construction of the PI ISFSI, including the site area, berm, and access road impacted approximately 10 acres of soil within the 560 acre PINGP site. The NRC's Environmental Assessment for PI ISFSI construction noted that the soils at the site were somewhat frost susceptible, and to avoid any potential problems, footings and slabs were founded below the anticipated frost depth or on fill below the frost depth. The settlement upon loading the cement slab has been found to be acceptable. In addition, the subsurface materials were found to be stable and adequate for the proposed foundation loading (Ref. 3, p. 17). The use of the TN-40HT casks will have no impact on geology or soils. PINGP has conducted recent construction projects that have had minor impacts on soils within the site, and it is reasonable to assume that PINGP will undertake additional projects over the period of extended operations that will impact soils on site. The SGR Project has involved ground disturbing in previously disturbed areas for the new warehouse, and temporary buildings, and will impact soils for expansion of the parking lot. Because the work for the SGR Project will occur primarily on disturbed land (Ref. 2, p. 3-9) there will be no additional impacts to geology or soils. The PI ISFSI expansion will include ground disturbing activities within the existing PI

ISFSI site as described above. Soil samples from within the PI ISFSI show that soils within the PI ISFSI exhibit a significant degree of previous disturbance (Ref. 8, p. 4), and some of the soil in the area of disturbance is Class 5 Aggregate brought to the site as part of PI ISFSI construction.

The proposed action will not result in any geology or soils impacts, as it will not involve soil disturbance and does not involve liquid discharges (Ref. 1, p. E-25, E-51 and E-59). The SGR Project and the PI ISFSI expansion will involve impacts on soils; however, these soils have been previously disturbed by other projects. PINGP has engaged in construction projects that have impacted soils within PINGP boundaries, and it is likely that PINGP will complete other construction projects over the period of extended operations. The remainder of the projects considered by NSPM will have no impacts to geology or soils. Therefore, there will be no incremental impact of the proposed action on geology and soils when added to other past, present, and reasonably foreseeable future actions.

NSPM implemented no mitigation measures for cumulative geology and soils impacts.

.Water Resources

Construction of the PI ISFSI did not have an impact on local water supplies, and the drainage system installed for the PI ISFSI did not alter the natural drainage patterns. Construction of the PI ISFSI resulted in negligible impacts on water quality and water supply (Ref. 3, p. 29), as water use was limited to the construction period (dust suppression, water for concrete). Both the TN-40HT amendment and SGR Project have no impacts on water resources (Ref. 4, p. 9; Ref. 2, p. 3-1). The NRC determined that the license renewal of PINGP would result in small impacts on nearby ground water wells or ground or surface water consumptive use during the period of extended operations. (Ref. 2, p. 4-2 through 4-4) The PI ISFSI expansion will not result in any additional discharges to water (Ref. 6, p. 7-39) or surface water impacts, as the additional casks will not have any liquid effluents or rely on surface water sources. Since the expansion will not add any wastes to storm water, it is expected that the quality of the runoff will be similar to the existing runoff quality. The expansion will add a little more than an acre of impervious surfaces which will not absorb runoff. Therefore, the quantity of runoff will slightly increase. This runoff will be directed toward existing natural flow routes around the PI ISFSI. The proposed expansion of the pads at the PI ISFSI is not expected to disturb any additional undisturbed land area; therefore no additional storm water permitting is expected (Ref. 6, p. 7-46 and 7-47). The PI ISFSI expansion could result in the use of up to 52,500 gallons of water for construction dust control during excavation of soil and placement of fill for the pads and a small amount of water to make the concrete. The water used for dust control would likely be appropriated from the Mississippi River (Ref. 6, p. 7-52). NSPM anticipates that the concrete will be trucked in, so no on-site water will be used for concrete.

The proposed action would not result in any additional water resource impacts, as it does not involve liquid discharges or use ground or surface water for operation (Ref. 1,

p. E-51 and E-59). Construction of the ISFSI and the PI ISFSI expansion have and would result in water use for dust control; however, quantities necessary for these activities are negligible and the activities would not occur at the same time. The remainder of the projects considered by NSPM will have no or small impacts to water resources. Therefore, the proposed action will have no impacts on water resources when added to other past, present, and reasonably foreseeable actions.

As a mitigation measure, NSPM will use energy absorbing controls (e.g., riprap, other sediment controls) to minimize the potential for storm water erosion during the construction and operation periods related to PI ISFSI expansion (Ref. 6, p. 7-47).

Ecological Resources

Construction of the PI ISFSI resulted in the loss of biological production from approximately 10 acres of land on the PINGP site. The habitat displaced by the PI ISFSI consisted primarily of trees, shrubs, prairie grasses, and weeds. The area was used by common small mammals, insects and birds. Minimal displacement of resident fauna likely occurred within the PI ISFSI as a result of construction noise. NRC determined that the land on which the PI ISFSI was constructed was not unique or critical to wildlife, and that the site was not used for nesting or feeding by bald eagles or migratory birds. Disruption of wildlife activities due to construction noise was expected to be minimal (Ref. 3, p. 28). The NRC also determined that operation of the PI ISFSI would have a minimal impact on the local wildlife, as birds were not expected to roost directly on the casks due to their high surface temperature, and the fence surrounding the PI ISFSI would prevent access by other wildlife (Ref. 3, p. 47). As the construction and operation of the PI ISFSI involved no use or degradation of water resources, its impact on fish and wildlife resources was negligible (Ref. 3, p. 29 and 47). For the TN-40HT amendment, the NRC determined that there would be no impact on aquatic biology, listed species or critical habitat (Ref. 4, p. 9). For PINGP license renewal, NRC found that that the total impact from impingement, entrainment, and heat shock on aquatic resources, along with impacts on terrestrial resources, would be small (Ref. 2, p. 4-13 and 4-14). The NRC determined that the continued operation of PINGP could cause long-term destabilization of certain special-status mussel species and have a moderate impact (Ref. 2, p 4-20). For the SGR Project, there would be small impacts to terrestrial species due to minimal noise and construction activity during the 80 day project timeline (Ref. 2, p. 3-4). For PI ISFSI expansion, the area impacted by construction has been disturbed by past vegetative clearing and land grading as described above. Plant species observed near the PI ISFSI are common plants of the area, and several are non-native and/or invasive species (Ref. 6, p. 7-8). Activities related to expansion will result in impacts to a facility already converted to industrial use. There could be small, short-term impacts due to minimal noise and construction activity during the project timeline.

The proposed action will not result in any additional impacts to ecological resources. NSPM continues to observe special-status bird and plant species on the PINGP site, but none within the area impacted by the proposed action (Ref. 1, p. E-51 and E-59).

Ecological impacts related to PINGP license renewal concern aquatic species; aquatic species will not be impacted by any activities at the PI ISFSI. The SGR Project and the PI ISFSI expansion project could result in small, short-term impacts to ecological resources as a result of construction activities and noise; however, these activities would not take place at the same time, and the periods of impact would not overlap. The remainder of the projects considered by NSPM will have no impacts to ecological resources in the PI ISFSI vicinity. Therefore, there will be no incremental impact of the proposed action on ecological resources when added to other past, present, and reasonably foreseeable actions.

NSPM has implemented no mitigation measures for cumulative ecological resource impacts.

Meteorology, Climatology, and Air Quality

Temporary increases in levels of suspended particulate matter likely resulted from construction of the PI ISFSI. In addition, exhaust from construction vehicles likely added to levels of hydrocarbons, carbon monoxide, and nitrogen oxide (Ref. 3, p. 30). Because the surface temperature of the storage casks is higher than ambient, the NRC determined that cask-induced fogging could occur. NRC's analysis indicated that visible fogging impacts due to the ISFSI casks could occur from .04 to .2 percent of all hours (Ref. 3, p. 47 and 48), and that this fogging would be insignificant (Ref. 3, p. 51). For the TN-40HT amendment, the NRC determined that the increase in cask surface temperature would not affect the climate of the region (Ref. 4, p. 9). PINGP has a number of stationary emission sources that result in small air quality impacts over the period of extended operations (Ref. 2, p 2-27 and 4-1). The SGR Project will result in small air quality impacts for the duration of the 80-day outage due to emissions and fugitive dust from operation of earth-moving and material-handling equipment and emissions from the vehicles of temporary workers (Ref. 2, p. 3-5 and 3-6). For PI ISFSI expansion, emissions during construction and from infrequent vehicular traffic also will result in small, temporary impacts on air quality. Construction activities will result in fugitive dust, and workers traveling to and from the site will contribute to additional exhaust from their vehicles. The NRC has previously determined that dust impacts during PI ISFSI expansion would be short-term and limited to onsite activities at PINGP (Ref. 2, p. 4-6).

The proposed action will not result in any additional air quality impacts, as the action will not result in air emissions and the PI ISFSI does not influence meteorology or climatology in the region (Ref. 1, p. E-29, E-51 and E-59). The SGR Project and PI ISFSI expansion will result in small, short-term impacts to air quality as a result of construction activities; however, these activities will not take place at the same time, and the periods of impact would not overlap. The remainder of the projects considered by NSPM have no or small impacts on meteorology, climatology, or air quality. Therefore, there will be no incremental impact of the proposed action on meteorology, climatology, or air quality when added to other past, present, and reasonably foreseeable future actions.

When the PI ISFSI was constructed, NSPM used water to control fugitive dust (Ref. 3, p. 30). NSPM will control fugitive dust related to PI ISFSI expansion by wetting exposed soil areas and covering stockpiles (Ref. 6, p. 7-39).

Noise

Construction of the PI ISFSI generated noise related to construction equipment, but the impact was of minimal duration. Due to the distance of the site from the nearest residence, the impact on the surrounding community was considered to be acceptable (Ref. 3, p. 29). The only operational noise associated with the PI ISFSI is related to the transfer of spent fuel from the spent fuel pool facility to the dry cask storage facility. Since this noise was not expected to be louder than normal truck traffic and was expected to be infrequent, adverse impacts were expected during PI ISFSI licensing (Ref. 3, p. 47). The TN-40HT amendment did not result in any noise impacts. For PINGP license renewal, the NRC did not identify any noise-related impacts related to nuclear plant operations that could be detected offsite other than those already experienced during past operations and determined that that impacts would be small (Ref. 2, p. xvi, 2-57, and 4-21). The NRC determined that the SGR Project may cause some noise and impacts for the replacement period, but these effects will likely be minimal and short term as the proposed refurbishment outage is approximately 80 days (Ref. 2, p. 3-4, 3-8, and 3-9). For the PI ISFSI expansion, there will be small noise impacts related to construction. NSPM conducted a noise analysis for ISFSI expansion and determined that predicted noise level during expansion will be higher than the ambient sound levels. However, all the construction sound levels were well below the Minnesota daytime code limit of 60 dBA. During normal operation after expansion the PI ISFSI will have no noise impact on the area. When spent fuel is moved from the plant to the concrete pad there will be some noise impact due to the operation of a truck or front end loader, but this impact will be minor and infrequent (Ref. 6, p. 7-41, 7-42, and 7-43). NSPM determined that there will be no noise impact related to PI ISFSI expansion at the nearest noise sensitive receptors and no noise control devices will be required (Ref. 6, p. 7-46). The NRC determined that noise impacts during PI ISFSI expansion will be short-term and limited to onsite activities at PINGP (Ref. 2, p. 4-62).

The proposed action will not result in any additional noise impacts, as no noise is directly attributable to the operation of the PI ISFSI other than the occasional vehicle

traffic to and from the site (Ref. 1, p. E-30, E-51, and E-59). The SGR Project and PI ISFSI expansion could result in small, short-term impacts to noise as a result of construction activities; however, these activities would not take place at the same time, the periods of impact would not overlap, and noise related to the projects would not be detectable off-site. The remainder of the projects considered by NSPM have no or small impacts on noise. Therefore, there will be no incremental impact of the proposed action on noise when added to other past, present, and reasonably foreseeable future actions.

NSPM has considered no mitigation measures for cumulative noise impacts.

Historical and Cultural Resources

When the PI ISFSI was constructed, NSPM was not aware of any areas of historical, archeological and cultural significance within the PI ISFSI site boundary (Ref. 3, p. 15). Excavation for the PI ISFSI construction took place as described above. For the TN-40HT amendment, the NRC determined that there would be no effects on historic properties and no adverse impacts to existing archaeological resources because there would be no increase in the footprint of the PI ISFSI (Ref. 4, p. 11). For PINGP license renewal, the NRC determined that the potential impacts of continued operations and maintenance of PINGP on historic, archaeological, and cultural resources could be moderate, but that impacts could be mitigated with a number of actions (Ref. 2, p. 4-40). For the SGR Project, ground disturbing activities have involved excavation of previously disturbed areas for temporary buildings and warehouses, and will require grading for parking lot expansion. Because the work would occur on disturbed land, the NRC determined that potential impacts would be small. However, the NRC concluded that there remains the potential for unknown cultural resources to be present in disturbed areas of the site (Ref. 2, p. 3-9). For the PI ISFSI expansion, NSPM is aware of no archaeological resources known to exist within the boundary of the PI ISFSI. According to original licensing documents no archeological resources were found in the vicinity of the PI ISFSI site during investigations (Ref. 6, p. 7-28), and no archaeological resources were found during construction of the PI ISFSI. NSPM commissioned a Phase I Archaeological Reconnaissance Survey of the entire site in 2009/2010; that study noted that the area where the PI ISFSI is located is very heavily disturbed by construction, and that within the disturbed areas, archaeological potential is generally very low. In addition, NSPM commissioned a study of eight core samples around the area of PI ISFSI expansion; that study concluded that it is likely that the majority of the deposits in the vicinity of the PI ISFSI have been significantly modified by past construction events, and contain limited original integrity (Ref. 8, p. 3 and 5). The NRC reviewed the impacts of PI ISFSI expansion in their cumulative impacts analysis for PINGP license renewal and determined that impacts on historic and archaeological resources would be small (Ref. 2, p. 4-62).

The proposed action would not result in any impacts to historical and cultural resources, as it would not involve any ground disturbing activities. The Minnesota State Historic Preservation Office (MN SHPO) has determined that no properties listed in or eligible

for listing in the National Register of Historic Places would be affected by PI ISFSI license renewal (Ref. 1, p. E-51, E-52, E-59). The SGR Project and the ISFSI expansion could result in small impacts to previously unknown historical, cultural and archeological resources, as there remains the potential for unknown cultural resources to be present in disturbed areas of the site. The remainder of the projects considered by NSPM have no to moderate impacts on historical and cultural resources, and moderate impacts could be mitigated.

NSPM has implemented a number of measures to mitigate archaeological, cultural, and historic impacts from past, present, and reasonably foreseeable future actions. These include the following:

- NSPM has implemented a cultural resource and awareness training program for NSPM staff responsible for managing excavation projects. The training helps to ensure that informed decisions are made when considering the effects of continued operations and maintenance on historic and archaeological resources.

- NSPM has developed a Cultural Resource Management Plan (CRMP) in cooperation with the PIIC, Minnesota State Historical Preservation Office (MN SHPO), and the Bureau of Indian Affairs. The CRMP coordinates corporate procedures and policies, manages and protects the archaeological sites and resources on the PINGP site, and provides for notification of a Qualified Archaeologist before work takes place in certain areas of the site.

- NSPM has revised its Archaeological, Cultural and Historic Resources and Excavation and Trenching Controls procedures in cooperation with the PIIC, MN SHPO, and the Bureau of Indian Affairs. Prior to any ground-disturbing activity, NSPM would consider the potential impact on undisturbed areas and archaeological resources according to these procedures. Should archaeological resources be encountered during construction, these procedures require that work cease until NSPM environmental personnel perform an evaluation and consider possible mitigation measures through consultation with the PIIC and other parties.

- NSPM maintains regular communication with the PIIC regarding activities that could impact historic and archaeological resources, including periodic meetings and an annual report on excavation activities.

- NSPM conducted a Phase I Archaeological Reconnaissance Survey of the entire PINGP site.

- NSPM conducted a survey of medicinally and culturally important plants present on the PINGP property, and from that survey developed a Plant Guide for PINGP personnel that can be used to aid in identification of plants with special importance to the PIIC.

- NSPM assisted in the repatriation of funerary artifacts and remains that were excavated in 1968 on the PINGP site and participated in a PIIC ceremony for the repatriation.

.Visual and Scenic Resources

Construction of the PI ISFSI involved conversion of 10 acres of the PINGP site to use for the PI ISFSI. The berm shields the PI ISFSI from public view. Although the TN-40HT casks are a few inches shorter than the TN-40 casks, they are of the same general size and shape and no additional visual impact will result from their use. For PINGP license renewal, the NRC determined that the viewshed impacts (e.g., cooling towers, containment buildings) from the Mississippi River and other offsite locations are small (Ref. 2, p. B-9). The SGR Project will occur within the footprint of the existing facility and although it will be seen by PINGP employees, it will not be seen from off-site. PI ISFSI expansion will not result in any additional impacts to visual and scenic resources, as it is shielded from view from any public or private locations, including the employee viewshed at most angles (Ref. 1, p. E-32, E-51, E-52, E-59). All construction activities related to the PI ISFSI expansion will occur within the existing PI ISFSI facility and within the berm.

The proposed action will not result in any additional impacts to visual and scenic resources, as it is shielded from view from any public or private locations, including the employee viewshed at most angles (Ref. 1, p. E-32, E-51, E-52, E-59). All of the projects considered by NSPM have no impacts or small impacts on visual and scenic resources. Therefore, there will be no incremental impact of the proposed action on visual and scenic resources when added to other past, present, and reasonably foreseeable future actions.

NSPM has considered no additional mitigation measures for cumulative visual or scenic impacts beyond the existing berm.

.Socioeconomics

Construction of the PI ISFSI was performed by local construction forces; therefore, no personnel were required to relocate. The peak construction force was about 20 workers, and operation of the PI ISFSI does not require an additional workforce. Therefore, the workers required to construct and operate the project did not affect the socioeconomic characteristics of the area (Ref. 3, p. 30). Use of the TN-40HT casks will not result in any impacts to socioeconomic resources. For PINGP license renewal, the NRC determined that there would be no impact on socioeconomic conditions in the region beyond what was currently being experienced. Since NSPM has no plans to hire additional workers during the license renewal term, overall expenditures and employment levels would remain relatively constant with no additional demand for permanent housing, public utilities, and public services. In addition, since employment levels and the tax payments would not change, there would be no population or tax revenue-related land use impacts (Ref. 2, p. 4-60). There also would be no significant

impacts related to tax revenue during the license renewal term beyond what has already been experienced (Ref. 2, p. 4-34). Continued operation of PINGP for up to an additional 20 years provides for continued economic benefit to the PIIC through PINGP-related commerce at their casino, hotel, and gas station/convenience store, and continued economic benefit to taxing jurisdictions. For the SGR Project, the NRC determined that due to the small amount of additional workers required there would be no noticeable impacts on housing and education (Ref. 2, p. 3-6 and 3-7). Expansion of the PI ISFSI would require approximately 13 workers, including equipment operators, laborers, electricians, iron-workers, concrete finishers, and construction supervision staff (Ref. 6, p. 7-51). These workers would likely be sourced locally. The PI ISFSI would not require any additional workers after expansion. The NRC determined that increased demand for rental housing during the PI ISFSI expansion could cause an impact, but due to the short duration of the PI ISFSI expansion and the availability of rental housing in the area, impacts would be short-term and limited (Ref. 2, p. 4-63). The NRC did not appear to consider that PI ISFSI expansion workers would be sourced locally, which decreases the likelihood of any impact on rental housing. The PI ISFSI expansion would also increase tax payments due to increased income to workers and assessed value to NSPM (Ref. 2, p. 4-61).

The proposed action will not result in any negative socioeconomic impacts, as it will not require additional employees not already employed by NSPM and therefore will not impact the general population, transient populations, minority or low-income populations, or the housing or services currently received by these populations. The continued existence of the PI ISFSI will maintain the taxable value of the property (Ref. 1, p. E-33-46, E-51, and E-59), and will contribute to continued positive socioeconomic impacts to the PIIC through an annual payment from NSPM for every year that the casks remain on-site. Although the SGR Project will require additional workers, the project will not require the number of workers necessary to have an impact on local housing or education resources. The PI ISFSI expansion project will likely have no impact on housing, as NSPM expects to source these workers locally. Both the SGR Project and the PI ISFSI expansion will add to the value of PINGP and therefore increase the amount of taxes paid to taxing jurisdictions. All of the other projects considered by NSPM either have no negative impacts on socioeconomic resources, or have positive impacts on businesses and communities in the immediate area. Therefore, there will be no incremental negative impact of the proposed action on socioeconomics when added to other past, present, and reasonably foreseeable actions.

NSPM has considered no mitigation measures for socioeconomic impacts as a result of the proposed action.

Waste Management

Construction and operation of the PI ISFSI resulted in generation of construction waste that was disposed of off-site. The NRC acknowledged that operation of the PI ISFSI would not generate any chemical, sanitary, or solid wastes (Ref. 3, p. 27). The use of

the TN-40HT casks will not result in any waste management impacts. For PINGP license renewal the NRC determined that the waste management impacts would be small (Ref. 2, p. 8-40). The NRC did not conduct a waste management analysis for SGR Project; however, they stated generically that wastes related to refurbishment projects would be disposed in a permitted manner, either onsite or offsite at an authorized disposal facility (Ref. 2, p. E-30). For PI ISFSI expansion, there will likely be a small amount of construction wastes that would be disposed of off-site. The expanded facility would not produce any solid or liquid wastes (Ref. 6, p. 7-46).

The proposed action would not result in any additional waste management impacts, as it would not involve generation of operational waste outside of what is normally produced for construction and operation of the ISFSI (Ref. 1, p. E-11, E-51, E-59). All of the other projects considered by NSPM have no impacts or small impacts on waste management. Therefore, there will be no incremental impact of the proposed action on waste management when added to other past, present, and reasonably foreseeable future actions.

NSPM has considered no mitigation measures for cumulative waste management impacts.

Environmental Justice

Because the PI ISFSI license application was submitted prior to issuance of Federal policies on considering environmental justice impacts, the NRC did not evaluate these impacts for construction of the PI ISFSI (Ref. 3).

For the TN-40HT amendment, the NRC determined that there could be potential radiological impacts to minority and low-income populations. However, radiation doses from the modified TN-40 cask design at the PI ISFSI would be well below regulatory limits. The NRC acknowledged that there is the potential for the PIIC to be disproportionately affected by the PI ISFSI; however, they determined that use of the TN-40HT cask would not have disproportionately *high and adverse* human health and environmental effects on minority and low-income populations, including the PIIC, residing near the PI ISFSI (Ref. 4, p. 10).

For PINGP license renewal, the NRC acknowledged that there was the potential for the PIIC to be disproportionately affected by the continued operation of PINGP. However, the analyses of impacts for all resource areas (e.g., land, air, water, ecology, human health, and socioeconomics), with the one exception of historic and archaeological (cultural) resources, indicated that the impact from license renewal would be small. The finding of moderate impacts on historic and archaeological resources was based on the extensive amount of cultural resources located on the PINGP site and the high potential for additional resources to be discovered on the site. However, given NSPM's mitigation strategies (described in the Historical and Cultural Resources section, above), the NRC determined that adequate measures are in place to address the potential impacts to historic and archaeological resources at PINGP. NRC concluded

that there would be no disproportionately *high and adverse* impacts to the PIIC or any other minority and low-income populations from the continued operation of PINGP during the period of extended operations (Ref. 2, p. 4-47).

For the SGR Project, the NRC determined that the PIIC could be disproportionately affected. Small to moderate effects could include transportation and noise impacts during replacement activities, shift changes, and the removal of the existing steam generator via rail. These impacts would be of short duration and were not expected to be high (Ref. 2, p. 3-9). NSPM has agreed to work with the PIIC to address these concerns through mitigation measures listed in the Transportation and Social Services section, above.

The NRC considered the environmental justice impacts of PI ISFSI expansion during its review of PINGP license renewal. Potential impacts to minority and low-income populations from the PI ISFSI expansion at PINGP will mostly consist of environmental and socioeconomic effects (e.g., noise, dust, traffic, employment, and housing impacts) already discussed in previous resources area discussions, above. Radiation doses after the PI ISFSI expansion will be small and remain well within regulatory limits (as discussed below). Noise and dust impacts during PI ISFSI expansion will be short-term and limited to onsite activities at PINGP. Minority and low-income populations, including members of the PIIC residing along site access roads, will experience minimal increased commuter vehicle traffic. In addition, the NRC determined that increased demand for rental housing during the PI ISFSI expansion could disproportionately affect low-income populations. However, due to the short duration of the PI ISFSI expansion, the estimated use of 13 local workers who would not need rental housing, and the availability of rental housing in the area, impacts to minority and low-income populations would be short-term and limited. The NRC concluded that PI ISFSI expansion would not have any long-term cumulative disproportionately *high and adverse* human health and environmental operational effects on minority and low-income populations residing in the vicinity of PINGP (Ref. 2, p. 4-63).

The PI ISFSI ER provides that there is the potential that the PIIC could be disproportionately affected by the continued operation of the PI ISFSI through continued offsite dose from normal operations and dose postulated for potential accidents. However, the analyses of impacts for these resource areas indicate that the impacts would be small. The ER also notes that there could be some impacts from transportation and noise as discussed above. The ER concludes that there will be no disproportionately *high and adverse* impacts to the PIIC or any other minority population from the continued operation of the PI ISFSI over the period of extended operations (Ref. 1, p. E-51, E-52 and E-59). The analyses for the other projects considered by NSPM all concluded that there would be no disproportionately *high and adverse* impacts to the PIIC or any other minority and low-income populations. Therefore, there will be no incremental impact of the proposed action on environmental justice concerns when added to other past, present, and reasonably foreseeable future actions.

NSPM has considered and implemented a number of mitigation measures to address issues that could contribute to environmental justice concerns related to past, present, or reasonably foreseeable future actions. These measures are presented in the following sections of this RAI Response: Transportation and Social Services, Meteorology, Climatology, and Air Quality, Historical and Cultural Resources, Offsite Dose from Normal Operation, and Dose Postulated for Potential Accidents.

Occupational Dose from Normal Operations

10 CFR Part 20 contains requirements for protecting plant personnel from radiation exposure and minimizing exposures. These requirements are strictly adhered to by NSPM during all activities related to operation of PINGP and the PI ISFSI, including loading of the casks (the original TN-40 and the TN-40HT casks), placing the casks in operation within the PI ISFSI, operation of PINGP during the period of extended operations, the SGR Project, and the expansion of the PI ISFSI.

The proposed action will not result in occupational dose outside of regulatory limits since the action has no impact on the dose associated with loading a cask or the annual dose associated with operating the PI ISFSI.

None of the other projects considered by NSPM contribute to occupational dose outside of regulatory limits. Therefore, there will be no incremental impact of the proposed action on occupational dose when added to other past, present, and reasonably foreseeable future actions.

Occupational dose is mitigated at PINGP through the effective use of ALARA (As Low As Reasonably Achievable) practices. These include use of the shielding built into the TN-40 and TN-40HT cask designs, the berm surrounding the PI ISFSI, minimizing the time spent near the source of radiation, and maximizing the distance between the workers and the source of radiation.

Other Occupational Health Effects

Impacts of construction of the PI ISFSI included normal occupational health hazards for the construction industry including moving heavy objects, working outside, and working with heavy equipment. The TN-40HT amendment did not result in any changes to occupational health for workers who work during cask transfer activities. For PINGP license renewal, the NRC did not identify any site-specific occupational and health concerns and accepted the generic finding that occupational health effects due to microbiological organisms would be small (Ref. 2, p. xvi). The NRC did not conduct a plant-specific analysis for other occupational health effects for the SGR Project; however, it is reasonable to assume that workers will experience normal occupational health hazards for the construction industry and that those hazards experienced during PI ISFSI construction will also be experienced during PI ISFSI expansion.

The proposed action would not result in any occupational health impacts different than those involved with the existing PI ISFSI activities such as moving heavy objects, working outside, and working with heavy equipment during cask transfer operations. All of the projects considered by NSPM have small impacts on occupational health effects. Therefore, there will be no incremental impact of the proposed action on other occupational health effects when added to other past, present, and reasonably foreseeable future actions.

NSPM has considered no mitigation measures for cumulative occupational health impacts.

.Dose to the Public from Normal Operations

The NRC staff discussed the dose impacts to the public from the operation of PINGP during the period of extended operations associated with the PINGP's license renewal (Ref. 2, p. 4-21). The NRC concluded that the radiological impacts from the current operation of PINGP including those from reasonably foreseeable future actions (e.g., SGR Project and PI ISFSI expansion) are not expected to change significantly. Because NRC expected that PINGP and NSPM would continue to comply with regulatory dose requirements during the license renewal term they determined that radiological impact to human health as a result of PINGP license renewal would be small (Ref. 2, Section 4.8.1). For PI ISFSI expansion, NSPM prepared an analysis to quantify the cumulative impacts of dose to the public from normal operations of the existing constructed PI ISFSI and the expansion of the PI ISFSI to accommodate a total of 64 casks. While the analysis did not use the assumptions described in the Safety Analysis Report, it did conservatively bound the more realistic fuel attributes such as enrichment, fuel loading, and burn-up. The dose rate for the cumulative impact of the PI ISFSI expansion (64 casks) to the nearest resident (located 0.45 mile northwest of the PI ISFSI) from normal operations was calculated to be 0.36 mrem/year.

The proposed action has no effect on the annual dose to the public and thus will not result in dose to the public outside of regulatory limits. It is expected that the cumulative impacts will not result in non-compliance with regulatory dose requirements (Ref. 6, Section 7.3.2.1.2). All other projects considered by NSPM do not contribute to dose to the public outside of regulatory limits. Therefore, there will be no incremental impact of the proposed action on dose to the public when added to other past, present, and reasonably foreseeable future actions.

Radiation dose to the public is mitigated at PINGP through the effective use of procedural controls and design activities such as the shielding built into the TN-40HT cask design and the berm surrounding the ISFSI.

.Dose to the Public from Accidents

The NRC analyzed the dose impacts to the public from postulated accidents that might occur during the period of extended operation for PINGP, which included design basis

accidents. The NRC generically determined that impacts associated with such accidents are small because the plants were designed to successfully withstand design basis accidents (Ref. 2, Chapter 5). The replacement steam generators installed as part of the SGR Project are designed to withstand design basis accidents. The PI ISFSI Safety Analysis Report discusses how the TN-40 and TN-40HT casks are designed to withstand design basis accidents. The design basis accidents that have the potential to impact dose to the public are limited such that they involve a single cask at a time. Hence, expanding the PI ISFSI to accommodate more casks does not impact the accident dose to the public.

The proposed action has no effect on the potential dose to the public associated with an accident involving a cask. None of the other projects considered by NSPM contribute to the accident dose. Therefore, NSPM maintains that there will be no incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions.

Radiation dose to the public resulting from an accident is mitigated at PINGP through the effective use procedural controls and design activities such as the shielding built into the TN-40 and TN-40HT cask designs and the berm surrounding the PI ISFSI.

Enclosure 2
Response to Request for Additional Information

Request for Additional Information 2:

According to the NRC's "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 39, Regarding Prairie Island Nuclear Generating Plant, Units 1 and 2-Final Report" (NUREG-1437, Supplement 39), NSPM implements a Storm Water Pollution Prevention Plan (SWPPP). Clarify whether the ISFSI is discussed within the SWPPP and provide a copy of the following document:

Nuclear Management Company, LLC, Prairie Island Nuclear Generating Plant Operations Manual, Section D14.6, "Storm Water Pollution Prevention Plan." March 2006.

NSPM Response to RAI 2:

Per discussion with the Staff, rather than supplying a copy of the March 2006 SWPPP, a copy of the most recent version of the SWPPP dated May 4, 2012 is included. (See Attachment 1) This is an update of the March 2006 SWPPP requested in the RAI. The SWPPP addresses storm water management at PINGP, including the PI ISFSI (see Figure 1 of the SWPPP).

Request for Additional Information 3:

The environmental review for the proposed license renewal will include an environmental justice analysis. Discuss any mitigation measures that have been or would be taken to reduce environmental justice concerns.

This information is necessary for the NRC staff to conduct an environmental justice analysis for the proposed action consistent with NRC's "Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions" (69 Federal Register 52040, August 24, 2004).

NSPM Response to RAI 3:

NSPM has concluded that there are no environmental justice concerns because operation of the PI ISFSI during the period of extended operation will not result in a disproportionately *high and adverse* impact to any low-income or minority population including the PIIC. The basis for this conclusion is that the analysis of the impacts for all resource areas is small (Ref. 1, p. E-52).

As provided in NUREG-1748 Appendix C, it is necessary to look at mitigation measures if there are significant impacts to a minority or low-income population. As stated in Ref. 1, NSPM has concluded that there are no significant impacts to minority or low-income populations related to the proposed action. Hence, NSPM has not taken and Ref. 1 does not include mitigation measures to address environmental justice concerns associated with the PI ISFSI license renewal.

Cumulative impacts from past, present, or reasonably foreseeable future actions are discussed in our response to RAI 1. Mitigation measures to address issues related to past, present, or reasonably foreseeable future actions are presented in NSPM's response to RAI 1.

Request for Additional Information 4:

By letter dated May 18, 2011, NSPM wrote to the U.S. Fish and Wildlife Service (FWS) requesting concerns and data related to the potential impact of the proposed ISFSI license renewal to threatened and endangered species. Provide copies of any further correspondence between NSPM and the FWS related to the proposed ISFSI renewal.

This information is necessary to support NRC's determinations with respect to the Endangered Species Act of 1969, as amended.

NSPM Response to RAI 4:

NSPM has not had any correspondence with the FWS regarding threatened and endangered species since our May 18, 2011 letter. NSPM did have a discussion with the FWS regarding a candidate species and our discussion is summarized in the response to RAI 5.

Request for Additional Information 5:

NRC staff reviewed FWS's most recent online occurrence data report and found that the Eastern massasauga rattlesnake (Sistrurus catenatus) was listed as a Federal candidate species as of October 2011 (76 Federal Register 66369) and may be present in Goodhue County, Minnesota. Its presence may not have been evaluated in the supplemental ER because the June 30, 2011, index report provided by the Minnesota Department of Natural Resources to NSPM did not list this species (see supplemental ER pages EA-39 to EA-41). Provide additional information regarding the potential occurrence of the Eastern massasauga rattlesnake in the vicinity of the site to support NSPM's statement that "[it] is aware of no activities during the period of extended operations that would adversely affect threatened or endangered species" (see supplemental ER page E-51).

This information is necessary to support NRC's determinations with respect to the Endangered Species Act of 1969, as amended.

NSPM Response to RAI 5:

NSPM reviewed the website (Ref. 9) identified by NRC in RAI 5 which listed the eastern massasauga rattlesnake as a candidate species for Goodhue County. NSPM also reviewed the U.S. Fish and Wildlife Service (FWS) online county list (Ref. 10) to verify the list of Threatened, Endangered, Proposed, or Candidate species in Goodhue County, Minnesota. The eastern massasauga rattlesnake was not listed as a candidate species in Goodhue County in Reference 10.

NSPM contacted the FWS to discuss the discrepancy. Through a return voicemail, Mr. Phil Delphey (FWS Endangered Species Coordinator) communicated that there is no reasonable likelihood that the eastern massasauga rattlesnake is present in Goodhue County, and that the FWS would be updating the website in Reference 9. NSPM's most recent review of Reference 9 indicates that the correction has been made and the eastern massasauga rattlesnake is no longer listed as a candidate species in Goodhue County.

Therefore, because the FWS has not identified the eastern massasauga rattlesnake as a candidate for federal listing in Goodhue County, NSPM maintains that it is aware of no activities during the PI ISFSI period of extended operations that would adversely affect threatened or endangered species.

References

1. Northern States Power Company, a Minnesota corporation, d/b/a Xcel Energy. Prairie Island Independent Spent Fuel Storage Installation Application for Renewed ISFSI Site-Specific License, Appendix E – Environmental Report Supplement. ADAMS Accession Number ML11304A068 (Cover letter only). October 20, 2011.

2. U.S. Nuclear Regulatory Commission. Generic Environmental Impact Statement for License Renewal of Nuclear Plants - Supplement 39 - Regarding Prairie Island Nuclear Generating Plant, Units 1 and 2, Final Report (NUREG-1437). May 2011.

   Available online at:

   http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1437/supplement39/sr1437s39.pdf

   Accessed February 2013.

3. U.S. Nuclear Regulatory Commission. Environmental Assessment Related to Construction and Operation of the Prairie Island Independent Spent Fuel Storage Installation. ADAMS Accession Number ML090260415. July 1992.

4. U.S. Nuclear Regulatory Commission. Environmental Assessment for the Amendment of U.S. Nuclear Regulatory Commission License No. SNM-2506 for Prairie Island Independent Spent Fuel Storage Installation. Docket No. 72-0010. ADAMS Accession Number ML093080494. November 2009.

5. Nuclear Management Company. Applicant's Environmental Report – Operating License Renewal Stage for Prairie Island Nuclear Generating Plant - Units 1 and 2. Docket Nos. 50-282 and 50-306. License Nos. DPR-42 and DPR-60. April 2008.

6. Northern States Power Company, a Minnesota corporation, d/b/a Xcel Energy. Application to the Minnesota Public Utilities Commission for Certificates of Need for the Prairie Island Nuclear Generating Plant for Additional Dry Cask Storage (Docket No. E002/CN-08-510) and Extended Power Uprate (Docket No. E002/CN-08-509). May 2008.

7. Minnesota Public Utilities Commission. Order Accepting Environmental Impact Statement, and Granting Certificates of Need and Site Permit with Conditions, (PUC Docket No. E-002/CN-08-509, Docket No. E002-CN-08-510, Docket No. E002/GS-08-690). December 2009.

8. Westwood Professional Services, Inc. Phase I Archaeological Reconnaissance Survey Report for the Proposed Upgrades to the Independent Spent Fuel Storage Facility (ISFSI) at the Xcel Energy Prairie Island Nuclear Generating Plant, Goodhue County, Minnesota. November 29, 2010.

9. U.S. Fish and Wildlife Service. Species by County Reports – Goodhue County. Available online at:

   http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=27049

   Accessed February 2013.

10. U.S. Fish and Wildlife Service. Endangered Species in Minnesota. County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species. Available online at:

    http://www.fws.gov/midwest/Endangered/lists/minnesot-cty.html

    Accessed February 2013.

11. U.S. Nuclear Regulatory Commission. Northern States Power Company's Answer Opposing the PIIC's New Environmental Contentions. ADAMS Accession Number ML093580062. December 2009.

ENCLOSURE 2

Attachment 1

PRAIRIE ISLAND STORM WATER POLLUTION PREVENTION PLAN

53 Pages Follow

D	STORM WATER POLLUTION PREVENTION PLAN	NUMBER: D14.6
		REV: 6

INFORMATION USE
• *Procedure may be performed from memory.*
• *User remains responsible for procedure adherence.*
• *Procedure should be available, but not necessarily at the work location.*

PORC REVIEW DATE:	OWNER:	EFFECTIVE DATE
NR	K. Davison	5/4/12

D	STORM WATER POLLUTION PREVENTION PLAN	NUMBER: D14.6
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1.0 PURPOSE

The National Pollutant Discharge Elimination System (NPDES) and State Disposal System (SDS) Permit MN0004006 authorizes Prairie Island Nuclear Generating Plant (PINGP) to discharge storm water associated with industrial activity in accordance with the terms and conditions of the NPDES/SDS Permit.

The primary goal of the Stormwater Pollution Prevention Plan is designed to reduce the amount of pollution that enters surface and ground water in the form of stormwater runoff. This plan is designed to eliminate or minimize stormwater contact with significant materials that may result in polluted stormwater discharges from the site.

2.0 REFERENCES

2.1 General Permit Authorization to Discharge Storm Water Associated with Industrial Activity Under the National Pollutant Discharge Elimination System (NPDES)/State Disposal System Permit Program, MN0004006

2.2 Prairie Island Operations Manual Section D14.3, “Spill Prevention Control and Countermeasures Plan”

2.3 Prairie Island Operations Manual Section D14.3 AOP1, “Response to an Oil Spill”

2.4 Prairie Island Operations Manual Section D14.4, “Chemical or Hazardous Waste Leaks or Spills”

2.5 Prairie Island Operations Manual Section D14.4 AOP1, “Chemical Leak or Spill Implementing Procedure”

3.0 PRECAUTIONS

3.1 All discharges of storm water associated with industrial activity **SHALL** be composed entirely of stormwater, unless otherwise permitted.

3.2 A discharge containing a hazardous substance in an amount equal to or in excess of the reportable quantity established under either 40CFR117 or 40CFR302 **SHALL** be reported to the Minnesota Pollution Control Agency.

3.3 The Storm Water Discharge Permit does not authorize the discharge of hazardous substances or oil resulting from an on-site spill.

3.4 The Storm Water Discharge Permit does not authorize the discharge of non-storm water discharge, through a storm water conveyance system, or any other conveyance system.

3.5 Stormwater associated with construction activities which disturb one (1) or more acres are not covered by this permit.

3.6 Notify the Environmental Group of construction activities which disturb one (1) or more acres of property.

3.7 Individual Construction Stormwater permit applications must be made through corporate Stormwater contact and all terms and conditions of construction stormwater permit must be complied with.

4.0 RESPONSIBILITIES

4.1 Management/Supervision is responsible for the following:

4.1.1 Approval and implementation of the Storm Water Pollution Prevention Plan.

4.1.2 Ensuring the Storm Water Pollution Prevention Plan is reviewed at a periodic interval as indicated by inspection findings.

4.1.3 Ensuring that this plan is revised whenever there is a change in materials or material management which may have the potential to discharge pollutants in storm water.

4.1.4 Ensuring that the plan is revised whenever it is determined that the plan is not controlling the discharge of pollutants in the storm water as indicated by inspection findings.

4.1.5 Certifying that the discharges from the site have been evaluated for the presence of non-storm water discharges and that no non-storm water discharges from the site exist not covered by an NPDES permit.

4.1.6 Ensure that there is a training plan to ensure that facility personnel have an adequate understanding of the Storm Water Pollution Prevention Plan and the NPDES Permit.

4.1.7 Identify the personnel that will be responsible for managing this Storm Water Pollution Prevention Plan, implementation, and reporting requirements. These individuals **SHALL** be available at reasonable times of operation. Contingencies will be provided so that unanticipated absences do not prevent adequate management of the plan.

4.2 Management responsible for meeting plan and permit requirements:

Chemistry Environmental Supervision

4.3 Personnel responsible for permit inspection, documentation and regulatory requirements and field inspections:

4.3.1 Storm Water Compliance Coordinator

4.3.2 Trained stormwater compliance individuals

4.4 Spill response procedures and responsibilities are detailed in:

4.4.1 D14.3, Spill Prevention Control and Countermeasure Plan

4.4.2 D14.3 AOP1, Response to an Oil Spill

4.4.3 D14.4, Chemical or Hazardous Waste Leaks and Spills

4.4.4 D14.4 AOP1, Chemical Leak or Spill Implementing Procedure

5.0 RECORDS

5.1 The storm water pollution prevention plan **SHALL** be retained for the duration of the permit.

5.2 A copy of the plan **SHALL** remain on the permitted site at all times and be available upon request.

5.3 The following records **SHALL** be maintained for the period of the NPDES permit coverage:

A. Name of inspector, date and time of inspection

B. Inspection findings

C. Corrective actions taken

D. Documentation of all changes to the plan

E. A copy of the annual reports

F. Training records

6.0 PLAN REVIEW/REVISION

6.1 The plan should be reviewed when indicated by the inspection findings.

6.2 The plan should be revised whenever there is a change in materials or material management practices which may have the potential to discharge pollutants in storm water.

6.3 The plan should be revised when it is determined that the plan is not controlling the discharge of pollutants in storm water.

7.0 DEFINITIONS

7.1 Agency - Minnesota Pollution Control Agency (MPCA)

7.2 Discharge - the conveyance, channeling, runoff, or drainage of storm water including snow melt, from a site.

7.3 Impervious Surface - a constructed hard surface that either prevents or retards the entry of water into the soil and causes water to run off the surface in greater quantities and at an increased rate of flow than prior to development. Examples include rooftops, sidewalks, patios, driveways, parking lots, storage areas, and concrete, asphalt, or gravel roads.

7.4 Non-storm water discharge - any discharge not comprised entirely of storm water except discharges authorized by a NPDES permit.

7.5 Nonstructural BMP's - practices that will reduce or eliminate pollutants to storm water and do not require installation of permanent structural devices to treat runoff. Examples of nonstructural BMP's include but are not limited to parking lots and street sweeping; employee training, changing material handling practices, installation of silt fence, minimizing materials exposed to storm water through inventory reduction, tarping, or moving of material indoors.

7.6 NPDES "National Pollutant Discharge Elimination System" which is the program for issuing, modifying, revoking, reissuing, terminating, monitoring, and enforcing permits and imposing and enforcing pretreatment requirements under Sections 307, 318, 402, and 405 of the Clean Water Act, United States Code, Title 33, Sections 1317, 1328, 1342, and 1345.

7.7 Significant Materials - when determining whether a material is significant, the physical and chemical characteristics of the material should be considered (e.g., the material's solubility, transportability, and toxicity characteristics) to determine the material's pollution potential. Includes, but is not limited to: raw materials such as solvents, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designated under Section 101(4) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) any chemical the facility is required to report pursuant to Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA); fertilizers; pesticides; and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

7.8 Storm Water - storm water runoff, snow melt runoff, and surface runoff and drainage.

7.9 Structural BMP's - the installation of devices that will reduce or eliminate pollutants to storm water through installation of permanent structural devices to treat or control runoff. Examples of structural BMP's include but are not limited to installation of storm water diversion berms or channels; sedimentation basins (retention or detention basins); oil/water separators; grit chambers; roofs, awnings or buildings to cover significant materials.

7.10 Waters of the State - all streams, lakes, ponds, marshes, wetlands, water courses, waterways, wells, springs, reservoirs, aquifers, irrigation systems, drainage systems and all other bodies or accumulations of water, surface or underground, natural or artificial, public or private, which are contained within, flow through, or border upon the state or any portion thereof.

7.11 Best Management Practices (BMPs) – means practices to prevent or reduce pollution of the waters of the state, including schedules of activities, prohibitions of practices, ad other management practices and also includes treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge, or waste disposal or drainage from material storage, as defined in Minnesota Rules pt. 7001.1020, subp. 5. Example of BMPs can be found in "Protecting Water Quality in Urban Areas," MPCA, 2000, and: "Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices," UP EPA< 1992.

7.12 Construction Activity – means a disturbance to the land that results in a Change in the topography, exiting soil cover (both vegetative ad non-vegetative), or the existing soil topography that may results in accelerated stormwater runoff, leading to soil erosion and movement of sediment into waters of the state. Examples can include cleaning, grading, filling and excavating

7.13 Erosion Control – means methods employed to prevent erosion. Examples include: soil stabilization practices, horizontal slope grading, temporary or permanent cover, and construction phasing.

7.14 Final Stabilization – means that all soil disturbing activities at the site have been completed, and that a uniform perennial vegetative cover (a density of 70 percent cover for unpaved areas and areas not covered by permanent structures) has been established or equivalent permanent stabilization measures have been employed. Examples of vegetative cover practices can be found in Supplemental Specifications to the 1988 Standard Specifications for construction (Minnesota Department of Transportation, 1991).

7.15 Flood Event – means that the surface elevation of a waterbody has risen to a level that cases the inundation or submersion of areas normally above the Ordinary High Water Level.

7.16 Storm Event – means a precipitation event (rainfall, snowfall, snowmelt, etc.) that results in surface runoff and is independent of the duration of the event and/or the volume of precipitation

7.17 Beach Nourishment – means the disposal of dredged material on the beaches or in the water waterward starting at or above the Ordinary High Water Level (OHWL) for the purpose of adding to, replenishing, or preventing the erosion of, beach material.

7.18 Carriage, or Conveyance, Water – means the water portion of the slurry that is pumped from a dredging site to a disposal site.

7.19 Interstitial, or Pore, Water – means the water that squeezes out of the interstices, or pores, of the sediment as it dewaters.

7.20 Ordinary High Water Level (OHWL) – means the boundary of waterbasins, watercourses, public waters, and public waters wetlands, and shall be an elevation delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly that point where the natural vegetation Cs from predominately terrestrial. For watercourses, the ordinary high water level is the elevation of the top of the bank of the channel. For reservoirs and flowages, the ordinary high water level is the operating elevation of the normal summer pool. (Minn. Stat. chap. 103G.005 Subd. 14 and MN Rule 6120.2500 Subp. 11)

7.21 Other Wastes – means garbage, municipal refuse, decayed wood, sawdust, shavings, bark, lime, sand, ashes, offal, oil, tar, chemicals, dredged spoil, solid waste, incinerator residue, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, cellar dirt or municipal or agricultural waste, and all other substances not included within the definitions of sewage and industrial waste set forth in Minnesota Statues chapter 115.01 which may pollute or tend to pollute waters of the state.

7.22 Stabilized – means staked sod, riprap, wood fiber blanket, or other material that prevents erosion from occurring as covered the exposed ground surface. Grass seed is not stabilization.

7.23 Treated Supernatant – means any water, carriage/conveyance or interstitial/pore, that is, or has the potential to be, discharged.

7.24 Unconfined Disposal – means the deposition of dredged material, in water, on the bed of a waterway. (Typically, this activity is not allowed. However, the MPCA would review, and grant or deny approval for, each proposal on it individual merits. For example, beach nourishment is a specific category of unconfined disposal that could also come under the category of beneficial re-use.)

7.25 Sediment Basin – a temporary pond built on a construction site to capture eroded or disturbed soil that is washed off during rain storms, and protect the water quality of a nearby stream, river, lake or bay. The sediment-laden soil settles in the pond before the runoff is discharged.

7.26 Detention Pond – a low lying area that is designed to temporarily hold a set amount of water while slowly draining to another location.

7.27 Vegetated Swale – constructed open-channel drainage ways used to convey stormwater runoff.

8.0 INVENTORY OF EXPOSED SIGNIFICANT MATERIALS

8.1 Categories of exposed significant materials:

8.1.1 Raw Materials - fuels, solvents, petroleum products, detergents, plastic pellets, stockpiled sand, salt, or coke

8.1.2 By-products or intermediate products - wood dust, wood chips or bark, limestone, gravel byproduct, recycled asphalt

8.1.3 Finished materials - metallic products, scrap metal, recycled or scrap motor vehicles, old process equipment/machinery

8.1.4 Waste products - ashes, sludge, solid and liquid waste

8.1.5 Hazardous substances defined under section 101(4) of CERCLA

8.1.6 Any chemical Prairie Island is required to report under Section 313 of EPCRA

8.2 Exposed significant materials at the site need to be inventoried; all exposed materials should be addressed to provide the best management controls to prevent contaminated storm water discharges. At a minimum, the following areas were evaluated:

A. vehicle and equipment maintenance, parking and storage areas including fueling and washing areas

B. liquid storage tank and other bulk material stockpile areas

C. loading and unloading areas

D. outdoor manufacturing, processing or storage areas and industrial plant yards

E. dust or particulate generating areas

F. rooftops contaminated by any industrial activity

G. on-site waste disposal areas, dumpsters, solid waste storage or management areas

H. exposed (non-vegetated) soil areas where there is a potential for erosion to occur

8.3 Attachment A Significant Material Inventory, identifies all exposed significant materials. The material, purpose or location, quantity, drainage area and ID# (indicating an exposed material or exposed container is identified).

8.4 Measures designed to control erosion should be implemented.

8.5 The Plan shall identify potential sources of pollutants which may affect the quality of stormwater discharges.

9.0 BEST MANAGEMENT PRACTICES

The plan SHALL describe and implement Best Management Practices (BMP's) that eliminate, minimize, or treat pollutants in storm water discharges.

Non-structural BMP's **SHALL** be implemented within 12 months and structural BMP's within 18 months of permit renewal date.

9.1 Attachment B includes existing controls for preventing storm water contamination.

9.2 Each of the items with an ID number in Attachment A are assigned a page that identifies the best management practices, non-structural and structural controls, to further help prevent storm water contamination.

9.3 The best management practices or existing controls will be amended when needed.

9.4 IF spills or other areas of concern are identified, THEN more Best Management Practices will be included to address each situation.

9.5 The following are general categories of BMP's:

A. Source Reduction - reduce or eliminate the significant materials that are exposed to storm water. An example would be not allowing vehicles to be washed on plant property.

B. Diversion - divert storm water away from exposed significant materials through the use of curbing, berms, sewers, or other forms of drainage control or elevate exposed significant material above the surrounding drainage.

C. Treatment - where contact of storm water with significant material is unavoidable, the facility is using treatment devices to reduce concentration and amount of pollutants in the discharge storm water. Such devices include oil/water separators, storm water detention/retention ponds, and vegetated swales.

10.0 SITE INSPECTIONS AND PREVENTATIVE MAINTENANCE PROGRAMS

10.1 Site Inspections

The permit required inspections are completed as directed by a computer generated schedule with the applicable signoff. This ensures that the required inspections will be completed. Personnel assigned inspection duties are aware of the necessity to complete one inspection during a storm runoff condition. The inspections identify any needed corrective actions or preventative actions to ensure compliance with the storm water permit.

10.1.1 Inspections **SHALL** be conducted at least once every two (2) months during non-frozen conditions (i.e., April, June, August, October), with one being completed during a stormwater runoff event.

10.1.2 Inspections **SHALL** be conducted by appropriately trained personnel.

10.1.3 Inspections **SHALL** be documented and a copy of all documentation **SHALL** remain on the permitted site and be available upon request. Indicate the date and time of the inspection as well as the name of the inspector on the inspection form.

10.1.4 The following compliance items will be inspected, and documented where appropriate.

A. Evaluate the facility to determine that the SWPPP accurately reflects site conditions;

B. Evaluate the facility to determine whether new exposed materials have been added to the site since completion of the SWPPP, and document any new significant materials.

C. Document inspections conducted during a runoff event. Observing runoff for discoloration or other visible contamination, implement corrective actions as needed.

D. Determine if the non-structural and structural BMP's as indicated in the SWPPP are installed and functioning properly.

10.1.5 Ensure temporary protection and permanent cover for the exposed areas are maintained.

10.1.6 If the findings of the site inspection indicate that BMPs are not meeting the objectives of the SWPPP corrective actions must be initiated within 30 days and the BMPs restored to full operations as soon as field conditions allow.

10.1.7 All attempts **SHALL** be made to minimize vehicle tracking of gravel, soil or mud.

10.2 Preventative Maintenance Programs

The storm water pollution prevention controls in place at Prairie Island are maintained through several different methods.

The preventative maintenance program consists of various actions taken on a routine basis, i.e., checking transformers, looking for signs of oil sheen or other pollutants, changing oil absorbants, and pumping berms.

10.2.1 Absorbent pillows and pads are placed under and near the oil demisters on the roof of the Aux building. The absorbents are visually inspected. Absorbents that are oil saturated or if the outer bag material shows signs of deterioration are replaced on a monthly basis per PM 4600-2.

10.2.2 The oil demister (roof of Auxiliary Building) oil absorbents are visually inspected and replaced if saturated or if outer bag material shows signs of deterioration. The oil demister (roof of Auxiliary Building) has its' oil absorbants changed on a monthly basis per PM 4600-2.

10.2.3 The berms surrounding the above ground storage tanks are inspected weekly. A written log entry is completed which documents that, if the berm contained water, it was inspected for oil residue before it was pumped or drained. This includes the large berm pits for the plant transformers which are also inspected for oil residue before pumping. Resolutions to non-compliant conditions are noted on the monthly inspection form. (PINGP 1299)

10.2.4 The plant transformers have a leakage problem due to their large size. Oil absorbents may be placed under the transformers and are routinely inspected and changed as necessary.

10.2.5 The substation transformers are inspected by operators on a daily basis. In addition, the plant services group inspects the oil absorbants on a first of the month calendar basis and changes them as necessary. This minimizes the chance of oil reaching the gravel area in the substation.

10.2.6 The Environmental Coordinator or trained designee completes several scheduled inspections of the areas surrounding the plant including AST inspections, water appropriations, SPCC inspections and outside building walkdowns.

11.0 SEDIMENTATION BASIN DESIGN AND CONSTRUCTION

11.1 New sedimentation basins **SHALL** be designed by a registered professional engineer, and installed under the direct supervision of a registered professional engineer.

11.2 Basins **SHALL** provide at least 1800 cubic feet, per acre drained, of hydraulic storage volume below the top of the outlet riser pipe.

11.3 Inlet(s) and outlet(s) **SHALL** be designed to prevent short circuiting and the discharge of floating debris.

11.4 The inlet(s) **SHALL** be placed at an elevation at least above one -half of the basin design hydraulic storage volume.

11.5 The outlet(s) **SHALL** consist of a perforated riser pipe wrapped with filter fabric and covered with crushed gravel. The perforated riser pipe **SHALL** be designed to allow complete drawdown of the basin (s).

11.6 Permanent erosion control, such as riprap, splash pads or gabions **SHALL** be installed at the outlet(s) to prevent downstream erosion.

11.7 The basins **SHALL** be designed to allow for regular removal of accumulated sediment by a backhoe or other suitable equipment.

12.0 APPLICATION OF CHEMICAL DUST SUPPRESSANTS

NOTE:	**Chemical Dust Suppressants are not used at PINGP.**

12.1 If chemical dust suppressants are applied, PINGP **SHALL** submit a Chemical Dust Suppressant Annual Report due March 31 of each calendar year following the application of a chemical dust suppressant.

12.2 The Chemical Dust Suppressant Annual Report **SHALL** include:

A. A record of the dates, methods, locations and amounts any volume of application at the facility;

B. Whether the product was applied in the preceding year; and

C. The results of a chemical analysis of the materials applied each year.

12.3 If a material applied is mixed with water or another solvent before application, the chemical analysis **SHALL** be done on the aqueous or other mixture that is representative of the solution applied. This analysis **SHALL** be conducted during the same calendar year of the application. This analysis **SHALL** include the parameters that may be determined by U.S. Environmental Protection Agency (EPA) Methods 624 and 625 which are described in 40 CFR Part 136.

12.4 In areas that runoff to the Mississippi River, chemical dust suppressants **SHALL** not be applied within 100 feet of the Mississippi River nor **SHALL** they be applied with 100 feet of ditches that conduct surface flow to the Mississippi River.

13.0 CERTIFICATION/EVALUATION OF NON-STORMWATER DISCHARGES

The site and plant discharges of storm water runoff have been evaluated and examined to determine if non-storm water is being mixed with the storm water runoff. Three specific cases of process water mixing with storm water were found, but in all cases the process water is an NPDES approved effluent releases. No evidence of any non-permitted releases exists.

No chemical analysis has been performed on the runoff. The required certification is fulfilled by the extensive evaluation of plant site drainage and plant building drainage which results in no indication of any non-approved mixing of storm water with process water. This process knowledge is being substituted for chemical analysis and serves as the certification of evaluation.

13.1 Minor roof drainage to Turbine Building sump

In several instances, minor amounts of storm water from roofs reaches the Turbine Building sumps and is discharged. This is an approved mixing of stormwater and process water because it is an NPDES approved effluent.

13.2 Air Ejector, Gland Exhaust Fan, and Water Box Air Ejector Condensate

The plant condenser air ejectors, the gland exhaust fans, and condenser water box air ejectors exhaust outside the turbine buildings on the dog house structures. The condensate drains to a roof drain and then back into the turbine building to the respective turbine building sump. Any chemical contaminants in the condensate are covered by Prairie Island NPDES permit.

13.3 Guardhouse Diesel Building

A floor drain inside the building was discovered to drain into the ground outside the building. It was plugged and the soil area was examined for any indication of wastes being dumped into drain. No indications of any type of release was found.

13.4 Fire Training Dry Chemical

The discharge of dry chemical fire extinguishers onto the ground near the softball diamond and near the NPD building was evaluated for possible stormwater concerns. The evaluation determined that this chemical release to the ground was not a storm water pollution concern.

13.5 Fire Hose Hydrostatic Test

Site fire hoses are hydrostatically tested per SP 1203. The frequency varies on the type of hose from 2 to 3 years. Untreated river water is used to test the hoses and the location of the testing is variable depending on open space to conduct the test.

13.6 Portable Diesel Fire Pump Test

The portable emergency diesel is tested using river water that is pumped from the river back to the river to prove the operability of the portable diesel. This test is performed annually to demonstrate the ability to pump water.

14.0 PERSONNEL TRAINING PLAN

The personnel at Prairie Island are made aware of the negative aspects of pollution of storm water runoff through several different communication methods.

14.1 General Access Training (GAT)

All employees attend yearly General Access Training. Storm water pollution prevention is part of GAT training. Initial GAT training is provided by classroom instruction, annual training may be delivered in a computer based format or a self study based format.

14.2 Plant Newsletter Updates (Team Notes)

Employees may be updated through the use of an environmental section in the periodic plant newsletter. This fosters a continual awareness of the need to review the outside storage of all significant material.

14.3 Training Program

Stormwater program administrators go through a CBT training from Xcel Energy Corporate on Industrial Stormwater. Please contact Corporate Stormwater compliance person for the lesson plan.

14.4 Informational Mail (E-mail)

Certain aspects of the storm water pollution prevention plan that need to be highlighted for all plant staff may be completed via the Microsoft Mail System (E-Mail).

15.0 SPILL PREVENTION AND RESPONSE PLAN

Prairie Island has several plant procedures listed under Section 2.0. These procedures direct the plant response to spills and identify the equipment and procedures which will help prevent or mitigate a release of significant material to the environment.

16.0 ATTACHMENTS

16.1 Attachment A – Significant Material Inventory

16.2 Attachment B – Best Management Practices and Existing Controls

16.3 Attachment C – Drainage Summary

16.4 Attachment D – Prairie Island Nuclear Generating Plant Storm Water Annual Report

16.5 Figure 1 – Site Map No. 1 - Identifies significant material storage areas. The location of a significant material is indicated by its ID number. The ID numbers are assigned in Attachment A.

16.6 Figure 2 – Site Map No. 2 - Identifies facility structures, impervious surface areas, and vegetation and soil characteristics.

16.7 Figure 3 – Site Map No. 3 - Identifies discharge outfalls, direction of storm water runoff, drainage areas, and topographic and geographic characteristics.

16.8 Figure 4 – General Site Drainage and Spill Flow Patterns

Attachment A Significant Material Inventory

Instructions: List and describe all potential sources of pollution which includes significant materials stored, handled, managed, processed, fabricated, manufactured, transported, or transferred at the facility site. Assess and evaluate these materials for their potential to contribute pollutants to storm water runoff. Also, complete Best Management Practice form (Attachment B) if the material is exposed.

Material	Purpose or Location	Quantity (gallons unless noted) Maximum	Average	Describe material's drainage area. Assign a number in the next column if the material is exposed to storm water or if a spill may likely affect a stormwater discharge.	ID
Oil	TR 1GT serial no. 7001453	17,300	17,300	Electrical Equipment outside, concrete containment	1
Oil	TR 2GT serial no. 7001454	17,300	17,300	Electrical Equipment outside, concrete containment	1
Oil	TR01M - SPARE serial no. RGR22871	4,660	4,660	Electrical Equipment outside, concrete containment	1
Oil	TR02M serial no. RBS21971	4,480	4,480	Electrical Equipment boneyard, concrete containment	1
Oil	TR01R serial no. RJR22861	7,747	7,747	Electrical Equipment outside, concrete containment	1
Oil	TR11 (CT) serial no. P710284	2,185	2,185	Electrical Equipment outside, concrete containment	1
Oil	TR12 (CT) serial no. P710285	2,185	2,185	Electrical Equipment outside, concrete containment	1
Oil	TR2RX serial no. RBSN0081	2,727	2,553	Electrical Equipment outside, concrete containment	1
Oil	TR2RY serial no. RBSN0082	2,727	2,553	Electrical Equipment outside, concrete containment	1
Oil	TR10 serial no. D590274	33,270	33,270	Electrical Equipment outside, substation gravel area	1

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Material	Purpose or Location	Quantity (gallons unless noted)		Describe material's drainage area. Assign a number in the next column if the material is exposed to storm water or if a spill may likely affect a stormwater discharge.	ID
		Maximum	Average		
Oil	TR01M serial no. SNL9522	4,279	4,279	Electrical Equipment outside, concrete containment	
Oil	TR2RS serial no. 7002922	8,070	8,070	Electrical Equipment outside, substation gravel area	1
Oil	TRCT1 serial no. 702301	12,775	12,775	Electrical Equipment outside, substation gravel area	1
Oil	TRSPR2 serial no. C0665551	18,400	18,400	Electrical Equipment outside, boneyard plastic-lined gravel containment	1
Oil XEES #467	UST, 12 Dsl Clg Wtr Pmp	19,500	19,500	Underground tank. Transfer area is gravel with drainage to sump.	2
Oil XEES #466	UST, 22 Dsl Clg Wtr Pmp	19,500	19,500	Underground tank. Transfer area is gravel with drainage to sump.	2
Oil XEES #463	UST, 121 Dsl Generator	19,500	19,500	Underground tank. Transfer area is gravel with drainage to sump.	2
Oil XEES #462	UST, 122 Dsl Generator	19,500	19,500	Underground tank. Transfer area is gravel with drainage to sump.	2
Oil XEES #461	UST, 123 Dsl Generator	19,500	19,500	Underground tank. Transfer area is gravel with drainage to sump.	2
Oil XEES #460	UST, 124 Dsl Generator	19,500	19,500	Underground tank. Transfer area is gravel with drainage to sump.	2
Oil XEES #459	UST, Dsl Fire Pump	4,000	4,000	Underground tank. Transfer area is gravel with drainage to sump.	2

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Attachment A Significant Material Inventory

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Material	Purpose or Location	Quantity (gallons unless noted) Maximum	Average	Describe material's drainage area. Assign a number in the next column if the material is exposed to storm water or if a spill may likely affect a stormwater discharge.	ID
Oil XEES #465	UST, 121 Heating Boiler	35,000	35,000	Underground tank. Transfer area is gravel with drainage to sump.	2
Oil XEES #464	UST, 122 Heating Boiler	35,000	35,000	Underground tank. Transfer area is gravel with drainage to sump.	2
Oil XEES #584	Oil Room, 121 Turbine Oil	14,000	14,000	Inside.	-
Oil XEES #194	Guardhouse Generator	500	500	Inside.	-
Oil	Oil Room, Misc Cans & Drums	< 3,000	< 3,000	Inside.	-
Oil XEES #585	Oil Room, 121 Turb. Oil Makeup Tank	2,000	2,000	Inside.	-
Oil XEES #586	1 Turbine - Gen. in Turbine Bldg Reservoir	14,000	14,000	Inside.	-
Oil XEES #587	2 Turbine - Gen. in Turbine Bldg Reservoir	14,000	14,000	Inside.	-
Oil XEES #195	12 Dsl Clg Wtr Pmp Day Tank, Screenhse	580	580	Inside.	-
Oil XEES #196	22 Dsl Clg Wtr Pmp Day Tank, Screenhse	580	580	Inside.	-
Oil XEES #572	12 Dsl Clg Wtr Pmp, Screenhouse	110	110	Inside	-
Oil XEES #573	22 Dsl Clg Wtr Pmp, Screenhouse	110	110	Inside.	-

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Material	Purpose or Location	Quantity (gallons unless noted) Maximum	Average	Describe material's drainage area. Assign a number in the next column if the material is exposed to storm water or if a spill may likely affect a stormwater discharge.	ID
Oil XEES #197	D1 Dsl Gen Day Tank, Turb. Bldg.	500	500	Inside.	-
Oil XEES #198	D2 Dsl Gen Day Tank, Turb. Bldg.	500	500	Inside.	-
Oil XEES #576	D1 Dsl Gen., Turb. Bldg.	250	250	Inside.	-
Oil XEES #577	D2 Dsl Gen., Turb. Bldg.	250	250	Inside.	-
Oil XEES #199	Dsl Fire Pmp Day Tank, Screenhouse	280	280	Inside.	-
Oil	11 EH Fluid Reservoir, Turb. Bldg.	200	200	Inside	-
Oil	21 EH Fluid Reservoir, Turb. Bldg.	200	200	Inside.	-
Oil	11 Feedwater Pump, Turb. Bldg.	160	160	Inside.	-
Oil	12 Feedwater Pump, Turb. Bldg.	160	160	Inside.	-
Oil	21 Feedwater Pump, Turb. Bldg.	160	160	Inside.	-

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Material	Purpose or Location	Quantity (gallons unless noted) Maximum	Average	Describe material's drainage area. Assign a number in the next column if the material is exposed to storm water or if a spill may likely affect a stormwater discharge.	ID
Oil	22 Feedwater Pump, Turb. Bldg.	160	160	Inside.	-
Oil	Misc. Equipment Screenhouse	< 100	< 100	Inside.	-
Oil	Misc. Equipment, CT Pmp House	< 200	< 200	Inside.	-
Oil	Misc. Equipment, Turb. Bldg.	< 500	< 500	Inside.	-
Oil	Misc. Equipment, Cooling Towers	< 800	< 800	Inside.	-
Oil	Misc. Equipment, Reactor & Aux Bldg	< 2,000	< 2,000	Inside.	-
Oil	New Oil Storage Bldg.	7,000	7,000	Inside.	-
Oil XEES #579	D3 Dsl Generator, Outside	250	250	Enclosure.	3
Oil XEES #580	D4 Dsl Generator, Outside	250	250	Enclosure.	3
Oil XEES #200	D3 Generator Day Tank, Outside	125	125	Enclosure.	3
Oil XEES #201	D4 Generator Day Tank, Outside	125	125	Enclosure.	3

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Material	Purpose or Location	Quantity (gallons unless noted) Maximum	Average	Describe material's drainage area. Assign a number in the next column if the material is exposed to storm water or if a spill may likely affect a stormwater discharge.	ID
Oil XEES #202	Used Oil Tank #1, Outside	5,000	5,000	Outside, concrete containment.	4
Oil XEES #203	Used Oil Tank #2, Outside	5,000	5,000	Outside, concrete containment	4
Oil XEES #210	21 Receiving Tank, D5, D6 Bldg.	15,000	15,000	Outside, concrete containment	3
Oil XEES #211	21 Storage Tank, D5 Bunker	32,778	32,778	Enclosure.	3
Oil XEES #212	22 Storage Tank, D6 Bunker	32,778	32,778	Enclosure.	3
Oil XEES #213	23 Storage Tank, D5 Bunker	32,778	32,778	Enclosure.	3
Oil XEES #214	24 Storage Tank, D6 Bunker	32,778	32,778	Enclosure.	3
Oil	D5 Diesel Generator, D5, D6 Bldg.	400	400	Enclosure.	3
Oil	D6 Diesel Generator, D5, D6 Bldg	400	400	Enclosure.	3
Oil XEES #2015	Diesel Fuel Oil Tank (Truck), Outside	550	550	Outside, concrete containment	5

Enclosure 3 to NSPM's Motion for Summary Disposition of the Skyshine Radiation Portion of Contention 4

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Material	Purpose or Location	Quantity (gallons unless noted) Maximum	Average	Describe material's drainage area. Assign a number in the next column if the material is exposed to storm water or if a spill may likely affect a stormwater discharge.	ID
Oil XEES #2014	Gasoline Tank (Truck), Outside Vehicle	550	550	Outside, concrete containment	5
Oil XEES #220	D5 Dsl Gen Oil Tank, D5, D6 Bldg.	850	850	Enclosure.	3
Oil XEES #221	D6 Dsl Gen Oil Tank, D5, D6 Bldg.	850	850	Enclosure.	3
Oil XEES #218	D5 Dsl Gen Day Tank, D5, D6 Bldg	665	665	Enclosure.	3
Oil XEES #219	D6 Dsl Gen Day Tank, D5, D6 Bldg	665	665	Enclosure.	3
Sodium Hydroxide XEES #206	Inside Auxiliary Bldg.	2,700	2,700	Inside.	-
Sodium Hydroxide XEES #207	Inside Auxiliary Bldg.	2,700	2,700	Inside.	-
Sodium Hypochlorite XEES #215	Inside Chlorine Bldg.	1,122	1,122	Inside.	-
Sodium Hypochlorite XEES #966	Inside Chlorine Bldg.	818	818	Inside.	-
Nexguard 22300 XEES #967	Inside Chlorine Bldg.	1,273	1,273	Inside.	-

Enclosure 3 to NSPM's Motion for Summary Disposition of the Skyshine Radiation Portion of Contention 4

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Material	Purpose or Location	Quantity (gallons unless noted)		Describe material's drainage area. Assign a number in the next column if the material is exposed to storm water or if a spill may likely affect a stormwater discharge.	ID
		Maximum	Average		
Sand Blasting Grit	Outside by carpentry shop	not applicable	not applicable	Outside, on crushed rock or asphalt, or in dumpster	6
Hazardous waste	Stored in hazardous waste building	not applicable	not applicable	Inside.	-
Misc. materials	Anywhere at the plant site.	not applicable	not applicable	Outside.	8
Garbage	Anywhere at the plant site.	not applicable	not applicable	Outside.	9
Sediment-erosion	Anywhere at the plant site.	not applicable	not applicable	Outside.	10
Herbicides	Anywhere at the plant site.	not applicable	not applicable	Outside	11
Boric Acid	Warehouse No. 3	not applicable	not applicable	Inside.	-
Hydrazine 35%	Decon Warehouse	not applicable	not applicable	Inside.	-
Methoxypropylamine (MPA)	Decon Warehouse	not applicable	not applicable	Inside.	-
Unit 1 Oil Demister Discharge	On Auxiliary Building Roof	not applicable	not applicable	Roof.	12
Unit 2 Oil Demister Discharge	On Auxiliary Building Roof	not applicable	not applicable	Roof.	12

Enclosure 3 to NSPM's Motion for Summary Disposition of the Skyshine Radiation Portion of Contention 4

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Material	Purpose or Location	Quantity (gallons unless noted) Maximum	Average	Describe material's drainage area. Assign a number in the next column if the material is exposed to storm water or if a spill may likely affect a stormwater discharge.	ID
Sand/Gravel Piles	Scrapyard	not applicable	not applicable	Outside.	8
Cinder Piles	Scrapyard	not applicable	not applicable	Outside.	8
Turbine Bldg Sump Sludge	Scrapyard	not applicable	not applicable	Outside.	8
Scrap Wood Products	Scrapyard	not applicable	not applicable	Outside.	8
Scrap Metal Products/Equipment	Scrapyard	not applicable	not applicable	Outside.	8
Railroad Ties (used/scrap)	Scrapyard	not applicable	not applicable	Outside.	8
Empty Drums (metal/plastic)	Scrapyard	not applicable	not applicable	Outside.	8
Turbine Bldg Sump Coke	Scrapyard	not applicable	not applicable	Outside.	8
Treated Wood	QA Storage	not applicable	not applicable	Outside.	8
Waste Cement/Asphalt	Scrapyard	not applicable	not applicable	Outside.	8
Waste Rubber Goods	Scrapyard	not applicable	not applicable	Outside.	9
Demolition Dumpster	Scrapyard	not applicable	not applicable	Outside.	9
Aluminum Can (recycle)	Scrapyard	not applicable	not applicable	Outside.	8
QA Storage (metal goods)	QA Storage	not applicable	not applicable	Outside.	8
Garbage Dumpsters	Various	not applicable	not applicable	Outside.	9

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Material	Purpose or Location	Quantity (gallons unless noted) Maximum	Average	Describe material's drainage area. Assign a number in the next column if the material is exposed to storm water or if a spill may likely affect a stormwater discharge.	ID
NALCO 1250 Carbohydrazide	Decon Warehouse Turbine Bldg	not applicable	not applicable	Inside.	-
NALCO 39M (nitrite based)	Turbine Bldg	not applicable	not applicable	Inside.	-
NALCO 1336 (conditioner)	Turbine Bldg	not applicable	not applicable	Inside.	-
NALCO 8338 (nitrite based)	Turbine Bldg	not applicable	not applicable	Inside.	-
Sodium Sulfite	Turbine Bldg	not applicable	not applicable	Inside.	-
Demineralizer Resin (mixed/cation/anion)	Decon Warehouse #1	not applicable	not applicable	Inside.	-
Nalco 8320	D1 and D2 and Warehouse No. 3	not applicable	not applicable	Inside, and outside – no drains	
GE Betz molybdate 4106	Turbine, Aux	not applicable	not applicable	Inside	
Formaldehyde Solution	Environmental Lab	not applicable	not applicable	Inside.	-
Sodium Bisulfate	Turbine Bldg	not applicable	not applicable	Inside.	-
Sodium Carbonate	Turbine Bldg	not applicable	not applicable	Inside.	-
GE Betz 1105	Turbine Bldg	not applicable	not applicable	Inside.	
GE Betz 1106	Turbine Bldg	not applicable	not applicable	Inside.	

Enclosure 3 to NSPM's Motion for Summary Disposition of the Skyshine Radiation Portion of Contention 4

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Attachment B Best Management Practices & Existing Controls

BEST MANAGEMENT PRACTICES & EXISTING CONTROLS

EXPOSED SIGNIFICANT MATERIAL OR AREA OF CONCERN
(include information, i.e., period of exposure, quantity exposed, location or storage method)

(#1) Oil Filled transformers

Located in the gravel substation and adjacent to the plant. The spare transformer is located in the scrapyard west of the Receiving Warehouse.

NON-STRUCTURAL CONTROLS & METHODOLOGY

The SPCC plan **SHALL** be followed to prevent and/or to respond to a spill.

Inspections for evidence of leaks or potential releases of oil from damaged/malfunctioning equipment **SHALL** be performed periodically.

Spills will be cleaned up by the nuclear plant service attendants or will be reported to substation maintenance for cleanup.

Containment drains **SHALL NOT** be pumped/drained unless drainage is free of oil sheens or the drainage is directed to a disposal container.

The three transformer oil sumps and the spare transformer containment area **SHALL** be inspected for oil sheen before they are pumped/drained.

STRUCTURAL CONTROLS & METHODOLOGY

Oil filled transformers are either provided with concrete containment or a gravel area which can serve as a sump until cleanup occurs.

One transformer oil sump is located at the northeast corner of the plant yard, collecting drainage from the transformers north of Unit 1.

One transformer oil sump is located at the northwest corner of the plant yard next to the guard house, collecting drainage from the transformers of Unit 2.

The remaining transformer oil sump behind the cooling tower substation serves CT 11 and CT 12 transformers.

A plastic lined gravel containment area collects drainage from the spare transformer.

At least the following BMPs were considered for development and implementation in this facility's swppp:
1) source reduction - preventative maintenance, spill prevention and response procedures, chemical substitution, materials management practices, employee training.
2) containment/diversion - segregating, separating, covering, berming, diverting flow, dust control
3) treatment - oil/water separator, storm water detention pond, recycling

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Attachment B Best Management Practices & Existing Controls

BEST MANAGEMENT PRACTICES & EXISTING CONTROLS	
EXPOSED SIGNIFICANT MATERIAL OR AREA OF CONCERN (include information, i.e., period of exposure, quantity exposed, location or storage method)	
(#2) Loading for underground storage tanks Located at the northeast corner of the plant yard.	
NON-STRUCTURAL CONTROLS & METHODOLOGY	
The SPCC plan **SHALL** be followed to prevent and/or respond to a spill. Connections will be inspected prior to start of transfer and after disconnect. Unloading operator **SHALL NOT** leave operation unattended. Dry cleanup methods should be used in the transfer area.	
STRUCTURAL CONTROLS & METHODOLOGY	
The tanks are located underground. Transfer area is gravel with drainage to a concrete sump. A spill collection pit is located under the fill connections.	
At least the following BMPs were considered for development and implementation in this facility's swppp: 1) source reduction - preventative maintenance, spill prevention and response procedures, chemical substitution, materials management practices, employee training. 2) containment/diversion - segregating, separating, covering, berming, diverting flow, dust control 3) treatment - oil/water separator, storm water detention pond, recycling	

Attachment B Best Management Practices & Existing Controls

BEST MANAGEMENT PRACTICES & EXISTING CONTROLS	
EXPOSED SIGNIFICANT MATERIAL OR AREA OF CONCERN (include information, i.e., period of exposure, quantity exposed, location or storage method)	
(#3) Tanks associated with diesel generators Located at the southeast corner of the plant yard (D3 & D4) and the southwest corner of the turbine building (D5 & D6)	
NON-STRUCTURAL CONTROLS & METHODOLOGY	
The SPCC plan **SHALL** be followed to prevent and/or respond to a spill. Connections will be inspected prior to start of transfer and after disconnect. Spill containers **SHALL** be placed underneath fill connections when filling D5/D6 Fuel Oil Receipt Tank. Unloading operator **SHALL NOT** leave operation unattended. Dry cleanup methods should be used in the transfer area. The D3 through D4 enclosure areas **SHALL** be properly operated and maintained, so oil does not normally escape from the enclosure. D3, D4, D5 and D6 sumps are inspected for oil sheen and pumped by nuclear plant service attendants. Visible oil is removed before the water is pumped to the turbine building sump.	
STRUCTURAL CONTROLS & METHODOLOGY	
The D5 and D6 tanks are vaulted and an enclosure prevents contact with the diesel generators and their associated day tanks. Transfer area to D5/D6 Fuel Oil Receipt Tank tank is asphalt. D3, D4, D5 and D6 sumps must be manually pumped, as there are no installed pumps.	
At least the following BMPs were considered for development and implementation in this facility's swppp: 1) source reduction - preventative maintenance, spill prevention and response procedures, chemical substitution, materials management practices, employee training. 2) containment/diversion - segregating, separating, covering, berming, diverting flow, dust control 3) treatment - oil/water separator, storm water detention pond, recycling	

Attachment B Best Management Practices & Existing Controls

BEST MANAGEMENT PRACTICES & EXISTING CONTROLS	
EXPOSED SIGNIFICANT MATERIAL OR AREA OF CONCERN (include information, i.e., period of exposure, quantity exposed, location or storage method)	
(#4) Two 5,000 gallon used oil tanks Located west of the plant.	
NON-STRUCTURAL CONTROLS & METHODOLOGY	
The SPCC plan **SHALL** be followed to prevent and/or respond to a spill. Transfer connections **SHALL** be inspected before any tank transfer operations and proper operation and maintenance **SHALL** be provided. Spill containers **SHALL** be placed underneath truck fill connection. Unloading operator **SHALL NOT** leave transfer operation unattended. The transfer area **SHALL** be kept free of debris. Overfill prevention is provided by inventory monitoring. The containment area **SHALL** be inspected for oil sheen before it is drained. The containment area **SHALL NOT** be drained unless drainage is free of oil sheens or the drainage is directed to a disposal container.	
STRUCTURAL CONTROLS & METHODOLOGY	
A concrete containment area surrounds the tanks with manual removal of storm water. Transfer area is gravel.	
At least the following BMPs were considered for development and implementation in this facility's swppp: 1) source reduction - preventative maintenance, spill prevention and response procedures, chemical substitution, materials management practices, employee training. 2) containment/diversion - segregating, separating, covering, berming, diverting flow, dust control 3) treatment - oil/water separator, storm water detention pond, recycling	

D	STORM WATER POLLUTION PREVENTION PLAN	NUMBER: D14.6
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Attachment B Best Management Practices & Existing Controls

BEST MANAGEMENT PRACTICES & EXISTING CONTROLS	
EXPOSED SIGNIFICANT MATERIAL OR AREA OF CONCERN (include information, i.e., period of exposure, quantity exposed, location or storage method)	
(#5) Tank Farm: one (1) 550 gallon Diesel fuel oil tank, one (1) 550 gallon gasoline tank, Located east of Warehouse No. 4.	
NON-STRUCTURAL CONTROLS & METHODOLOGY	
The SPCC plan **SHALL** be followed to prevent and/or respond to a spill. Transfer connections will be inspected before tank loading operations. Proper operation and maintenance **SHALL** be provided. (Signs instructing personnel to remain in area while refueling are located on tanks.) Operator **SHALL NOT** leave transfer operation unattended. The containment and transfer areas **SHALL** be kept free of debris. Drainage will only be released if the water is free of an oil sheen. If a small oil sheen is present, absorbent materials **SHALL** be used to remove the sheen and a thorough inspection of the tank and connections **SHALL** be performed to determine the source of the leak.	
STRUCTURAL CONTROLS & METHODOLOGY	
Containment is provided for each of the tanks. A concrete containment area surrounds the tanks with manually operated drains. Dispensing occurs over containment and asphalt.	
At least the following BMPs were considered for development and implementation in this facility's swppp: 1) source reduction - preventative maintenance, spill prevention and response procedures, chemical substitution, materials management practices, employee training. 2) containment/diversion - segregating, separating, covering, berming, diverting flow, dust control 3) treatment - oil/water separator, storm water detention pond, recycling	

Attachment B Best Management Practices & Existing Controls

BEST MANAGEMENT PRACTICES & EXISTING CONTROLS	

EXPOSED SIGNIFICANT MATERIAL OR AREA OF CONCERN
(include information, i.e., period of exposure, quantity exposed, location or storage method)

(#6) Sand Blasting Grit

Located outside by the carpentry shop.

NON-STRUCTURAL CONTROLS & METHODOLOGY

Keep blasting sand within the designated area to maximum extent possible.

After sanding is complete, the waste **SHALL** be collected and disposed of properly. (Periodically the grit should be collected and placed in the appropriate dumpster.)

A tarpaulin **SHALL** be placed over the waste sand prior to disposal or the sand collected in an area not exposed to storm water.

When possible, sanding in windy weather should be avoided.

Paper bags of sand **SHALL NOT** be allowed to remain outside unless they are covered with plastic.

STRUCTURAL CONTROLS & METHODOLOGY

A concrete slab is provided to collect the waste grit in the sand blasting area.

Covered dumpsters are provided for storage of waste grit waiting for disposal.

At least the following BMPs were considered for development and implementation in this facility's swppp:
1) source reduction - preventative maintenance, spill prevention and response procedures, chemical substitution, materials management practices, employee training.
2) containment/diversion - segregating, separating, covering, berming, diverting flow, dust control
3) treatment - oil/water separator, storm water detention pond, recycling

Attachment B Best Management Practices & Existing Controls

BEST MANAGEMENT PRACTICES & EXISTING CONTROLS	

EXPOSED SIGNIFICANT MATERIAL OR AREA OF CONCERN
(include information, i.e., period of exposure, quantity exposed, location or storage method)

(#7) Chemical Application Road Salt/Sidewalk Ice-Melt/Dust Control

Road salt and dust control chemical application by contracted vendor.

Ice Melt - applied by plant staff.

NON-STRUCTURAL CONTROLS & METHODOLOGY

Salt **SHALL** only be stored in the designated location which is at a distance from any surface water discharge location when it needs to be stored. Normally it will be hauled in and then excess will be hauled away by contractor.

Ice melt for walking areas will be applied as necessary by plant staff.

Dust control chemical application will be completed by a contracted vendor. No chemicals stored onsite.

STRUCTURAL CONTROLS & METHODOLOGY

At least the following BMPs were considered for development and implementation in this facility's swppp:
1) source reduction - preventative maintenance, spill prevention and response procedures, chemical substitution, materials management practices, employee training.
2) containment/diversion - segregating, separating, covering, berming, diverting flow, dust control
3) treatment - oil/water separator, storm water detention pond, recycling

Attachment B Best Management Practices & Existing Controls

BEST MANAGEMENT PRACTICES & EXISTING CONTROLS	

EXPOSED SIGNIFICANT MATERIAL OR AREA OF CONCERN
(include information, i.e., period of exposure, quantity exposed, location or storage method)

(#8) Miscellaneous materials

Treated wood is stored in the QA storage area and cooling tower renovation area.
Pipes and metal materials are stored along the south side of Warehouse No. 2.
Pipes and rolled cable are stored along the west side of Warehouse No. 1.
Miscellaneous metal parts and pipe are also stored west of the Fab. Shop and QA storage area.
Specific areas are designated for cement, empty drums, wood, metals, aluminum cans, pallets and are located west of the plant.
Specific areas are designated for sludge, new coke, charcoal, asphalt, old equipment, gravel piles, cinder piles, scrap wood, railroad ties and neut tank sludge and are located west of the plant.

NON-STRUCTURAL CONTROLS & METHODOLOGY

Liquid materials stored outside **SHALL** be kept within a closed container. Empty drums **SHALL** be stored on their side.

Miscellaneous materials should be covered as much as practical to keep stormwater from carrying loose materials away.

Material that can be elevated should be raised off ground.
Powder or dry chemicals/products **SHALL** be stored inside or **SHALL** be adequately covered with plastic.

Materials **SHALL** be stored in their designated locations. Hazardous waste **SHALL** only be stored within the hazardous waste building, heated hazardous waste area, or at designated satellite storage areas.

Periodically, consider removal of scrap equipment, recycle materials.

If leaking equipment/vehicles must be stored outside, drip pans or catchment will be provided for the leak.

Outdoor drip pans will be emptied frequently to prevent overflow, including from rainfall.

Liquids should be drained from scrap equipment.

Placement and distance to storm drains or waterways will be considered when storing a liquid material outside.

STRUCTURAL CONTROLS & METHODOLOGY

Materials are mainly stored along the south side of the plant with drainage from this end of the facility landlocked by a berm to the west of the cooling towers.

A roof covers materials located along the west side of Warehouse No. 1.

Racks elevate materials along the south side of Warehouse No. 2, above the flow of surface damage.

At least the following BMPs were considered for development and implementation in this facility's swppp:
1) source reduction - preventative maintenance, spill prevention and response procedures, chemical substitution, materials management practices, employee training.
2) containment/diversion - segregating, separating, covering, berming, diverting flow, dust control
3) treatment - oil/water separator, storm water detention pond, recycling

D	STORM WATER POLLUTION PREVENTION PLAN	NUMBER: D14.6
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Attachment B Best Management Practices & Existing Controls

BEST MANAGEMENT PRACTICES & EXISTING CONTROLS	

EXPOSED SIGNIFICANT MATERIAL OR AREA OF CONCERN
(include information, i.e., period of exposure, quantity exposed, location or storage method)

(#9) Garbage

Located anywhere on the plant site in covered dumpsters.
Demolition dumpster (uncovered) located west of plant.

NON-STRUCTURAL CONTROLS & METHODOLOGY

Periodically the facility site **SHALL** be cleaned of miscellaneous debris.

Materials **SHALL** be placed in proper disposal locations.

Outdoor dumpsters should be kept in a closed position.

Demolition dumpster should be covered.

Rubber goods should be properly disposed of periodically.

STRUCTURAL CONTROLS & METHODOLOGY

Covered dumpsters are available at various locations at the plant.

Recyclable materials are stored in designated areas and located west of the plant.

At least the following BMPs were considered for development and implementation in this facility's swppp:
1) source reduction - preventative maintenance, spill prevention and response procedures, chemical substitution, materials management practices, employee training.
2) containment/diversion - segregating, separating, covering, berming, diverting flow, dust control
3) treatment - oil/water separator, storm water detention pond, recycling

Attachment B Best Management Practices & Existing Controls

BEST MANAGEMENT PRACTICES & EXISTING CONTROLS	
EXPOSED SIGNIFICANT MATERIAL OR AREA OF CONCERN (include information, i.e., period of exposure, quantity exposed, location or storage method)	
(#10) Sediment - erosion Located anywhere on the plant site.	
NON-STRUCTURAL CONTROLS & METHODOLOGY	
The site **SHALL** be inspected per the inspection schedule and any excessively eroded areas should be identified and repaired.	
STRUCTURAL CONTROLS & METHODOLOGY	
Culverts, storm drains, swales and grading are provided at the facility to provide adequate drainage of storm water to prevent excessive erosion. Non-vegetated areas due to construction activities should be seeded in a timely manner to minimize erosion.	

At least the following BMPs were considered for development and implementation in this facility's swppp:
1) source reduction - preventative maintenance, spill prevention and response procedures, chemical substitution, materials management practices, employee training.
2) containment/diversion - segregating, separating, covering, berming, diverting flow, dust control
3) treatment - oil/water separator, storm water detention pond, recycling

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Attachment B Best Management Practices & Existing Controls

BEST MANAGEMENT PRACTICES & EXISTING CONTROLS	
EXPOSED SIGNIFICANT MATERIAL OR AREA OF CONCERN (include information, i.e., period of exposure, quantity exposed, location or storage method)	
(#11) Herbicides and fertilizers. In general, consumer lawn fertilizers, are applied to lawn areas once a year. Herbicides are sprayed along fence lines, normally 18 inches on each side of the fence, except for the one going east from the substation. This fence line is weed killed at approximately 10 feet on both sides for about 2000 feet, for security reasons and for mowing reasons (because of terrain). Rock areas within Protected Area, areas around absorbent boom storage boxes, receiving warehouse storage yard, railroad spur line (about 4 feet from either side from rail), some areas in scrap metal yard, area near cooling towers, equipment house and fan house transformers, substation, and parking area for emergency plan trailers are also sprayed with weed killer. No soil conditioners or pesticides are applied. Prairie Island Training Center has a contract with a lawn care service.	
NON-STRUCTURAL CONTROLS & METHODOLOGY	
Herbicides and fertilizers will be applied as recommended by commercial service company.	
STRUCTURAL CONTROLS & METHODOLOGY	
At least the following BMPs were considered for development and implementation in this facility's swppp: 1) source reduction - preventative maintenance, spill prevention and response procedures, chemical substitution, materials management practices, employee training. 2) containment/diversion - segregating, separating, covering, berming, diverting flow, dust control 3) treatment - oil/water separator, storm water detention pond, recycling	

Attachment B Best Management Practices & Existing Controls

BEST MANAGEMENT PRACTICES & EXISTING CONTROLS	
EXPOSED SIGNIFICANT MATERIAL OR AREA OF CONCERN (include information, i.e., period of exposure, quantity exposed, location or storage method)	
(#12) Turbine Oil Reservoir Demister and Generator Exciter Vapor Extractor Exhaust Discharge. Units 1 and 2 Located on the Auxiliary Building roof.	
NON-STRUCTURAL CONTROLS & METHODOLOGY	
Oil absorbents placed in the drain funnel below the exhausts are inspected on a routine basis and changed if needed.	
STRUCTURAL CONTROLS & METHODOLOGY	
At least the following BMPs were considered for development and implementation in this facility's swppp: 1) source reduction - preventative maintenance, spill prevention and response procedures, chemical substitution, materials management practices, employee training. 2) containment/diversion - segregating, separating, covering, berming, diverting flow, dust control 3) treatment - oil/water separator, storm water detention pond, recycling	

Attachment B Best Management Practices & Existing Controls

BEST MANAGEMENT PRACTICES & EXISTING CONTROLS	
EXPOSED SIGNIFICANT MATERIAL OR AREA OF CONCERN (include information, i.e., period of exposure, quantity exposed, location or storage method)	
(#13) Loading and Unloading and Transfer of Material Located at plant warehouses. Transfer of material between warehouses.	
NON-STRUCTURAL CONTROLS & METHODOLOGY	
Personnel are trained to load/unload inside warehouses during stormwater events. Personnel are trained to cover material in transfer during stormwater events.	
STRUCTURAL CONTROLS & METHODOLOGY	

At least the following BMPs were considered for development and implementation in this facility's swppp:
1) source reduction - preventative maintenance, spill prevention and response procedures, chemical substitution, materials management practices, employee training.
2) containment/diversion - segregating, separating, covering, berming, diverting flow, dust control
3) treatment - oil/water separator, storm water detention pond, recycling

Attachment C Drainage Summary

Drainage Summary:

Prairie Island Nuclear Generating Plant has no connection to a municipal storm sewer system.

Storm water drainage from the site discharges into surface water as described below:

The gravel parking area and roof drains at the Environmental Lab adjacent to the Intake Screenhouse may drain into the intake canal or to the Mississippi River from drainage holes along the parking lot curbing. The barge landing area east of the Environmental Lab drains into the Mississippi river.

Runoff from part of the "unused" parking lot, roof drains (Administration Building, and Warehouse), plant entrance road and area south of the substation may be collected by surface drains which release drainage through an 18 inch culvert into the intake canal, north west of the old screenhouse.

Runoff from the north side of the Plant is collected by a surface drain that releases drainage to the intake canal on the west side of the old screenhouse.

The access road along the east side of the plant drains to culvert No. 28 along the east side security fence and empties into the recycle canal.

The area by the discharge basin drains to the recycle canal via Culvert No. 12.

The area along the east side of the eastern most cooling tower drains to the discharge canal.

Runoff from part of the cooling tower access road and cooling tower area may drain through a culvert at the southwest corner to the Duck Pond and then to the discharge canal.

A dike exists west of the cooling tower area which prevents south side plant and Dry Cask Storage Area drains from the possibility of having drainage reach surface waters.

Runoff from the south side of the Plant is collected by surface drains that release drainage to the land locked area south west of the Plant.

Runoff from the Dry Cask Storage Area is collected by a surface drain that releases to the landlocked ditch south of the area.

Attachment C Drainage Summary (Cont'd)

Run off from the Original Steam Generator laydown yard is collected by a culvert that releases to the landlocked ditch south of the area.

The roof drainage system at the Prairie Island Training Center is through rain headers to seepage pit which allow water to seep into surrounding soils.

Runoff from the Multi Use Building area and a portion of the surrounding parking lot, drain to the west through a culvert into a filtration basin adjacent to the employee parking lot.

Runoff from the employee parking lot drains to the north and west into the filtration basins adjoining the parking lot.

Attachment D Prairie Island Nuclear Generating Plant Storm Water Annual Report Form

**EXAMPLE ONLY
USE CURRENT REVISION**

Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Industrial Stormwater Annual Report Form

NPDES/SDS Industrial Stormwater Permit

Due March 31, 2011

Doc Type: Permitting Annual Report

The purpose of the Annual Report is to:

- Summarize the permittee's compliance with its stormwater permit over the last calendar year.
- Assure that the Stormwater Pollution Prevention Plan (SWPPP) adequately represents facility conditions.
- Assures that Best Management Practices (BMPs) are working properly in managing industrial stormwater discharges.

All discharges of stormwater associated with industrial activity shall be composed entirely of stormwater. **Discharges of any material other than stormwater** are prohibited unless authorized under a separate National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Permit.

Note: If this is the **first time** you have ever completed an Annual Report, it should cover the period from when the facility received authorization under the permit to December 31st of the reporting year.

Return Annual Report Form to: Water Quality Submittals Center
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

2010 Reporting Year

Beginning date:_____________, 2010 to December 31, 2010.

Beginning date is the date your facility received permit authorization under the 2010 Multi-Sector General Permit. Look for this date on your facility's permit coverage card.

Facility Information

Facility name: ____________________

Facility address: ____________________

City: ____________ State: ________ Zip code: ________

SIC Code(s) and/or narrative activities: ____________________

Sector letter(s):__________ Subsector(s): ____________

Permit no./Facility ID no.: __________ Facility contact name: ____________

SWPPP Information

1a. Provide a summary of inspection dates, results, BMP maintenance, and oil and grease inspection results, if applicable. See part VII of the permit to determine if oil and grease inspection requirements are applicable. (Permit References: IV.B.7.a.1, IV.B.7.a.2)

Inspection #	Inspection date (mm/dd/yy)	Inspection results	BMP maintenance	Results of oil/grease inspections (if applicable)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Attachment D Prairie Island Nuclear Generating Plant Storm Water Annual Report Form

EXAMPLE ONLY
USE CURRENT REVISION

1b. Was a minimum of one inspection per calendar year conducted during a runoff event? (Permit Reference: III.F.1)
☐ Yes ☐ No Date of inspection(s): ______________________

1c. The following sectors have additional sector-specific inspection requirements: A, C, D, E, F, G, H, I, J, L, M, N, O, P, Q, R, S, T, U, V, AA, AB. See part 5.d. of part VII of each "sector chapter" for your sector-specific inspection. Provide a summary of the inspection results if your facility falls within these sectors. Attach additional sheets if necessary. **(Permit Reference: VII.5.d)**

Sector letter	Sector-specific inspection results	Frequency of inspections
Example: Sector M	*Example: During my monthly inspections, I inspected all areas where hazardous materials and general automotive fluids are stored, and there were no signs of spilled materials on the ground.*	*Example: I am required to conduct two of my monthly inspections during precipitation event, which I did, in September and November. Both times, no pollutants were observed during either inspection.*

2a. Does the SWPPP accurately reflect facility conditions?
☐ Yes ☐ No If no, modify your SWPPP. **(Permit Reference: IV.B.7.a.3)**

2b. Are there any newly exposed significant materials identified at the facility during the reporting year?
☐ Yes ☐ No If yes, modify your SWPPP. **(Permit Reference: IV.B.7.a.4)**

2c. Summarize below any SWPPP modifications made since receiving permit coverage at the facility. Attach additional sheets if necessary. **(Permit Reference: IV.B.7)**

____
____
____
____
____
____

2d. Is the facility using any of the following monitoring waivers? **(Permit Reference: IV.B.7.a.7)**

General Benchmark Monitoring Waiver	☐ Yes ☐ No
Run-On Demonstration Waiver	☐ Yes ☐ No
Natural Background Pollutant Waiver	☐ Yes ☐ No

3. Has a review been conducted to determine if the facility is discharging to any newly listed impaired waters that are within one mile of the facility during the reporting year? ☐ Yes ☐ No

Note: Only check "yes" if the impaired water is impaired for the facility's required monitoring parameters (Part VII of the permit) or pollutant surrogates, check language listed on page 26 of the permit. If yes, list those waters below and modify your SWPPP. **(Permit Reference: IV.B.7.a.5)**

____
____
____

Note: if benchmark values are exceeded and the facility discharges to an impaired water, the facility SWPPP must be updated no later than 30 days past the discovery of the exceedance. The facility must implement necessary non-structural BMPs no later than 60 days after discovery of the exceedance and structural BMPs no later than 180 days after discovery of the exceedance.

4. Has the facility been subject to any U. S. Environmental Protection Agency (EPA) -approved Total Maximum Daily Loads (TMDLs) during the reporting year? ☐ Yes ☐ No

Important Note: If yes, please review Part 1.B.j regarding eligibility for this permit. For information on TMDLs, visit http://www.pca.state.mn.us/water/tmdl/index.html. **(Permit Reference: IV.B.7.a.6)**

Attachment D Prairie Island Nuclear Generating Plant Storm Water Annual Report Form

EXAMPLE ONLY
USE CURRENT REVISION

5. Provide a list of spills and leaks (as defined in Minn. Stat. § 115.061) that occurred at the facility during the reporting year. **(Permit Reference: IV.B.7.a.8)**

____

____

____

____

____

6. If applicable, provide a summary of all mobile industrial activities conducted by the facility during the reporting year. **(Permit Reference: IV.B.7.a.9)**

Description of activity (include SIC code and/or Narrative Activity)	**Locations where the mobile activity occurred** (include latitude/longitude coordinates)	**Length of time at each location**

Certification

Based on my inquiry of the person, or persons, who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete (Minn. R. 7001.0070).

Owner authorized signature:

Print name: ______________________

Title: ______________________

Signature: ______________________

Date: ______________________

Operator authorized signature:

Print name: ______________________

Title: ______________________

Signature: ______________________

Date: ______________________

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Figure 1 Site Map No. 1

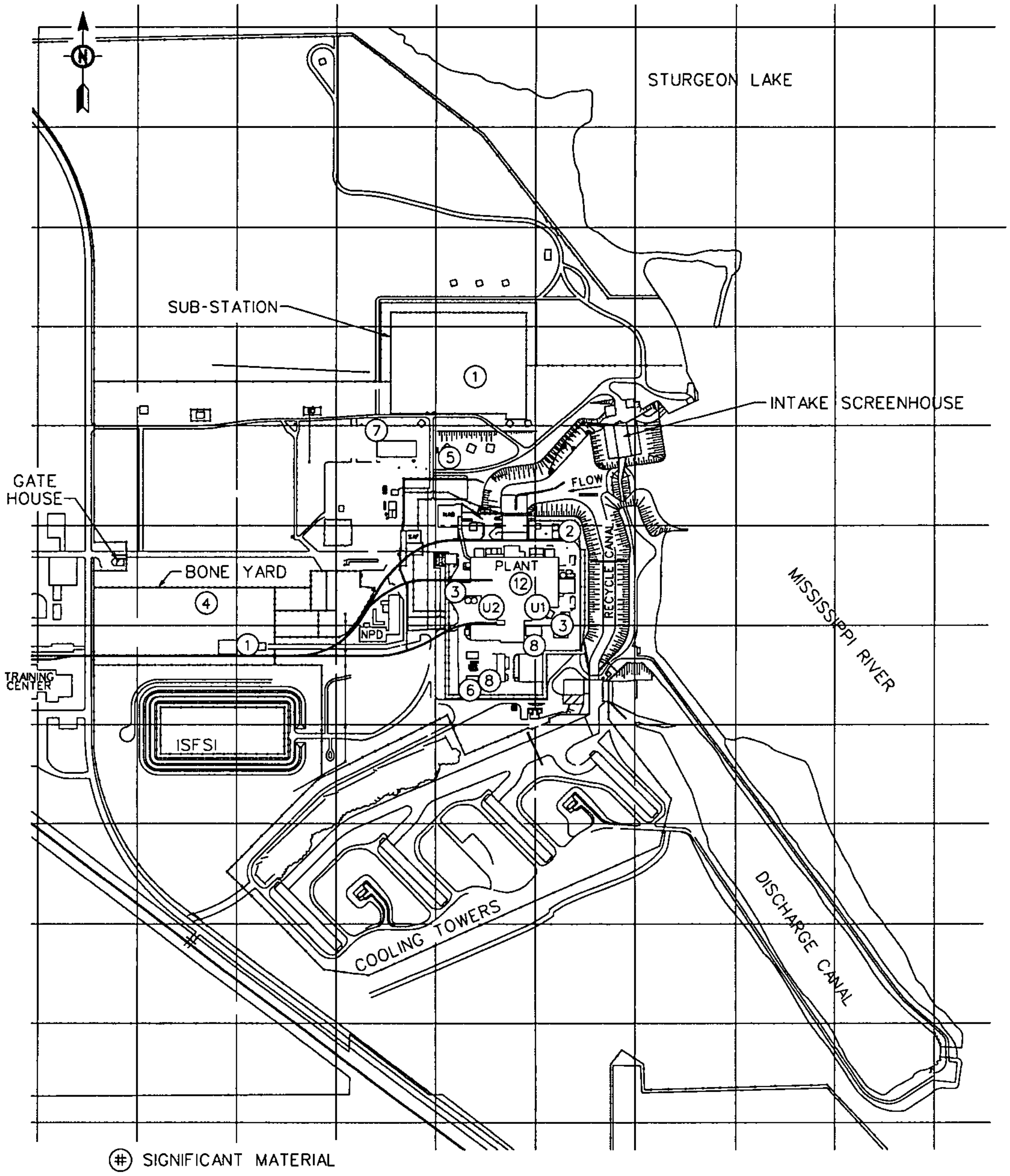

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Figure 2 Site Map No. 2

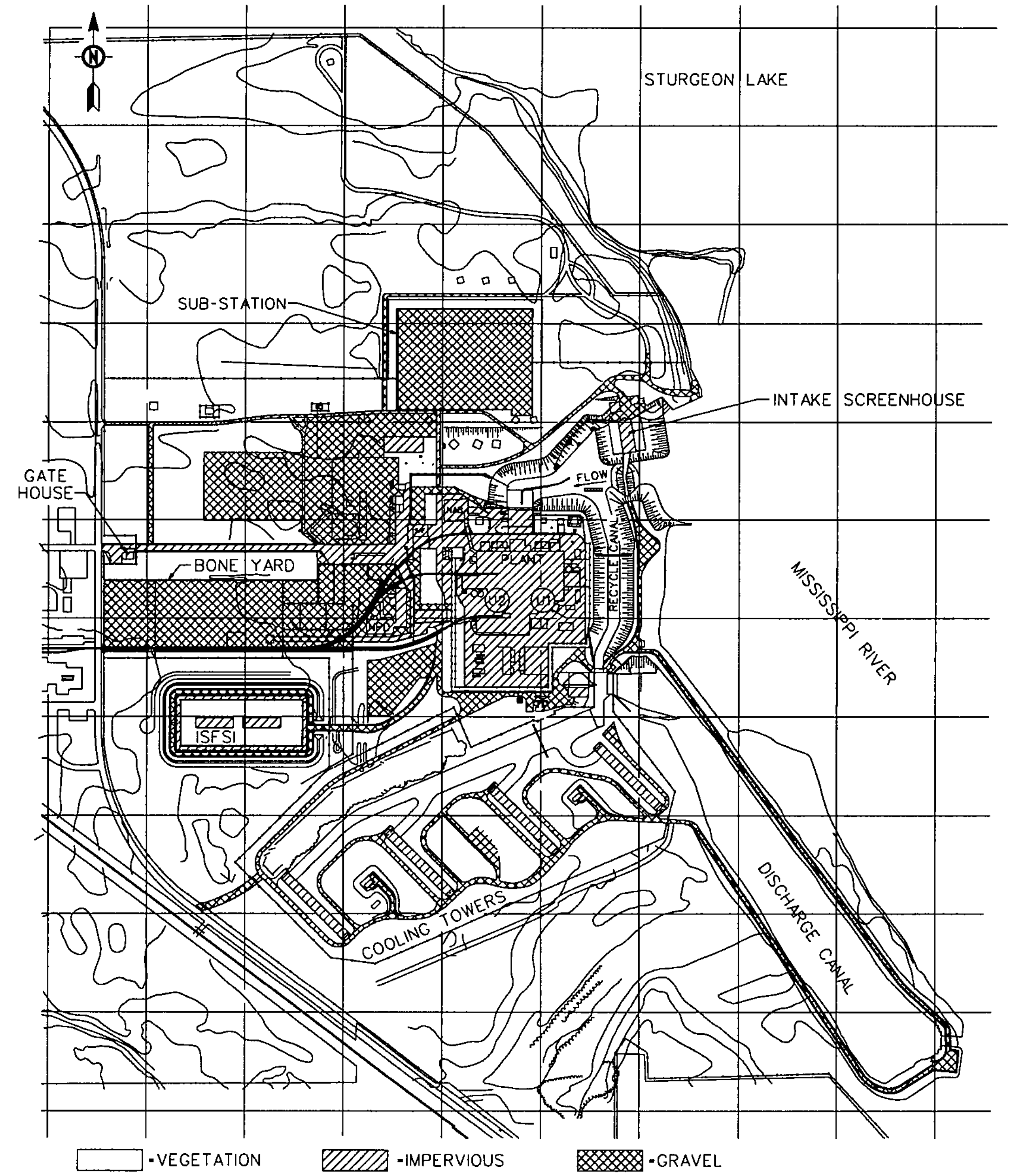

Figure 3 Site Map No. 3

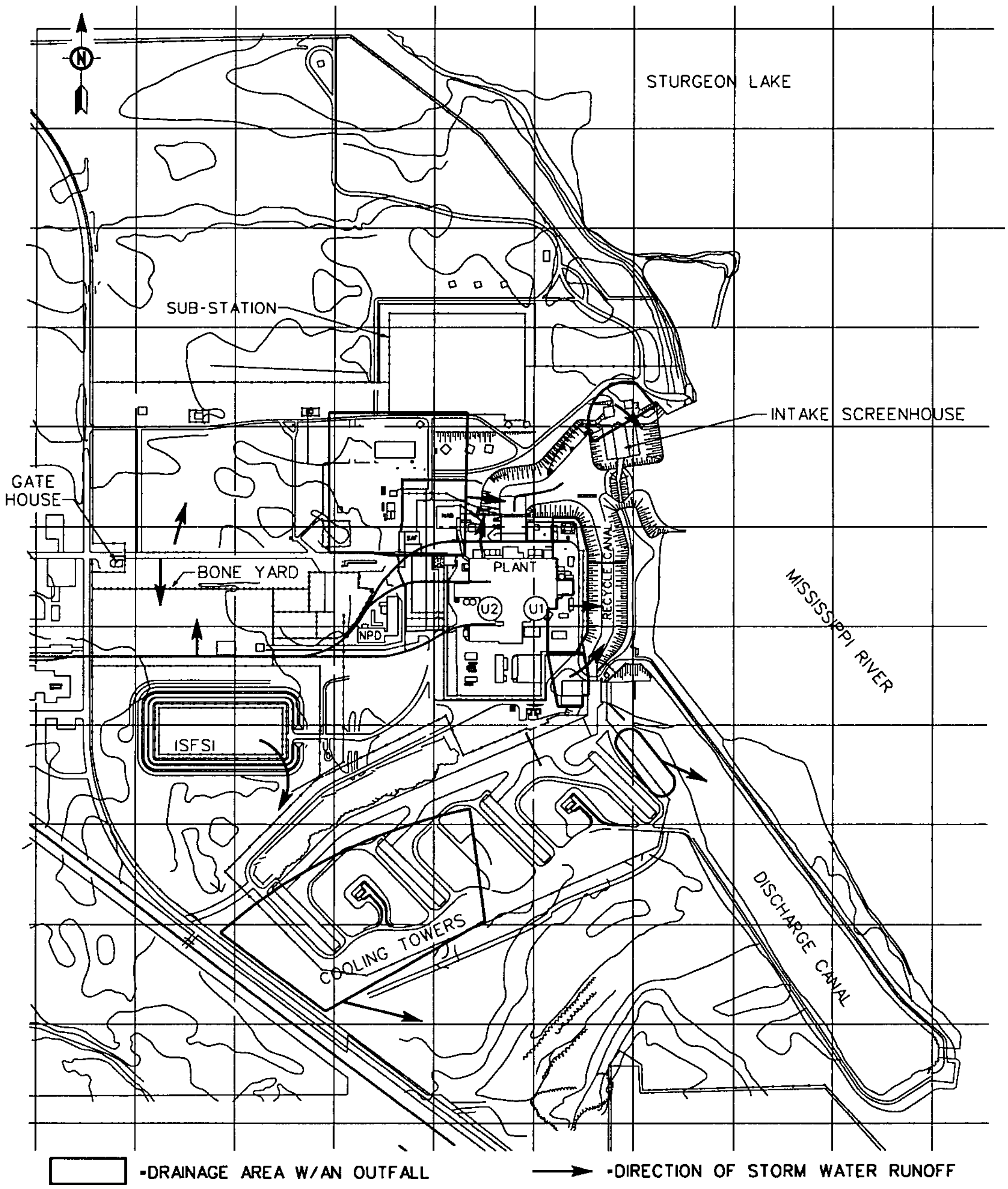

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Figure 4 General Site Drainage and Spill Flow Patterns

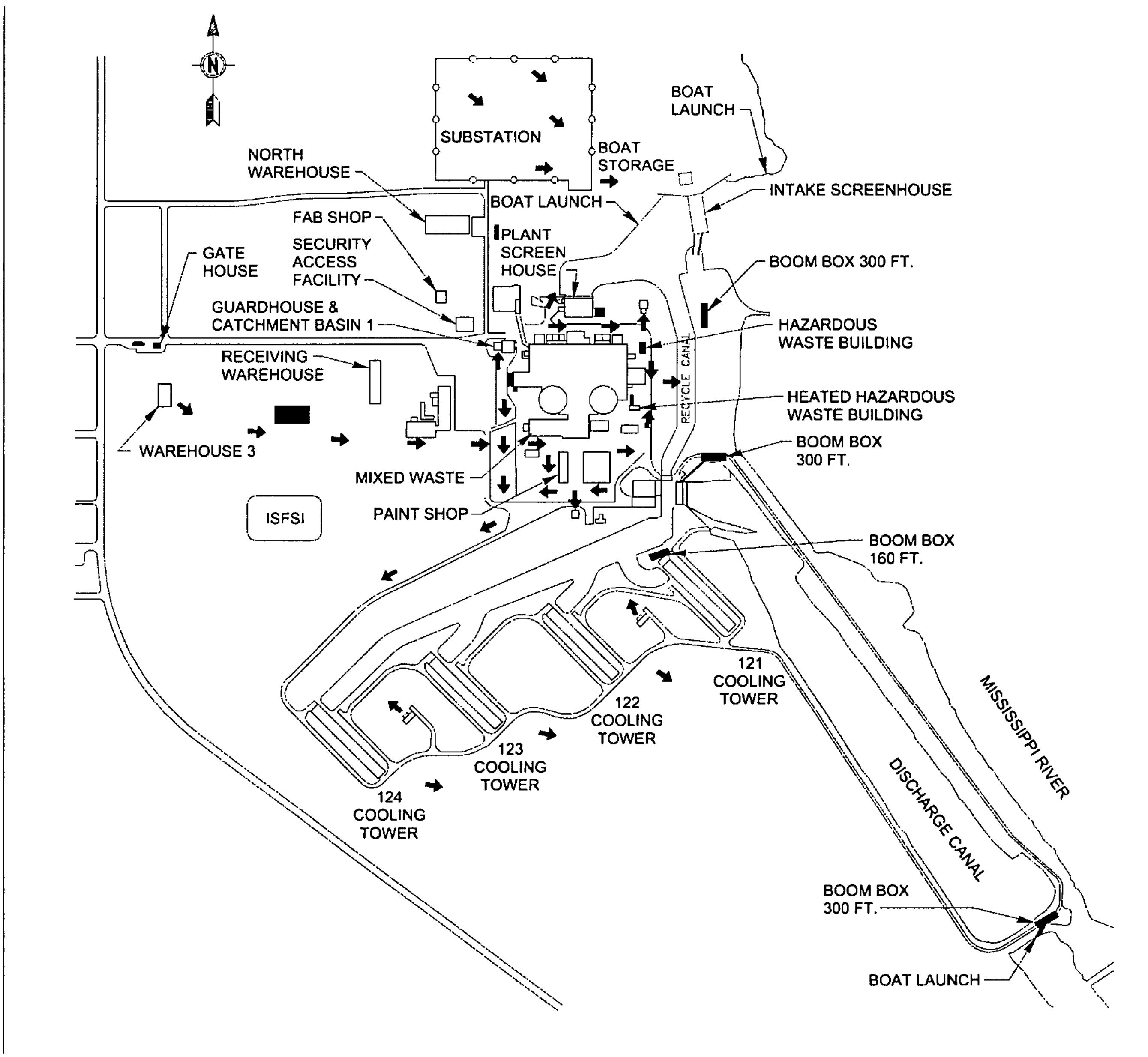

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Figure 5 Scrap Metal Dumpster Locations

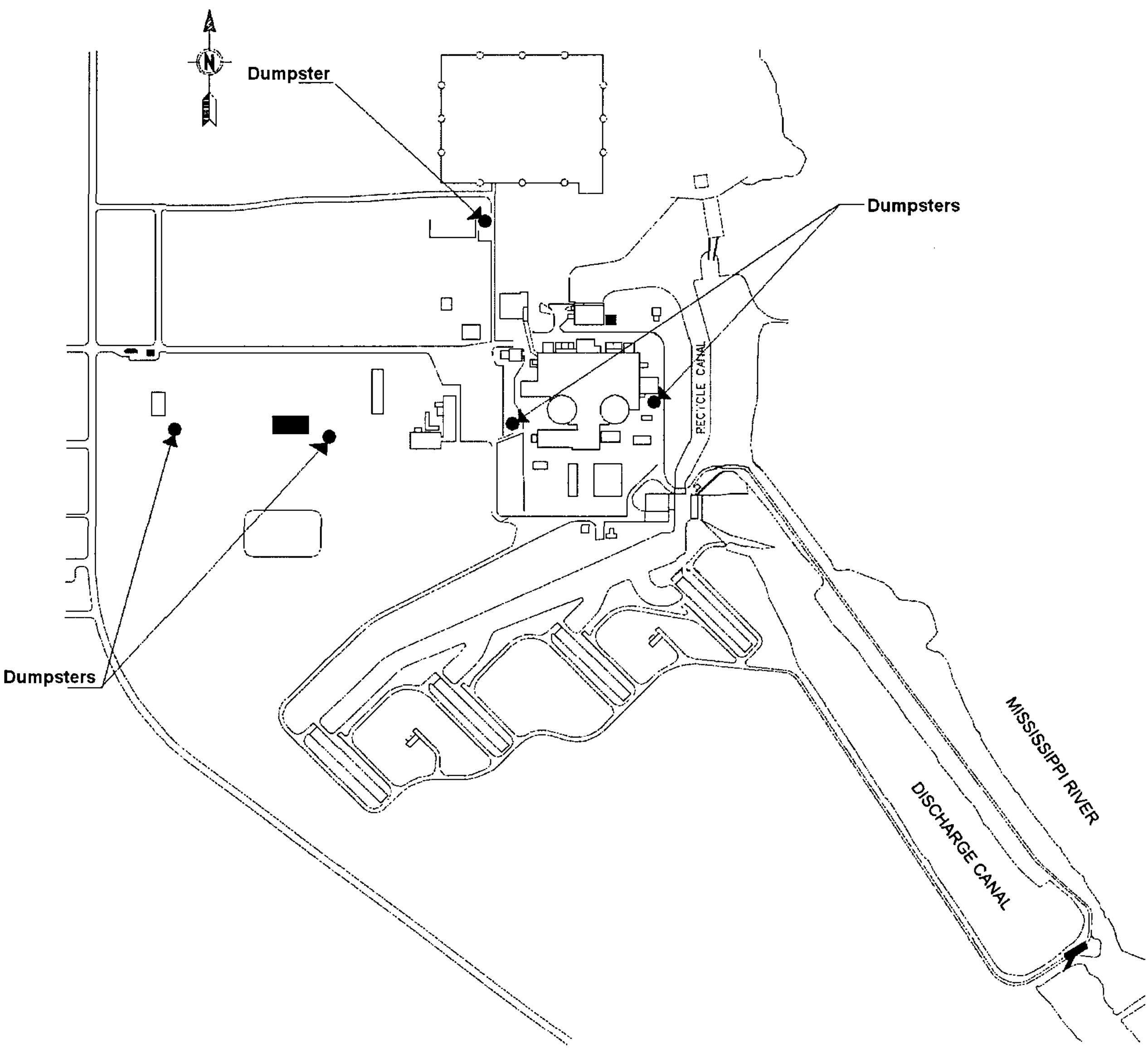

Figure 1: Layout of Prairie Island ISFSI

Figure 2 PINGP Site

APPLICATION TO THE MINNESOTA PUBLIC UTILITIES COMMISSION FOR CERTIFICATES OF NEED FOR THE PRAIRIE ISLAND NUCLEAR GENERATING PLANT

FOR

ADDITIONAL DRY CASK STORAGE DOCKET NO. E002/CN-08-510

AND

EXTENDED POWER UPRATE DOCKET NO. E002/CN-08-509

MAY 16, 2008

Xcel Energy®

Xcel Energy®

414 Nicollet Mall
Minneapolis, Minnesota 55401

May 16, 2008

- VIA ELECTRONIC FILING -

Burl W. Haar
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 CERTIFICATES OF NEED FOR THE PRAIRIE ISLAND NUCLEAR GENERATING PLANT FOR

ADDITIONAL DRY CASK STORAGE
DOCKET NO. E002/CN-08-510

AND

EXTENDED POWER UPRATE
Docket No. E002/CN-08-509

Dear Dr. Haar:

Northern States Power Company, a Minnesota corporation ("Xcel", or "the Company"), is pleased to submit to the Minnesota Public Utilities Commission ("Commission") for consideration, two Applications for Certificates of Need ("CON") for the Prairie Island Nuclear Generating Plant. The first Certificate of Need is for authorization for up to an additional 35 dry cask storage containers so that the plant can operate another 20 years beyond its currently licensed life. The second Certificate of Need is to implement an Extended Power Uprate ("power uprate") project that will increase the generating capacity of Prairie Island by 164 MW (82 MW each unit) to meet our customers' growing energy needs.

The Commission's July 28, 2006 Order in Docket E002/RP-04-1752 (2004 Resource Plan) required the Company to pursue the necessary regulatory approvals for the Prairie Island power uprate project. The Commission's September 28, 2007 Order in the same docket granted a delay of the filings until at least December 14, 2007. The delay was granted based on our request to reassess the impacts of the state's Next Generation Energy Act of 2007. On December 14, 2007, we filed our 2007 Resource Plan (Docket No. E002/RP-07-1572), which indicated that even after including the

demand-side management and renewable requirements of the 2007 legislation, we are projecting a generation deficit starting in 2010. We submit this application as one element of our plan to address that deficit.

The CON for additional dry cask storage is filed pursuant to Minn. Stat. § 116C.83, Minn. Stat. § 216B.243, and Minn. R. 7855; the CON for the power uprate is submitted pursuant to Minn. Stat. § 216B.243, and Minn. R. 7849. Our Application demonstrates that the additional casks at Prairie Island and the power uprate project are the most cost-effective options available, provide significant environmental benefits by utilizing and increasing the size of a non-carbon emitting resource as compared to fossil fueled alternatives, and reduce our exposure to fossil fuel price risk and the risk of future environmental regulations by adding to our fuel diversity.

In support of our applications, we are submitting our initial fee payment of $4,450, for the Extended Power Uprate CON as provided for in Minn. R. 7849.0210 subp.1, and $20,000 for the Additional Dry Cask Storage CON as provided for in Minn. R. 7855.0210 subp. 6 (b) to your attention under separate covers. The Company intends to file the accompanying Site Permit application for the Prairie Island power uprate project in the next few weeks.

We are providing hard copies of this filing to the Office of the Attorney General and are providing hard copies and/or a filing summary to parties per the attached service lists. Additionally, copies of our application can be viewed or obtained from the Xcel Energy web site at www.xcelenergy.com.

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

SINCERELY,

/s/

SCOTT M. WILENSKY
ACTING VICE PRESIDENT
GOVERNMENT AND REGULATORY AFFAIRS

Enclosures
c: Service Lists

STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

LeRoy Koppendrayer	Chair
David Boyd	Commissioner
Thomas Pugh	Commissioner
Phyllis Reha	Commissioner
J. Dennis O'Brien	Commissioner

IN THE MATTER OF THE APPLICATION OF NORTHERN STATES POWER COMPANY, A MINNESOTA CORPORATION, FOR CERTIFICATES OF NEED FOR THE PRAIRIE ISLAND NUCLEAR GENERATING PLANT FOR ADDITIONAL DRY CASK STORAGE AND EXTENDED POWER UPRATE

DOCKET NO. E002/CN-08-509
DOCKET NO. E002/CN-08-510

INITIAL APPLICATION FOR CERTIFICATES OF NEED FOR PRAIRIE ISLAND NUCLEAR GENERATING PLANT

SUMMARY OF FILING

Please take notice that on May 16, 2008, Northern States Power Company, a Minnesota corporation ("Xcel Energy" or "the Company"), filed with the Minnesota Public Utilities Commission ("Commission") Application for two Certificates of Need to the Minnesota Public Utilities Commission. The Company's first request is for a CON to allow for sufficient dry cask storage at the existing Independent Spent Fuel Storage Installation ("ISFSI") at Prairie Island in order to accommodate plant operations through 2034. The procedures and criteria for this CON are contained in Minn. Stat. § 216B.243, and Minn. R. Parts 7855 and 7849. The second request is for a CON to allow for a 164 MW increase in the electrical generating capacity of the Prairie Island plant. The procedures and criteria for this CON are contained in Minn. Stat. § 216B.243, and Minn. R. Parts 7849 and 7829.

The additional casks will be located on two new concrete pads within the existing storage facility. The existing storage site boundaries will not need to be expanded. The power uprate will require very few modifications to the reactor and its support systems that produce steam; however the project will require a number of modifications to the systems that convert the steam to electricity. The projects will also require a number of license amendments or approvals by the Nuclear Regulatory Commission who oversees the safe operation of nuclear power plants.

Implementation of the additional dry cask storage and power uprate projects at Prairie Island are the least cost power supply and significantly *reduces* carbon emissions by expanding a non-carbon emitting plant and displacing energy from existing carbon producing plants.

Copies of the Petition can be obtained from the Xcel Energy web site at www.xcelenergy.com.

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

DOCKET NO. E002/CN-08-0509
DOCKET NO. E002/CN-08-0510

Distributed to:

- In the Matter of Xcel Energy's 2008-2022 Integrated Resource Plan Initial Distribution List (Docket No. E002/RP-07-1572)
- Xcel Energy's Miscellaneous Electric Service List
- In the Matter of Xcel Energy's Application for Authority to Increase Rates for Electric Service (Docket No. E002/05-1428)
- In the Matter of Xcel Energy's Application for a Certificate of Need for Prairie Island Nuclear Generating Plant (Docket No. E002/CN-91-19)
- Prairie Island Plant – Service List (Entire Filing Binder) - Goodhue County and City Officials, Tribal Leaders, Agencies & Interested Parties

Dated this 16th day of May 2008

/s/

Carole Wallace

In the Matter of Xcel Energy Prairie Island
Certificates of Need

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05/16/2008

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In the Matter of Xcel Energy's Application for
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Official OAH Docket No. 3-2500-17033-2
PUC Docket E002/GR-05-1428
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Prairie Island Certificate of Need
Docket No. E002/CN-91-19

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Prairie Island Plant – Service List (Entire Filing Binder)
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11-14-07

Additional Dry Cask Storage
Docket No. E002/08-0510
Extended Power Uprate
Docket No.: E002/08-0509

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Application for Certificates of Need for the Prairie Island Nuclear Generating Plant

Table of Contents

1 Summary

1.1 Introduction

Northern States Power Company, a Minnesota corporation ("Xcel Energy" or the "Company"), submits this Application for two Certificates of Need to the Minnesota Public Utilities Commission ("Commission"). First, we request the Commission issue a Certificate Of Need ("CON") to allow for sufficient dry cask storage at the existing Independent Spent Fuel Storage Installation ("ISFSI") at Prairie Island in order to accommodate plant operations through 2034. The procedures and criteria for this CON are contained in Minn. Stat. § 216B.243, and Minn. R. Parts 7855 and 7829. Second, we request the Commission issue a CON to increase the combined electrical generating capacity of the two reactors at Prairie Island by 164 MW to meet the growing needs of our customers. The procedures and criteria for this CON are contained in Minn. Stat. § 216B.243, and Minn. R. Parts 7849 and 7829.

The 35 additional storage casks necessary to continue operating Prairie Island an additional 20 years and the additional 164 MW of capacity and energy from the power uprate provide our customers and the region significant economic and environmental benefits.

- *Economic Benefits.* Extending Prairie Island's operating life for an additional twenty-years and implementation of the power uprate helps the Company meet our customers' growing energy needs in the most cost-effective manner. Continuing to operate Prairie Island for an additional twenty-years is $1.1 billion less expensive on a present value revenue requirements ("PVRR") basis as the next best alternative, which was replacing the plant with two natural gas combined cycle units. Implementation of the power uprate results in over $519 million in savings on a PVRR basis over the alternative. Numerous sensitivity analyses confirm the projects are the least-cost options under a multitude of assumptions.

- *Environmental Benefits.* Prairie Island is an existing, non-carbon emitting generation source. Replacing Prairie Island with a fossil fueled generation resource would significantly increase carbon emissions. Continued use of the plant instead of replacing it with the next least cost option (natural gas combined cycle units) that prevents approximately 88 million tons of carbon from being released over the

next 20 years. Implementing the power uprate could result in between 16 million and 65 million less tons of carbon being emitted over the next 20 years. The reduction in carbon and other emissions is due to both new fossil fuel generation resourced not being built due to the power uprate and the reduction in the use of some existing fossil fuel plants due to the availability of the power uprate project.

Additionally, the projects will occur within the existing plant and ISFSI so no greenfields will be disturbed and the operation of the plant after power uprate will take place within all existing permit limits.

- *Risk Benefits.* The continued operation of Prairie Island will add to our diversity of fuels by acting as a price hedge against the volatility of natural gas prices and future carbon regulations. The project also provides a hedge against unanticipated delays in meeting the challenges in achieving the conservation goals and delivering the wind power contained in our 2007 Resource Plan.

The economic, environmental and risk benefits these two projects provide are consistent with the Company's and the State's goals of being an environmental leader, while minimizing the impact on electric rates. We are pleased to request approval of these projects as both the projects proved superior to the available alternatives.

1.2 Structure of Petition

We present our Applications in the Sections listed below, including sections specifically addressing each of the four principal criteria provided by the Commission's Certificate of Need rules (Minn. R. 7855.0120 and 7849.0120):

- *Summary*, providing an overview of the Applications, the projects and the need and benefit of the projects.
- *General Information and Regulatory Permits*, where we provide general information required by the applicant and the additional permits necessary to implement the projects.
- *Plant Information and Project Descriptions*, where we describe Prairie Island, its importance, and a description of the additional dry cask storage and power uprate projects.
- *Alternatives to Continued Operation*, which describes the alternatives to the continued operation of the plant including additional demand-side

management, renewables, fossil fuel generation and the "no action" alternative.

- *Dry Cask Storage Alternatives*, reviews the alternatives to on-site storage, the potential for increase pool storage capacity, dry cask technologies and discusses alternatives of different size and at different sites, as well as the "no action" alternative.
- *Alternatives to Power Uprate*, describes the evaluation methodology and criteria used to determine the most viable alternatives to the power uprate and the economic and environmental results of that evaluation.
- *Dry Cask Storage Environmental Information*, presents the environmental impact of the additional dry casks being proposed at the existing ISFSI.
- *Power Uprate Environmental Information*, discusses the environmental impact of the proposed power uprate project.
- *Denial Would Adversely Affect Adequacy, Reliability, and Efficiency of Energy Supply System*, provides verification of our system needs for the energy and capacity the two proposals provide.
- *Projects Benefit Society*, presents additional considerations such as risk mitigation and environmental impacts that will benefit society if our proposals are adopted.
- *Project Compliance,* demonstrates that our proposals comply with all applicable Statutes, Rules and other requirements.

1.3 Background

Xcel Energy's nuclear power plants -- Prairie Island and Monticello -- play important roles in our fleet of generating resources. Prairie Island is a 1,100-megawatt plant consisting of two pressurized water reactors, located in Red Wing, Minnesota and Monticello is a 600-megawatt boiling water reactor located in Monticello, Minnesota. The plants operate around the clock for extended periods of time, and provide valuable base load service. Together, they provide approximately 15 percent of the Company's production capacity and produce over 28 percent of our customers' electric energy requirements of our northern five-state service territory.

As discussed in our 2007 Resource Plan, the Next Generation Energy Act of 2007 Act is recasting what the Company must do to meet our future energy

needs. We remain committed to providing an energy supply that is adequate, reliable and efficient, while meeting the aggressive new energy conservation goal and the requirement of 30 percent renewable energy by 2020 for Xcel Energy, and the requirement to reduce greenhouse gas emissions by 15 percent by 2015. In this effort, we will be adding significant amounts of wind energy to our system. To ensure our system has adequate capacity, especially as we significantly increase our renewable generation resources, we affirmed in the 2007 Resource Plan our earlier decision to seek to continue the operation of Prairie Island beyond its current operating licenses. As we have discussed in previous applications, we have concluded that the nuclear plants can continue to be operated safely, reliably and economically.

In our 2007 Resource Plan, we also affirmed our plans to pursue power uprates at both Prairie Island and Monticello as the most cost-effective means to meet growing demand without increasing our carbon emissions. On February 14, 2008, we filed an application for an increase in generating capacity at Monticello. In this application, we request the Commission approve a similar project at Prairie Island.

To accommodate the extended operating lives of the Prairie Island reactors, it will be necessary to increase the number of dry casks temporarily stored at the existing ISFSI. While the federal government remains responsible for the ultimate disposal of the spent nuclear fuel, until a permanent federal repository is available, it is necessary for Xcel Energy to provide temporary on-site storage for the spent fuel.

This filing is our application for the two CONs required to accommodate the extended and enhanced operation of Prairie Island. As discussed in this application, the operation of Prairie Island cannot continue after 2014 unless authority is granted to increase the number of dry casks stored at the existing ISFSI. In addition, our evaluation has demonstrated that the proposed power uprate is the most cost-effective option to meet the growing energy needs of our customers. Both projects will significantly contribute towards reducing carbon and other emissions.

1.4 The Prairie Island Plant

Prairie Island has two, two-loop pressurized water reactors. These reactors produce on average a nominal value of 550 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 Nuclear Regulatory

Commission ("NRC") license for each unit was for a period of 40 years. The initial licenses will expire in 2013 and 2014 for Unit 1 and Unit 2, respectively. The Company submitted an application to the NRC for an additional 20-year license extension for both units on April 15, 2008.

Each reactor at Prairie Island is shut down approximately every eighteen to twenty months for refueling. During each refueling outage, an average of 48 fuel assemblies are removed from each reactor and replaced with new assemblies. The spent fuel assemblies are placed in the spent fuel pool within the plant for temporary storage. The entire inventory of spent nuclear fuel produced during the plant's 35 years of operation is stored in the plant's spent fuel pool or in dry casks at the ISFSI. There are currently 24 dry casks at the ISFSI. The Commission has authorized the storage of the spent fuel generated during the period of the initial NRC operating licenses at the ISFSI until a permanent federal repository is available.

1.5 Additional Dry Cask Storage Project Description

Prairie Island currently has State authorization for enough dry casks (29) to store the spent fuel generated until the end of the current operating licenses in 2013 and 2014. The plant will require additional storage for the spent nuclear fuel generated after 2014. In order for the reactors to continue operation through a license renewal period to 2033 and 2034, up to an additional 35 dry casks will need to be added to the existing ISFSI. We propose to use enhanced version of the TN-40 cask currently at use at the plant. The enhanced version is called the TN-40HT and is also manufactured by Transuclear, Inc.

We propose to provide the additional spent fuel storage at Prairie Island by extending the concrete storage pads within the existing ISFSI located at the plant. The ISFSI is currently licensed by the NRC to store 48 TN-40 casks. The proposed extension of the storage pads will be sufficient to accommodate the 16 additional casks.

1.5.1 Alternatives to the Continued Operation of Prairie Island

If the Commission should deny our application for additional dry cask storage, Prairie Island will be required to shutdown in 2013 (Reactor Unit 1) and 2014 (Reactor Unit 2). Under this scenario, there will be a need to "replace" the 1,100 megawatts of electrical power currently provided by Prairie Island by new sources of generation. However, the need for additional dry cask storage is not eliminated if the plant does not operate beyond 2013-2014.

If our CON application for additional storage to continue operating the plant is not granted, Prairie Island would be required to shutdown by the end of 2014 and the decomissioning process would begin. In order to decommission the plant, spent fuel would have to be removed from the reactor and spent fuel pool. To support the decommissioning process, 39 additional dry cask storage containers would be necessary. Thus, if the Commission denies this CON application for an additional 35 storage casks to continue operating the plant, we will need to offer a new CON application to store an additional 39 dry casks at the ISFSI to decommission the plant.

The demand for electricity in our service territory in the Upper Midwest is growing at the rate of about 1.1 percent per year, or roughly 556 GWH and 133 MW each year. These estimates of demand and energy consumption already take into account the demand-side management goals set by the Minnesota Legislature in 2007. Without those efforts, growth would be even higher each year.

In our 2007 Resource Plan filing, we assumed we would achieve a saving of 1.1 percent of our retail sales through direct conservation programs. This will require a 30 percent savings increase from our 2004 energy savings goal and a 48 percent savings from our 2004 demand savings goals. These reductions are significant and it is not feasible to reduce demand by an additional 1,100 MW by 2013-2014 from conservation programs to replace the production of Prairie Island.

The potential replacement of all or substantially all of the power now produced by Prairie Island would result in both increased energy costs and significantly more carbon emissions. To replace the 1,100 MW of base load power generated by Prairie Island, new power plants fueled by coal or natural gas would need to be constructed. To evaluate these generation alternatives, as well as the continued operation of Prairie Island, we ran simulations with a planning model called "Strategist". Using a variety of assumptions, simulations were developed in which Prairie Island would continue to operate or, alternatively, was replaced with coal or natural gas fueled base load plants in 2013 and 2014. The simulations predict that our power supply will be at least $1.1 billion more expensive if Prairie Island must be replaced at the end of its current operating licenses. The simulations also estimate that carbon emissions will increase by approximately 17 percent if Prairie Island is shutdown at the end of its current operating licenses.

1.5.2 Alternatives to Additional Dry Cask Storage

We examined both off-site and on-site alternatives to the proposed additional dry cask storage at the existing ISFSI, but we did not find a more reasonable and prudent alternative. We examined four off-site alternatives: reprocessing spent nuclear fuel, the potential future federal storage facility at Yucca Mountain, Nevada, the potential future Private Fuel Storage facility in Utah, and the General Electric storage facility in Morris, Illinois.

There are no private companies currently operating reprocessing facilities in the United States, thus reprocessing is not a viable alternative. And while the federal government is statutorily and contractually responsible for developing a facility for the permanent disposal, the development of Yucca Mountain will not be available soon enough to prevent the need for additional dry cask storage at Prairie Island. Similarly, the development of the Private Fuel Storage ("PFS") facility is not without controversy and will not be available in the timeframe needed for Prairie Island. The last off-site alternative is the General Electric ("GE") storage facility in Morris, Illinois, which is no longer accepting spent fuel from commercial nuclear reactors.

We also examined four on-site alternatives: fuel rod consolidation, pool re-racking, alternative methods of dry spent fuel storage, and alternative on-site locations for storage of the additional dry casks.

Based on the results of a fuel rod consolidation demonstration project conducted at Prairie Island in the mid 1980's and the lack of any recent industry initiatives or design advances that would address the issues raised by the demonstration project, we conclude that fuel rod consolidation is not a viqable option. Re-racking is not a viable alternative as the number of storage cells gained by reracking would not be sufficient to support the additional storage cells needed for an additional 20 years of operation. The construction of a new spent fuel pool was evaluated in 1991 as part of the CON application for the existing ISFSI, where it was determined not to be cost-effective and that the increased handling of the fuel posed concerns. After reviewing multiple dry cask storage technologies, it was determined that the use of the non-canistered storage system we are currently using best fit our needs.

1.6 Environmental Information -- Additional Dry Cask Storage

The proposed addition of dry spent fuel casks to the existing ISFSI will have minimal environmental impacts. Since the additional casks will be placed in the existing ISFSI, there will be no disturbance at the plant site outside the ISFSI.

Within the ISFSI, the concrete pads on which the casks are placed will be extended. The two main environmental impacts due to the additional casks on the ISFSI and the continued operation of the plant are:

1) There will be a slight increase in the radiation due to the increased number of casks. The dose rate is also affected by the fuel to be stored and the use of the enhanced cask. Considering the fuel, new casks, the increased number of casks, and the estimated loading sequence, the off-site dose rate to the nearest Prairie Island resident was calculated to be approximately 0.36 mrem annually.[1] This is a small fraction of the 25 mrem annual allowable limit set by the NRC. Additionally, the 0.36 mrem would constantly decrease due to radioactive decay.
2) There will be a significant reduction in the amount of carbon and other emission released to the environment if Prairie Island continues to operate versus if it is replace with fossil fuel generation. Between 88 million and 107 million tons of carbon will not be released into the environment due to the continued operation of the plant as compared to the alternatives. Continued operation of Prairie Island will also result in significantly less SOx, NOx, CO, PM10 and VOC to be released compared to the alternatives.

1.7 Need for Power Uprate

The proposed power uprate at Prairie Island is necessary to meet the growing energy demands of our customers. For several years, we have recognized the need to increase energy and capacity to meet the rising levels of demand anticipated after 2010. In our 2004 Resource Plan, the Commission approved our request to pursue a package of uprates – including the Prairie Island project – as part of an effort to meet identified base load need (energy and capacity). Following the passage of major energy initiatives in the 2007 legislative session,

[1] This is a conservative calculation as explained further in Section 7.

the Commission granted the Company's request to defer implementation of the Prairie Island power uprate project pending a reevaluation of future needs.

In our Resource Plan filed December 14, 2007, even after planned compliance with the aggressive new Renewable Energy Standard and DSM initiatives, our system demand and energy requirements continue to grow at approximately one percent per year, or 133 MW and 556 GWH. By 2012, we estimate a 126 MW deficit; by 2022, the deficit will grow to over 2,800 MW. (Table 1-1)

Table 1-1 Projected Deficit Table

Year	MW
2010	(126)
2013	(395)
2014	(597)
2022	(2,886)

The power uprate project will supply 164 MW of electric power from Prairie Island to help reduce the growing deficit.

1.8 Power Uprate Project Description

The additional 164 MW due to the power uprate at the Prairie Island plant will be achieved by:

a) Increasing the amount of heat produced in the reactor, which will result in more steam being produced by the steam generators.

b) 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.

The project will result in very few modifications to the reactor and the reactor support systems that produce steam, but the balance–of-plant systems that convert the steam produced in the reactor to electricity will need modifications.

Some of the more significant balance-of-plant changes will be the replacement of the high-pressure turbines, rewinding or replacement of the main generators, replacement of the generator step-up transformers, replacement of the moisture separator reheaters and upgrading of the isophase bus duct cooling system.

The Prairie Island power uprate project will require license amendments from the NRC to operate the plant at a higher thermal temperature. The operating license amendments will be filed in 2010.

1.9 Alternatives to the Proposed Power Uprate Project

As part of our CON application, we evaluated several alternatives to the 164 MW power uprate project at Prairie Island, including both non-construction and construction alternatives.

1.9.1 Non-Construction Alternatives

1.9.1.1 Demand-Side Management

We are committed to achieving a 1.1 percent energy reduction as our CIP/DSM goal, consistent with the Next Generation Energy Act of 2007. We believe the target is aggressive, and will push the limits of achievable potential in our service territory and there is significant uncertainty regarding both the size and timing of actual savings.

Given these circumstances, a DSM based alternative to meet the projected future need in addition to the aggressive DSM goals already in place is risky, and is not a more reasonable or prudent alternative than the proposed power uprate.

1.9.1.2 Increased Efficiency of Existing Facilities

In addition to pursuing pending proposals for power uprate at Monticello and upgrades at Sherco, our next three largest plants – King, Riverside and High Bridge – are already undergoing major modifications to reduce their emissions and increase their electric output under our Metro Emission Reduction Program ("MERP"). Between the MERP plants and the Monticello Power Uprate and

the Sherco upgrades, we have recently increased, or are seeking to increase the electric output of our six largest plants.

Since there are fewer opportunities for additional efficiency projects at our existing plants, we determined an increased-efficiency alternative at our existing plants to meet the future need is not viable.

1.9.1.3 Long-Term Purchased Power Agreement ("PPA")

Although we are not aware of a specific long-term purchase opportunity, we modeled an estimate of a long-term PPA from a coal-based resource as a possible alternative to the power uprate. The hypothetical coal PPA was modeled to have the same cost, performance and emission characteristics of a new conventional coal plant. Our modeling showed that a 164 MW Coal PPA would be approximately $619 million more expensive over a 20-year period than the proposed power uprate.

In view of its significantly higher costs, we conclude a long-term purchased power alternative is not a more reasonable and prudent alternative.

1.9.1.4 Short-Term Purchased Power

We currently rely on short-term power purchases to cover about five to ten percent of our projected capacity and energy needs. In our 2007 Resource Plan, our analyses incorporated 750 MW of short-term purchases. Significant concerns exist about the reliability of short-term purchased power, including specific concerns about firm transmission service and continued recognition of MISO Network Transmission service being approved for accreditation of resources by MAPP. Additionally, there is significant risk involved with relying on short-term purchased power to fill base load needs – both from an availability and cost standpoint.

In view of the risks of increasing our reliance on short-term purchased power, we found that short-term purchased power alternative is not a more reasonable and prudent alternative than the proposed power uprate.

1.9.1.5 New Transmission Lines

Hypothetically, additional transmission infrastructure will provide access to additional capacity resources. However, since the capacity construction boom

of the late 1990's, there has been little capacity built in the region. Capacity markets are very tight, with little or no excess capacity available.

Since there are few opportunities for new transmission to bring in additional capacity, new transmission lines are not a viable or more prudent alternative than the proposed power uprate.

1.9.1.6 Distributed Generation

Pursuant to Minn. Stat. § 216B.2426, we are required to consider whether distributed generation can meet the need of this application. However, we are not aware of any distributed generation resources available that would be capable of meeting the current need. A significant percentage of the likely sources of distributed generation are wind and DSM. Our analysis already includes significant increases in both of these resources to meet the goals and requirements of the new RES and DSM legislation. As a result, the main sources of other distributed generation are likely to be biomass, biodiesel and hydro. Based on available cost estimates, these distributed resources are not likely to be cost-effective alternatives to the power uprate.

Although we did not identify individual "smaller-scale" distributed generation projects that would meet the 164 MW need, we did model a 164 MW base load biomass alternative. (Given its size, we did not categorize its as distributed generation.) Our analysis found the biomass plant would have roughly the same capacity and energy characteristics as the proposed power uprate, but lesser performance in terms of reliability and availability due to technology and fuel supply considerations. We also found the cost of the biomass alternative was approximately $1.179 billion more expensive than the power uprate.

Given its much higher cost and lesser reliability, we conclude the biomass alternative is not a more reasonable and feasible alternative.

1.9.1.7 Reduced Project Size

The proposed power uprate, with a net capacity increase of 164 MW, is the optimal, achievable MW increase at Prairie Island. If the size of the project were reduced, it would result in higher costs per MW and would require the implementation of additional projects to meet our customers' growing needs. In addition, even with the increased MW available in 2013 from the power uprate, our 2007 Resource Plan forecasts a 395 MW deficit in 2013 and a 1,195 MW deficit in 2015.

In view of the size of the need and the higher unit costs associated with a smaller power uprate project, a reduced project size alternative is not a more reasonable and prudent alternative to the power uprate project.

1.9.1.8 No Facility

If the power uprate is not undertaken, and no alternative source of the 164 MW is pursued, our system would begin showing a deficit in 2010 that would grow to over 2,800 MW by 2022. Thus, a "no facility" or "no action" alternative is not a more reasonable or prudent alternative to the power uprate.

1.9.2. Construction Alternatives

In addition to the hypothetical 164 MW Biomass plant and the hypothetical 164 MW Coal PPA discussed earlier, we evaluated an "unconstrained alternative". In this scenario, we allowed Strategist to select the most cost-effective combination of resources from the available generic resources including coal, natural gas combined cycle, and natural gas simple cycle resources. The model selected a natural gas combustion turbine ("CT") in place of the power uprate and indicated the natural gas CT alternative would be $519 million more expensive than the power uprate. The natural gas CT alternative also had more emissions associated with it than the power uprate.

Given its higher cost and emission levels, a natural gas CT alternative would not be a more reasonable and prudent alternative than the proposed power uprate project.

1.10 Environmental Information – Power Uprate

The proposed power uprate project at Prairie Island has minimal environmental impacts. The project will take place within the existing plant buildings. Since the plant's footprint isn't changing, no new land areas will be disturbed. In general, the effect of the power uprate on a given medium is bounded by the assumption that the increase is proportional to the increase in core thermal power. As a bounding limit, the increase in the use of a resource, such as surface or groundwater, or the increase of liquid or solid radioactive waste could increase in proportion to the proposed power increase of about 10 percent. As discussed in more detail in Section 8 for each medium, a bounding 10 percent increase is generally not significant and is well within the established parameters of acceptable operation. Thus, no changes to existing operating or

environmental permits are anticipated. There will also be a slight increase in circulating water outfall temperature, but the facility will continue to meet the discharge temperature limits set by the MPCA.

1.11 Certificate of Need Criteria

The procedures and criteria for Certificates of Need are contained in Minn. Stat. § 216B.243 and in Minn. R. Parts 7849, 7855 and 7829. Pursuant to the authority granted in Minn. Stat. § 216B.243, subd. 1, the Commission has established criteria to assess the need for additional dry cask storage (Minn. R 7855.0120) and the need for a large electric generating facility (Minn. R. 7849.0120). The four criteria are similar for both Certificates of Need.

Our Application for approval of the additional dry cask storage and the Prairie Island power uprate project meet all four principal criteria.

1.11.1 Minn. R. 7855.0120, subd. (A) & Minn. R. 7849.0120, subd. (A).

> *A. The probable result of denial would be an adverse effect upon the future adequacy, reliability, or efficiency of energy supply to the applicant, to the applicant's customers, or to the people of Minnesota and neighboring states...,*

Our proposals for additional dry cask storage and power uprate at Prairie Island fully meet these criteria on all points:

- *Adequacy*: Our updated growth forecast[2] indicates that despite compliance with the new DSM and renewable legislation, our system continues to grow. Our system demand and energy requirements continue to grow at approximately 1 percent per year,[3] or by 133 MW per year and approximately 556 GWh per year. Our forecast indicates that starting in 2010 we have a 126 MW capacity deficit that increases to over 2,800 MW by 2022. This growth assumes that Prairie Island continues to operate until 2032-2034. If additional dry cask storage is not approved and the plant is required to shutdown starting in 2013, the 2013 deficit will increase from 395 MW to 980 MW; the 2015 deficit will increase from 1,195 MW to almost 3,000 MW; and the 2022 deficit will be almost 4,000 MW.

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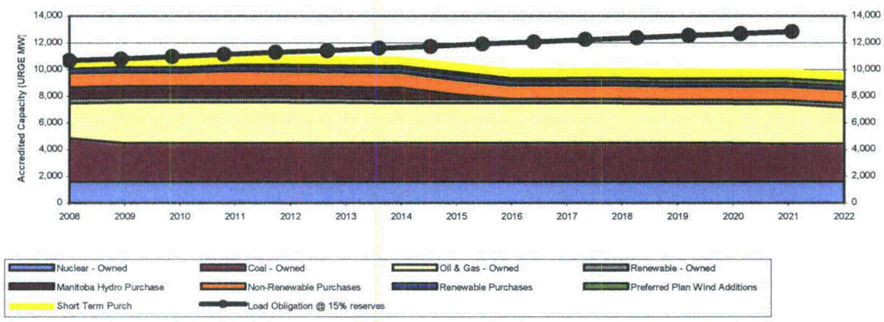
[2] Appendix B contains an explanation of a change that was made as to how we account for DSM in the forecast versus previous filings.

[3] 90th percentile peak forecast and 50th percentile energy forecast level

- *Reliability*: Prairie Island is essential to the reliability of the region's electric energy supply as it provides base load energy and capacity needs 24 hours per day, 7 days per week. Prairie Island has proven to be a highly reliable plant and the power uprate project will not affect the current reliability of the plant and the additional capacity and energy will be available at the current level of reliability.

- *Efficiency*: By comparing the forecast need to the available generation resources and planned additions, (including the addition of approximately 200 MW per year to meet the RES), we gain a better understanding of the importance or Prairie Island on our future resource needs. Figure 1-1 indicates that even with Prairie Island, we still have a significant capacity shortfall that grows over time. Absent the continued use of and expansion of Prairie Island, it is anticipated that the majority of the future capacity need will be filled by new natural gas generation.

Figure 1-1
Resource and Requirements



The continued use and expansion of such a reliable source of base load energy will help our future need for intermediate and peaking natural gas plants. By maintaining and expanding an existing base load generation facility, we can use some of the existing natural gas generation (which have more flexibility to be dispatched) to complement the intermittency of the new wind resource. The synergies gained are an extremely efficient use of energy supply resources.

Denial of our proposals will have an adverse effect on the adequacy, reliability, and efficiency of energy supply for our customers and the region. Our customers' growing needs, combined with new regulations, require us to maintain our existing non-carbon producing resources, while obtaining new

environmentally friendly resources to adequately meet future needs. The projects will not affect Prairie Island's high reliability and the power uprate projects will achieve 164 MW from one of our most reliable resources. Efficiencies will be gained by the use of an existing site versus the development of a new generation resource on a new green-field site and by changes to the dispatching of existing natural gas plants to complement energy from new wind resources.

> B. *A more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record...,*

The Prairie Island projects offer the best alternatives to meet the needs of our customers. The projects are the lowest-cost alternatives, provide significant environmental benefits through reduced carbon and other emissions and will assist us in meeting our legislated carbon and reduction goal.

We reach this conclusion after comparing the projects to various alternatives (including on-site and off-site storage, multiple dry cask storage containers, and a variety of generation and non-generation alternatives). We performed numerous sensitivities to determine the robustness of our analysis. In all cases, the Prairie Island projects proved to be the most cost-effective and contributed the most to our legislated carbon and fossil fuel reduction goals. As seen in Table 1-2 below, the generation replacement alternatives were between \$1.1 billion and \$2.2 billion more expensive than operating Prairie Island on a PVRR basis and the power uprate was \$519 million less than the next best option.

Table 1-2
PVRR Analysis

PVRR (thousands)	Replacement	Power Uprate
Prairie Island	$61,875	$61,356
Super Critical Pulverized Coal w/ 50% Sequestraton	$64,068	N/A
Natural Gas Combined Cycle	$62,938	N/A
Coal PPA	N/A	$61,974
Biomass	N/A	$62,535
Unconstrained (Natural Gas Combustion Turbine)	N/A	$61,875

Our analysis confirms that the alternatives do not offer more financially or environmentally prudent resources - demonstrating that the proposed Prairie Island projects are the most reasonable and prudent alternatives available to meet our customers' needs.

> *C. By a preponderance of the evidence on the record, the proposed facility, or a suitable modification of the facility, will provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments, including human health,*

The Prairie Island projects provide multiple benefits to our customers and to society. The projects serve our customers' current and growing needs with significantly fewer environmental impacts than the alternatives. The continued operation of Prairie Island will result in between 88 and 107 million tons of carbon from not being released to the atmosphere as compare to the coal with partial sequestration and combined cycle alternatives. The power uprate alternatives would have increased carbon emissions by 16 million tons for the natural gas combustion turbine, 32 million tons for the biomass plant and 65 million tons from the coal PPA versus no carbon increase due to the power uprate. This result stems from the emission-free nuclear resource replacing energy and capacity from existing and future fossil fuel resources.

Additionally, since both projects are located at existing sites (plant and ISFSI) and the footprint of the existing sites will not be expanded due to the projects, society benefits by not developing new green-field sites. The changes for the power uprate will almost exclusively take place within the confines of existing buildings. Since the increase in on and off-site dose and cumulative radiation dose is minimal and will remain well below the federal regulatory limits, human health will not be negatively affected.

> *D. The record does not demonstrate that the design, construction, or operation of the proposed facility, or a suitable modification of the facility, will fail to comply with relevant policies, rules, and regulations of other state and federal agencies and local governments.*

The Prairie Island projects are highly regulated by the NRC. The projects are being designed, implemented, and will be operated in compliance with stringent NRC requirements. The NRC will review the projects per their ISFSI operating license renewal process and the license amendment process to grant approval for more than the currently authorized 48 casks, and through the extended power uprate review process. The review processes will result in changes to multiple plant licenses.

The continued operation and expansion of Prairie Island is an integral piece of our strategy to meet and advance Minnesota's new energy policies established by the Next Generation Energy Act of 2007. The projects also meet the State's policy favoring non-proliferation of transmission corridors by utilizing an existing generation site to produce additional energy and capacity and existing transmission facilities.[4]

1.12 Conclusion

The proposed projects at Prairie Island are the most cost-effective alternatives to meet our customers' energy needs under a wide variety of assumptions. The continued and expanded operation of Prairie Island also provides significant environmental benefits. The projects will take place at existing sites – potentially eliminating the development of multiple new greenfield sites. The projects will enable us to minimize the amount of greenhouse gases and other emissions released to the atmosphere from our generation fleet and the project provide a hedge against future risks and costs by reducing our exposure to fossil-fuel prices and future environmental regulations. The projects provide multiple benefits and we are pleased to offer them for consideration.

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[4] *People for Environmental Enlightenment and Responsibility PEER) v. Minnesota Environmental Quality Board,* 266NW2d858 (Minn. 1978).

2 General Information and Regulatory Permits

2.1 Section Summary

This part of our Application provides general information and regulatory requirements regarding the applicant and the proposed projects.

Pursuant to Minn. Stat. § 116C.83, Minn. Stat. § 216B.243 and Minn. R. 7855, Northern States Power Company, a Minnesota corporation ("Xcel Energy" or "the Company"), hereby petitions the Minnesota Public Utilities Commission ("the Commission") for a Certificate of Need ("CON") authorizing the use of up to 35 additional dry cask storage containers at Prairie Island Nuclear Generating Plant so that the plant can operate another 20 years beyond its currently licensed life. The Company also hereby petitions, the Commission for a Certificate of Need pursuant to Minn. Stat. § 216B.243 and Minn. R. 7849 to increase the electrical generating capacity of the Prairie Island plant by 164 MW (82 MW per unit).

2.2 General Information

The applicant's complete name and address, telephone number, and standard industrial code are:

Northern States Power Company, a Minnesota corporation ("Xcel Energy")
414 Nicollet Mall
Minneapolis, Minnesota 55401
(612) 330-5500
SIC Code: 4911

The official or agent to be contacted regarding the filing is:

Brian R. Zelenak
Manager, Regulatory Administration
414 Nicollet Mall, 7th Floor
Minneapolis, Minnesota 55401
(612) 330-5641
brian.r.zelenak@xcelenergy.com

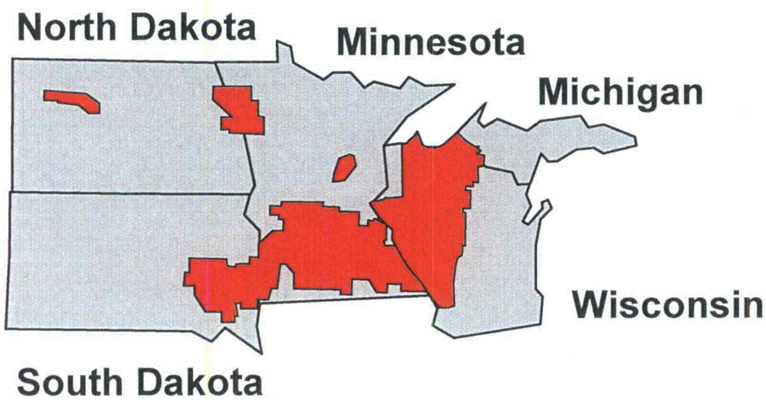
2.3 Description of Business and Service Area

Northern States Power Company is a public utility under the laws of the state of Minnesota. Northern States Power Company and our parent public utility holding company, Xcel Energy, are Minnesota corporations headquartered in Minneapolis, Minnesota.

Xcel Energy generates, transmits, distributes, and sells electricity to residential and business customers within service territories assigned by state regulators in parts of Minnesota, Wisconsin, South Dakota, North Dakota, and the upper peninsula of Michigan. The Company owns and operates a number of electric generation facilities serving the five state area using a variety of technologies and fuels including, coal, oil, natural gas, hydropower, refuse derived fuel ("RDF") and nuclear. Wind, landfill gas, biomass and additional hydropower are also included in our generation portfolio through purchased power agreements.

Xcel Energy has 1.5 million electricity customers in our upper midwest service territory, shown in Figure 2-1.

Figure 2-1: Service Territory Map



2.4 Description of Proposed Projects

The Prairie Island Nuclear Generating Plant is owned by Northern States Power Company, and operated by Nuclear Management Company, LLC ("NMC") under contract with Xcel Energy. In addition to the Prairie Island plant, NMC operates the Company's Monticello Nuclear Generating Plant.[5]

[5] The reintegration of NMC into Xcel Energy is in process and is expected to be completed by mid-year 2008.

2.4.1 Additional Dry Cask Storage CON Description

Xcel Energy proposes to increase the spent fuel storage at the Prairie Island plant located in Red Wing, Minnesota. Additional storage is needed so that Prairie Island can continue to operate beyond the current operating licenses that expire in 2013 and 2014. Our application requests the Commission grant a CON for up to 35 additional dry storage casks and associated equipment to accommodate plant operation through 2034. Sixty-four (64) casks will ultimately be needed to allow Prairie Island to operate an additional 20 years.[6] The additional casks would be placed on two concrete pads to be added inside the existing storage facility, known as the ISFSI. It is not necessary to expand the footprint of the existing ISFSI to accommodate the new concrete pads.

A more detailed description of the proposal for additional dry cask storage is contained in Section 3A of the application.

2.4.2 Extended Power Uprate CON Description

The proposed power uprate project will increase reactor power from the current licensed thermal power level of 1650 MWt to 1805 MWt. The corresponding increase in net generator output is estimated at 82 MW per unit.

The power uprate project will take place over two refueling outages and will require few modifications to the reactor and the reactor support systems that produce steam. The additional power from the power uprate project will be achieved primarily 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. To obtain the higher steam flow, the reactor will be operated at a higher thermal power level. A higher thermal level is achieved by using a fuel assembly that has slightly larger diameter fuel pellets and rods resulting in slightly more uranium in each fuel assembly and more surface area on the fuel rods for increased heat transfer.

The balance-of-plant systems that convert the steam produced into electricity, will need modifications. These modifications will be made during the planned 2012 and 2015 refueling outages. Some of the more significant balance-of-plant changes will be the replacement of, or modifications to, the high-pressure turbines; main generator windings; generator step-up transformers; moisture separator reheaters; and an upgrade to the isophase bus duct cooling.

[6] As discussed further in this Application, the power uprate will not require additional dry storage casks.

2.5 Other Filings, Regulatory Requirements, and Permits Required

A number of permits or approvals must be obtained to increase spent nuclear fuel storage and to increase the power output of Prairie Island.

2.5.1 Additional Dry Cask Storage Filings/Approvals

1) A Certificate of Need authorizing the storage facility and additional casks must be obtained from the Minnesota Public Utilities Commission (Minn. Stat. § 116C.83 and § 216B.243, Minn. R. 7855);
2) Three NRC licenses or license amendments will be required to support the additional casks: (a) approval of the enhanced TN-40HT cask; (b) renewal of the current ISFSI license that is set to expire in 2013; and (c) an amendment to the current ISFSI license to increase the number of casks beyond the 48 currently authorized by the NRC. All NRC filings are subject to the requirements established by the NRC for the design, construction, and operation of an ISFSI and the use of storage containers must be complied with (Title 10, Code of Federal Regulations, Part 72).

2.5.1.1 Certificate of Need – Minnesota Public Utilities Commission

Pursuant to Minn. Stat. § 116C.83, we must obtain a CON from the Commission before additional dry storage casks can be used at the spent fuel storage facility at Prairie Island.

> *116C.83, subd. 2. Commission process for future additional authorization.*
>
> *Authorization of any additional dry cask storage other than that provided for in subdivision 1, or expansion or establishment of an independent spent-fuel storage facility at a nuclear generation facility in this state, is subject to approval of a certificate of need by the Public Utilities Commission pursuant to section 216B.243. In any proceeding under this subdivision, the commission may make a decision that could result in a shutdown of a nuclear generating facility. In considering an application for a certificate of need pursuant to this subdivision, the commission may consider whether the public utility that owns the nuclear generation facility in the state is in compliance with section 216B.1691 and the utility's past performance under that section.*

Under Minn. Stat. § 216B.243 we are also required to address the impacts of continued operations of Prairie Island beyond 2014.

216B.243, subd. 3b.

Nuclear power plant; new construction prohibited; relicensing.
Any certificate of need for additional storage of spent nuclear fuel for a facility seeking a license extension shall address the impacts of continued operations over the period for which approval is sought.

Once a Certificate of Need decision has been made by the Commission, Minn. Stat. § 116C.83, subd. 3 provides the Minnesota legislature with the opportunity to review the Commission's decision during the next legislative session.

116C.83, subd. 3a. Authorization for additional dry cask storage/Legislative review.

To allow opportunity for review by the legislature, a decision by the commission on an application for a certificate of need pursuant to subdivision 2 is stayed until the June 1 following the next regular annual session of the legislature that begins after the date of the commission decision. By January 15 of the year of that legislative session, the commission shall issue a report to the chairs of the house and senate committees with jurisdiction over energy and environmental policy issues, providing a summary of the commission's decision and the grounds for that decision, the alternatives considered and rejected by the commission, and the reasons for rejecting those alternatives. If the legislature does not modify or reject the commission's decision by law enacted during that regular legislative session, the commission's decision shall become effective on the expiration of the stay.

2.5.1.2 Spent Nuclear Fuel Storage Regulations, 10 CFR 72 - Nuclear Regulatory Commission

The Prairie Island ISFSI is currently licensed to store spent fuel in up to 48 TN-40 vertical metal casks (24 on each of the two storage pads), under the existing site-specific license issued in October 1993 (License No. SNM-2506). To fully implement the additional storage requested in this Application, the following three license amendments will be submitted to the NRC:

1) The first required license amendment request is to certify that an enhanced version of the TN-40 cask, referred to as the TN-40HT cask, complies with the requirements of 10 CFR 72. The TN-40HT is very similar to the TN-40 cask in dimensions, storage capacity, and operation. It is designed to use the same handling, transfer and operating equipment as used for the TN-40

casks. The enhancements involve features that improve heat transfer and neutron absorption. These features will enable the TN-40HT casks to store fuel assemblies that have a higher uranium-235 enrichment and higher burn-up, i.e. energy per fuel assembly. The license amendment request was submitted March 28, 2008. The expected NRC approval date is approximately March 2009.

2) The second license amendment request is to renew the Prairie Island ISFSI license, (No. SNM-2506). The license was issued in October 1993 with a 20-year term. Therefore, to continue operation beyond October 2013, the license must be renewed. Per 10 CFR 72.42, the application for renewal of a license must be filed at least two years prior to the expiration of the existing license. Therefore, a submittal will be made prior to October 2011 and it is anticipated that the NRC will renew the license prior to October 2013.

3) The third license amendment request would be to increase the allowed storage beyond the current NRC approved 48-cask limit. To house up to 35 additional casks, two new concrete storage pads designed for a single row of casks will be constructed adjacent to the south side of the existing pads. Since the cask loading plans do not call for the utilization of these new storage pads until 2022, it is projected that the installation of the pads would not occur until 2020. To support this timeline, it is projected that the license amendment request would be submitted to the NRC sometime in 2018 with an anticipated NRC approval in 2019.

Although not required for spent fuel storage at the ISFSI, there are two additional NRC submittals that may be of interest to the Commission. On August 7, 2006 the designer of the TN-40 casks, Transnuclear Inc., made a submittal to the NRC requesting a transportation license for the TN-40 casks pursuant to 10 CFR 71. It is anticipated that the NRC will issue this license in late 2008. After the NRC has approved the TN-40 casks for transportation, Transnuclear plans to submit a license amendment request to license the TN-40HT cask design for transportation. It is anticipated that the NRC would approve that amendment some time in 2009.

Additionally, on April 15, 2008 we submitted an operating license renewal application to the NRC to allow continued operation of Prairie Island until 2033 and 2034.

2.5.2 Power Uprate Filings/Approvals

In order to increase the generating capacity of the Prairie Island plant, we must comply with three principal sets of requirements.

1) A Certificate of Need authorizing the power uprate must be obtained from the Commission (Minn. Stat. § 216B.243, Minn. R. Part 7849);
2) A Site Permit authorizing the power uprate must be obtained from the Commission (Minn. Stat. § 216E.03);[7] and
3) An operating license amendment from the NRC must be obtained authorizing Prairie Island to operate at the increased thermal power level and generating capacity (10 CFR 50).

2.5.2.1 Certificate of Need - Minnesota Public Utilities Commission

Minn. Stat. § 216B.243 requires a Certificate of Need be obtained before increasing the generating capacity of a plant by 50 MW or more.

> *216B.243, subd. 2. Certificate Of Need For Large Energy Facility/Certificate required.*
>
> *No large energy facility shall be sited or constructed in Minnesota without the issuance of a certificate of need by the commission pursuant to sections 216C.05 to 216C.30 and this section and consistent with the criteria for assessment of need.*

We are seeking a CON for our proposal to increase the electrical generating capacity of Prairie Island by 164 MW or 82 MW per unit. A more detailed description of our proposal is contained in Section 3 of this application.

[7] A site permit is required before any person may construct any large electric power generating plant (50 MW or more). *See* Minn. Stat. § 216E.03, subd. 1. The definition of "construction" in the Minnesota Power Plant Siting Act ("Siting Act") states: "'Construction' means any clearing of land, excavation, or other action that would adversely affect the natural environment of the site or route but does not include changes needed for temporary use of sites or routes for non-utility purposes, or uses in securing survey or geological data, including necessary borings to ascertain foundation conditions." Minn. Stat. § 216E.01, subd. 3. The Prairie Island site exists with the "natural environment" already affected by the present plant. For purposes of triggering the Siting Act, the question is whether the uprate project as proposed would: "adversely affect the natural environment of the site." If the only outside plant activities occur on portions of the site that already contain plant facilities and do not "adversely affect the natural environment," the Siting Act may not be applicable.

2.5.2.2 LEPGP Site Permit - Minnesota Public Utilities Commission

Pursuant to Minn. Stat. § 216E.03, subd. 1, no person may construct a large electric power generating plant without first obtaining a Site Permit from the Commission.

> *216E.03, subd. 1. Designating Sites And Routes/Site permit.*
>
> *No person may construct a large electric generating plant without a site permit from the commission. A large electric generating plant may be constructed only on a site approved by the commission. The commission must incorporate into one proceeding the route selection for a high-voltage transmission line that is directly associated with and necessary to interconnect the large electric generating plant to the transmission system and whose need is certified under section 216B.243.*

We will be submitting our Site Permit Application to the Commission shortly after this application so that the commission can consolidate its Need and Siting processes if it so chooses.

2.5.2.3 Operating License Amendment—Nuclear Regulatory Commission

The 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 the Prairie Island plant. Therefore, we must obtain an amendment to Prairie Island's operating licenses from the NRC prior to operating the units at the proposed higher power level. The regulatory approval process to amend a nuclear facility's operating licenses and technical specifications is governed by Title 10 of the Code of Federal Regulations, Part 50. The operating license amendment for power uprate will be filed in 2010 and obtained prior to operating the plant at higher thermal or electrical levels.

Additionally, the change to the larger diameter fuel rods will require NRC approval. The switch to the new fuel will take place over time prior to the implementation of the power uprate. We will file for approval of the new fuel in mid 2008 and anticipate a decision by mid 2009. This will allow us to start utilizing the new fuel in the reactors starting with the 2009 fall outage, so that

we have a full core of the new fuel by the 2012 outage when we implement the power uprate project.[8]

2.5.3. Minnesota Environmental Review

2.5.3.1 Dry Storage Environmental Impact Statement

Minn. Stat. § 116C.83, subd. 6(b) requires an Environmental Impact Statement ("EIS") be prepared by the Department of Commerce, Office of Energy Security ("DOC") pursuant to Minn. Stat. 116D, the Minnesota Environmental Policy Act:

> *116C.83, subd. 6(b)*
>
> *An environmental impact statement is required under chapter 116D for a proposal to construct and operate a new or expanded independent spent-fuel storage installation. The Commissioner of the Department of Commerce is the responsible governmental unit for the environmental impact statement. Prior to finding the statement adequate, the commissioner must find that the applicant has demonstrated that the facility is designed to provide a reasonable expectation that the operation of the facility will not result in groundwater contamination in excess of the standards established in section 116C.76, subdivision 1, clauses (1) to (3).*

The DOC must prepare an EIS, which identifies and assesses the potential environmental impacts of the proposed project, including the environmental impacts of alternatives and potential mitigation measures. The EIS process does not represent a separate approval process for the additional dry cask storage. The purpose of the EIS is to inform the Commission of the potential environmental consequences and potential mitigation measures relating to the proposed project. The environmental review process also provides an opportunity for substantial public participation in identifying and evaluating the potential environmental impacts of the proposed project.

Once our applications are received, the DOC will begin the process of developing a document that describes the scope of issues to be addressed in the EIS. The draft-scoping document will identify and discuss the potential environmental impacts of the proposed project that should be addressed in the EIS. This draft-scoping document will be published to allow for public comment. After comments are

[8] Switching to the larger diameter fuel pins may provide benefits even if the power uprate project is not implemented. For example, it may give us the potential for longer fuel cycles resulting in less used fuel assemblies over the life of the plant.

[9] As noted above, Minn. Stat. § 216E.03, subd. 5, also requires the DOC to prepare an EIS in connection with the site permit for the power uprate project. Minn. R.

received, the DOC will prepare a final scoping order. After the scoping order is issued, the DOC will prepare a draft EIS. The draft EIS will then be published to allow for public comment. After the close of the public comment period, the DOC will prepare a final EIS and deliver it to the Commission to assist the Commission in making its final determination regarding the CON Application.

We anticipate the EIS process will take approximately nine months to a year to complete.

2.5.3.2 Power Uprate Environmental Report

Minn. R. 7849.7030 requires the DOC to prepare an environmental report to assist the Commission in determining whether to approve the request for the power uprate.

> *7849.7030 Environmental Report.*
>
> *The commissioner of the Department of Commerce shall prepare an environmental report on a proposed high voltage transmission line or a proposed large electric power generating plant at the need stage. The environmental report must contain information on the human and environmental impacts of the proposed project associated with the size, type, and timing of the project, system configurations, and voltage. The environmental report must also contain information on alternatives to the proposed project and shall address mitigating measures for anticipated adverse impacts. The commissioner shall be responsible for the completeness and accuracy of all information in the environmental report.*

The DOC must provide the commission the environmental report before the Commission can hold a public hearing or render a final decision on the Application. The Commission must consider the environmental report before making its final decision.

It is our intent to file the required Site Permit for the power uprate project within a few weeks of this Application. Since we will apply for a site permit for the power uprate prior to the time the DOC completes the environmental report, the Commission may elect to prepare an Environmental Impact Statement in lieu of the environmental report required under part 7849.7030, (Minn. R. 7849.7100, subp. 2.) We anticipate the DOC will consolidate environmental review by publishing one EIS to address both additional spent fuel storage and power uprate projects.

2.5.4 Resource Plan

Pursuant to Minn. Stat. § 216B. 2422, we are required to periodically submit a resource plan to the Commission. In our resource plan we examine the need for electricity over a 15-year planning period, evaluate a broad spectrum of alternatives to meet the anticipated demand for power, and present our preferred plan. The Commission then accepts, modifies, or rejects the plan. The process includes opportunities for comments including alternative resource plan proposals and, if necessary, provides for public meetings and hearings. The proceeding typically takes over a year to complete.

We filed our most recent Resource Plan on December 14, 2007 ("2007 Resource Plan"). Our resource plan filing contains much of the same information contained in this Certificate of Need Application about the role Prairie Island plays in meeting the demand for electricity as well as the alternatives to continuing to operate Prairie Island.

The focus of our Resource Plan is how best to meet the growing demand for electricity while accounting for the impacts on recent legislation expanding renewable energy and energy conservation considerably.

2.5.5 Other Project Permits

In addition to the State and NRC permits mentioned above, the project will require interconnection approval and an updated transmission service agreement with the Midwest Independent System Operator ("MISO"). At this time we have not filed the generator interconnection request or the request for transmission service. We are working with MISO on the review process and will file the appropriate requests prior to the projects implementation.

We have identified no other required permits necessary for the additional dry cask storage or the power uprate projects at Prairie Island.[10] Since the additional dry cask storage and the power uprate CONs are both for existing facilities, we already possess a number of the necessary operating permits. After reviewing the Air Quality, Water Appropriations and Wastewater Discharge Permits, it is not anticipated any of these will require amendments.

---

[10] No additional dry cask dry storage is necessary to support the Prairie Island project.

If a Site Permit is issued for the power uprate CON, no other zoning, building or land use rules by a regional, county or local government apply. See Minn. Stat. § 216E.10.

2.6 Fee Determination

2.6.1 Additional Dry Cask Storage

Minn. R. 7855.0210 subp. 1.E. establishes a fee of "$20,000, plus such additional fees as are reasonably necessary for completion of the evaluation of need" for a Certificate of Need for spent fuel nuclear fuel storage. A check for $20,000 was submitted to the Commission under separate cover, simultaneously with this Application. It is our understanding that the Commission staff will determine the amount and timing of additional fees and request additional payments as necessary as this proceeding moves forward.

2.6.2 Power Uprate

Minn. R. 7849.0210, subp. 1 establishes an application and processing fee of $10,000 plus $50 for each megawatt of plant capacity, plus "such additional fees as are reasonably necessary for completion of the evaluation of need for the proposed facility." Subpart 2 of the rule requires that 25 percent of the fee accompany the application with the balance paid in three equal installments within 45, 90, and 135 days after submission of the application. The proposal will increase the generating capacity of Prairie Island by an estimated 164 MW, resulting in a total fee of $18,200.

A check for $4,550 (25 percent) was sent under separate cover to the Commission simultaneously with the filing of this Application. Thus, an additional $13,650 must be paid in three installments of $4,550. We will file the additional payments at the required 45, 90 and 135-day intervals.

2.7 Officer Certification

Pursuant to Minn. Stat. § 116C.83 and Minn. Stat. § 216B.243 and Minn. R. 7855, Xcel Energy does hereby petition the Commission for a Certificate of Need to add 35 additional casks within the existing ISFSI, and the associated facilities and equipment to support operations at the Prairie Island Nuclear Generating Plant until 2033 and 2034.

/s/

_____________________________.

Scott M. Wilensky
Acting Vice President,
Government and Regulatory Affairs

3 Prairie Island Plant Information and Project Description

3.1 General Plant Information

Prairie Island uses nuclear fuel in two two-loop pressurized water reactors to produce on average a nominal value of 550 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. The Company applied to the NRC to renew the operating licenses for both units for an additional 20 years in April 2008.

Prairie Island is located within the city limits of Red Wing, Minnesota in Goodhue County, on the western bank of the Mississippi River, in Section 4 and 5, T–113N, R–15W, at 44° 37.3' N latitude and 92° 37.9' W longitude, approximately 30 miles southeast of Minneapolis/St. Paul (Figures 3-1 and 3-2).

The Prairie Island site consists of approximately 560 acres of land owned by Xcel Energy. A perimeter fence and other barriers restrict access to Prairie Island.

Figure 3-3 shows an aerial photo depicting a 1-mile radius around Prairie Island. Figure 3-4 shows an aerial photo depicting a 2-mile radius around Prairie Island.

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 a record 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.

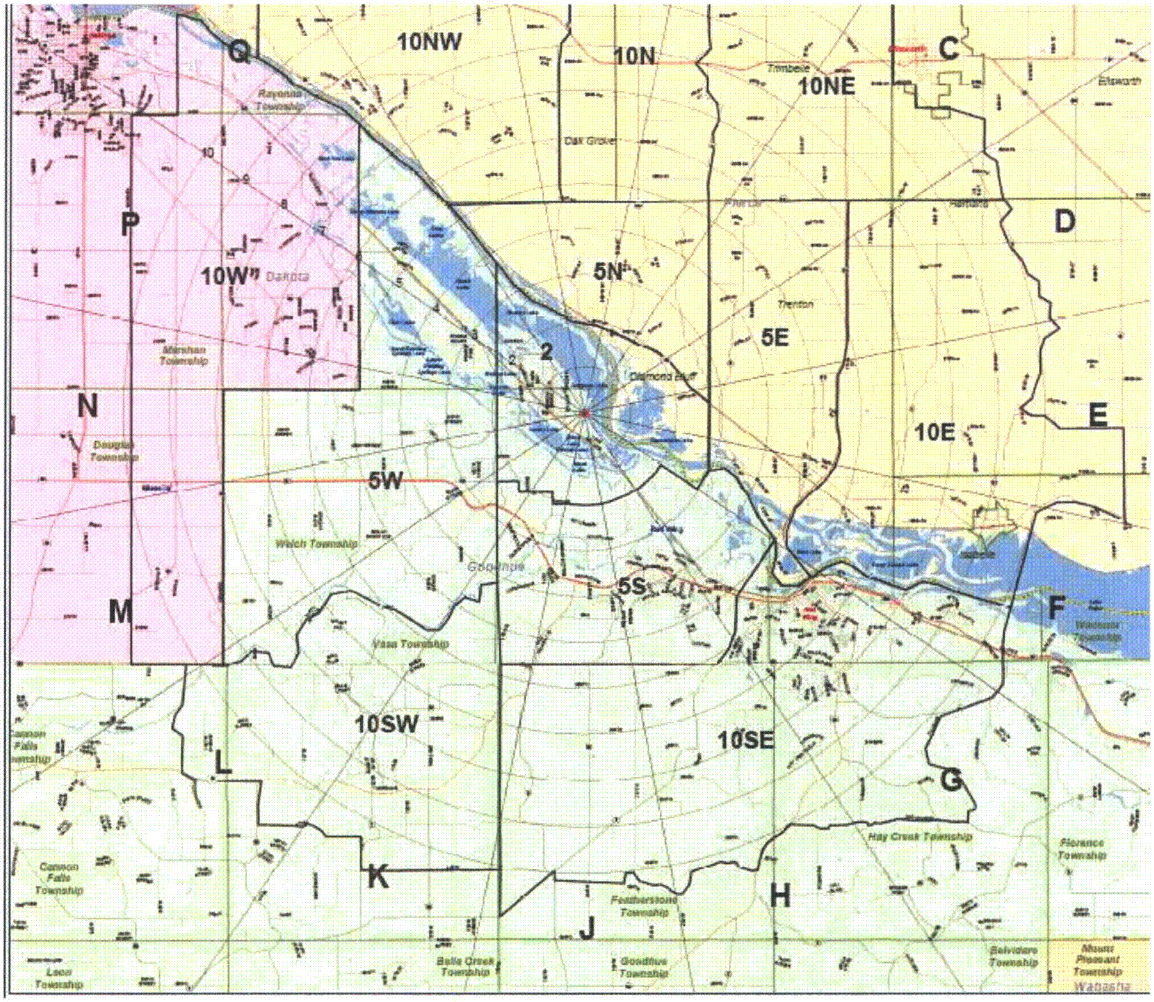


Figure 3-1: 50-mile Radius

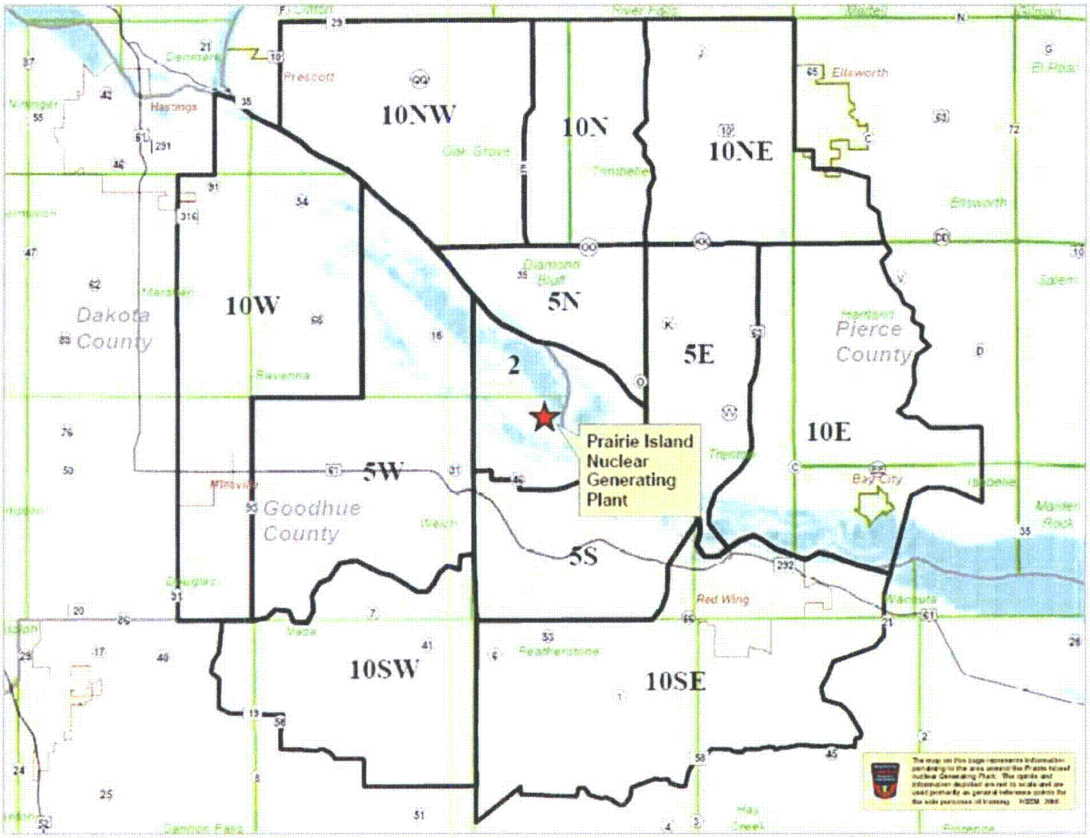


Figure 3-2: Ten mile Radius

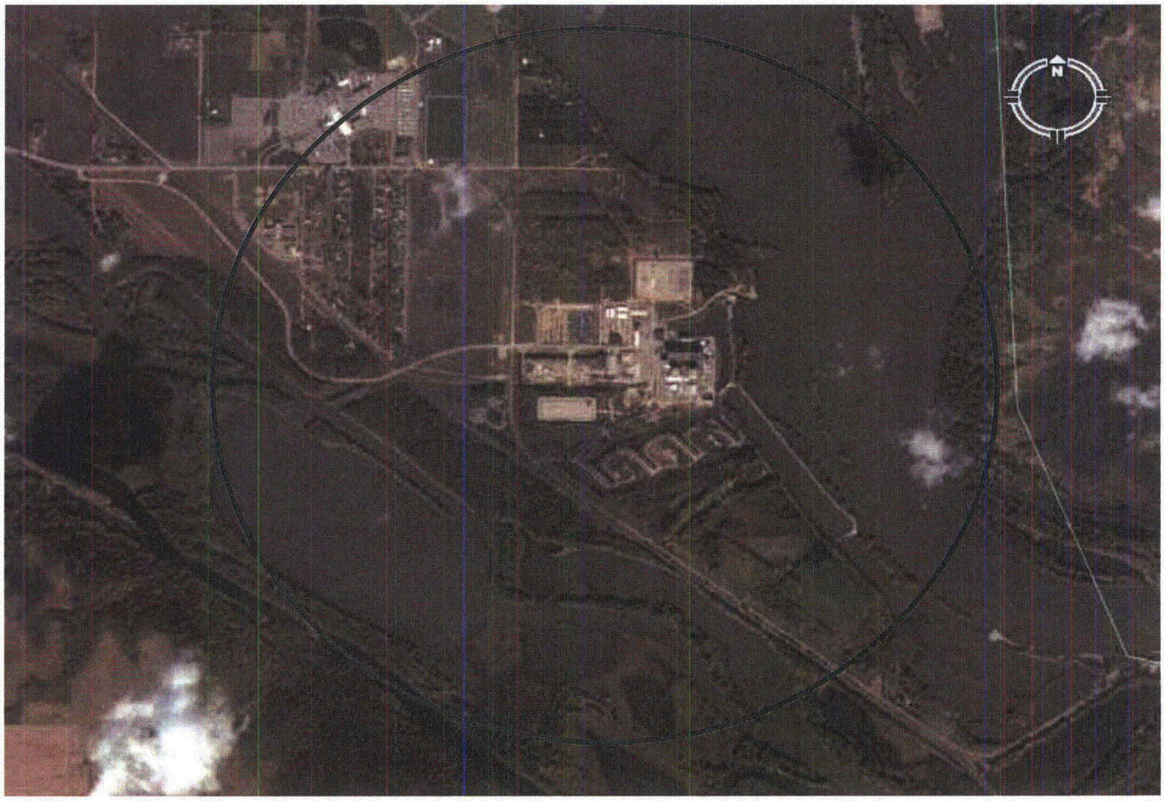


Figure 3-3: One-mile Radius

Figure 3-4: Two-mile Radius

3.2 Pressure Water Reactor 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 3-5). 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 on-site diesel generators.

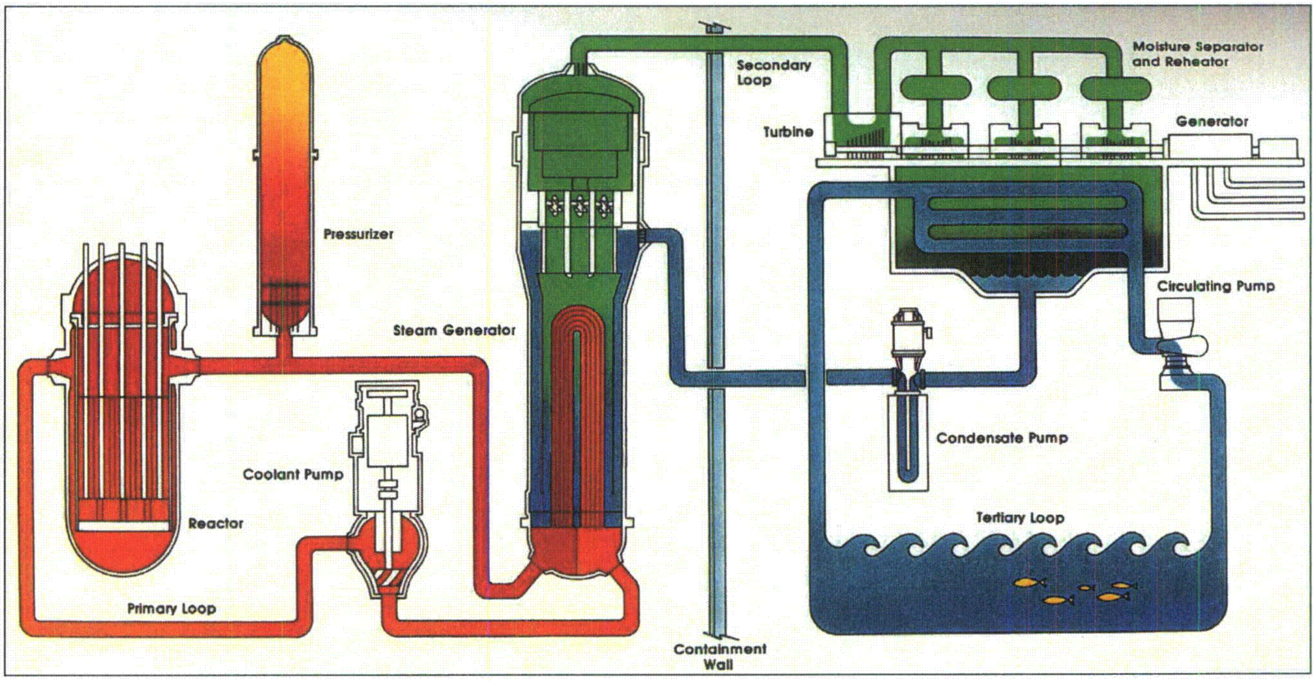


Figure 3-5: Pressurized Water Reactor System

3.3 Description of Fuel and Operating Cycle

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

The reactor core of each unit is comprised of 121 fuel assemblies. A fuel assembly (Figure 3-6) consists of 179 fuel rods spaced in a 14x14 square array secured by means of stainless steel upper and lower tie plates. Control rod guide tubes occupy sixteen locations of the array and an instrument tube occupies one location. Each fuel assembly is 7.76 by 7.76 inches wide and 161.3 inches long. Figure 3-6 shows a representation of a typical fuel assembly used at Prairie Island.

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.

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 a third of the fuel assemblies (typically 48), in the reactor are replaced with new ones. Thus, a typical nuclear fuel assembly provides heat constantly over about a five-year period before its output declines to the point it is no longer useful. These spent nuclear fuel assemblies are then removed from the reactor and stored in the spent fuel pool.

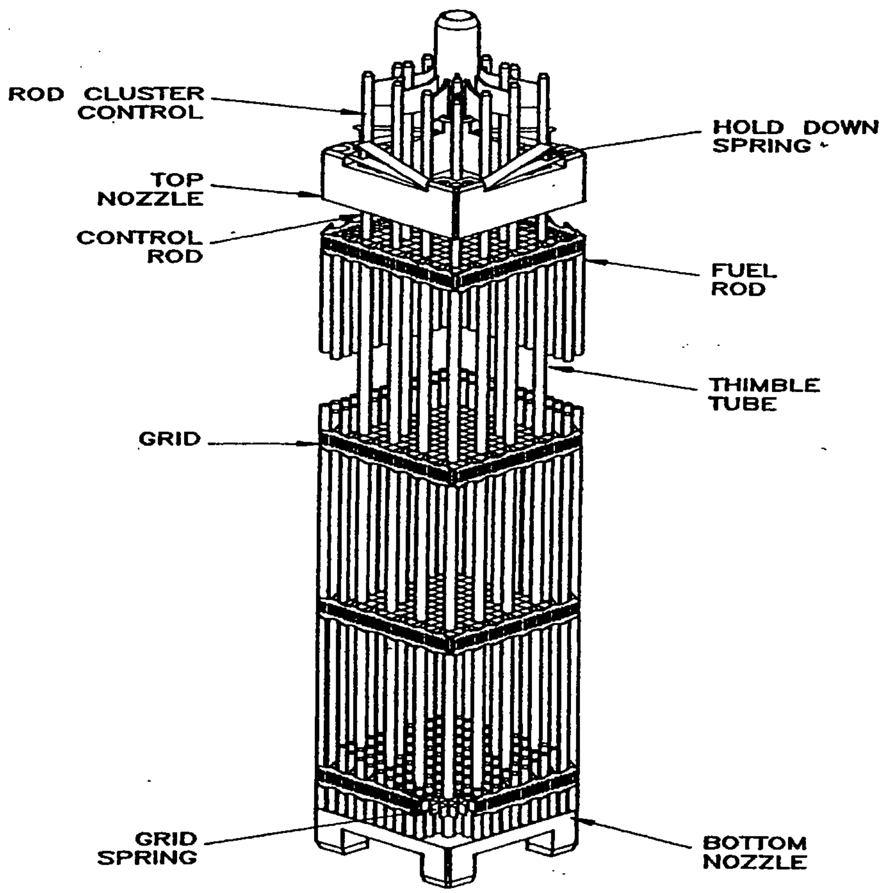


Figure 3-6: Fuel Assembly

3.4 Fuel Availability

Continued availability of uranium to support the continued operation of Prairie Island and the power uprate project is not in question. The Organization for

Economic Cooperation and Development ("OECD") and the International Atomic Energy Agency ("IAEA") in 2005 jointly produced a report on uranium resources. The report states that uranium resources are adequate to meet the needs of both existing and projected reactors. Both the OECD and IAEA believe uranium supplies are adequate to meet the needs of nuclear power plants worldwide, as well as new reactors anticipated in the next decade. The agencies base their conclusion on official projections from 43 uranium-producing countries, as well as independent studies by the agencies.

3.5 Spent Fuel Pool

The spent fuel pool provides storage for spent fuel assemblies. The pool is located within the fuel pool enclosure in the auxiliary building. It is filled with storage racks that hold the spent fuel assemblies and other irradiated reactor components. The depth of water in the pool is 37 feet 9 inches. Figure 3-7 shows the spent fuel pool. The spent fuel pool is equipped with redundant cooling systems to remove heat that continues to be generated by the assemblies. The filtering portion of the system maintains pool water chemistry and removes suspended particles. The water above the spent fuel also provides radiation shielding. The spent fuel pool also provides an area for cask loading operations. Space is set aside so that a cask may be lowered into the pool and assemblies transferred to it for dry storage or transport. Spent fuel assemblies are placed in the pool for between 10 and 12 years to cool before they can be placed in casks for storage.

The NRC operating licenses allow for long-term storage of up to 1,386 spent fuel assemblies in the current spent fuel storage rack configuration. To facilitate plant evolutions, four additional storage racks, with a combined capacity of 196 assemblies may be temporarily installed in the cask lay down area to provide a total of 1,582 storage locations. The fuel rods from 36 consolidated assemblies are stored in 18 canisters, occupying 18 storage rack locations. A total of 52 storage locations hold material such as spent fuel assembly components from the consolidated assemblies, individual fuel rods, and other irradiated reactor instrumentation and hardware. Thus, there are 1,316 locations available for long term spent nuclear fuel assembly storage.

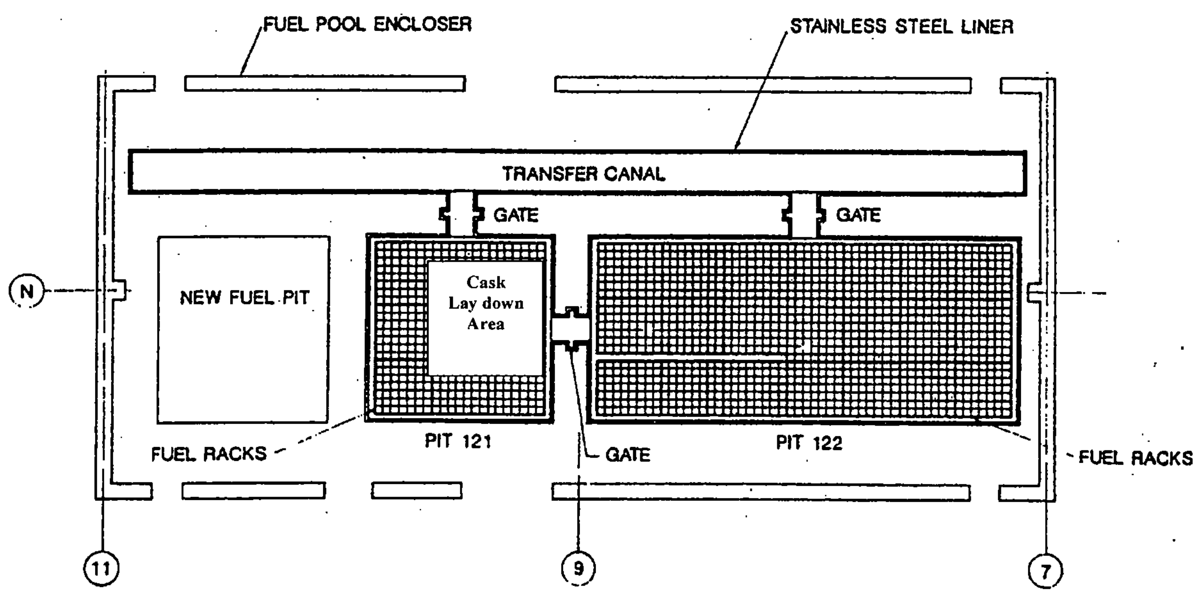


Figure 3-7: Spent Fuel Pool

As of April 15, 2008, 2,109 spent fuel assemblies have been discharged from Prairie Island's reactors of which 1,842 reside in the spent fuel pool and 960 in 24 dry casks.

Prairie Island maintains the ability to temporarily remove all of the fuel from both reactors (referred to as full core offload capability) with the use of temporary racks that could be installed in the dry cask storage lay down area of the spent fuel pool. Maintaining full core offload capability is not necessary for safe plant operation. It is retained for economic reasons and operational flexibility. We estimate that 3,895 spent fuel assemblies will be discharged from Prairie Island's reactors during operation between April 15, 2008 and 2034. Table 3-1 provides an estimate of the number of spent fuel assemblies that will be discharged from Prairie Island's reactors. The spent fuel assemblies that will need to be discharged to offload the number of reactors at the end of the extended operating life are also provided in Table 3-1.

Table 3-1			
Prairie Island Spent Fuel Assemblies			
Year	**Number of Additional Spent Fuel Assemblies Discharged During Unit 1 Refueling**	**Number of Additional Spent Fuel Assemblies Discharged During Unit 2 Refueling**	**Total Number of Spent Fuel Assemblies Produced at Prairie Island**
As 4/15/2008			2109
Remainder of 2008		49	2158
2009	49		2207
2010		56	2263
2011	44		2307
2012	44	45	2396
2013		44	2440
2014	49		2489
2015	48	48	2585
2016		49	2634
2017	48		2682
2018	49	48	2779
2019		48	2827
2020	48		2875
2021	48	49	2972
2022		48	3020
2023	49		3069
2024	48	48	3165
2025		49	3214
2026	48		3262
2027	49	48	3359
2028		48	3407
2029	48		3455
2030	48	49	3552
2031		48	3600
2032	40		3640
2033	121	13	3774
2034		121	3895

3A Additional Dry Cask Storage Project Description

3A.1 Additional Dry Cask Storage Proposal

We propose to provide additional dry cask storage at Prairie Island by extending the concrete storage pads within the existing Independent Spent Fuel Storage Installation ("ISFSI") already located at Prairie Island.

Figure 3-8: ISFSI and Plant Site

The ISFSI consists of a lighted area, approximately 720 feet long and 340 feet wide, roughly 5-1/2 acres in size, located west of Prairie Island cooling towers as shown on Figure 3-8. The tallest structures are the light poles that are approximately 40 feet tall. Two fences surround the facility with a monitored, clear zone between the two fences. Within the storage area, the casks are currently stored on two reinforced concrete pads, 36' x 216' x 3'. The additional casks necessary to support license renewal would reside on new 18' concrete pads to be located immediately south of each of the existing concrete pads as shown on Figure 3-9.

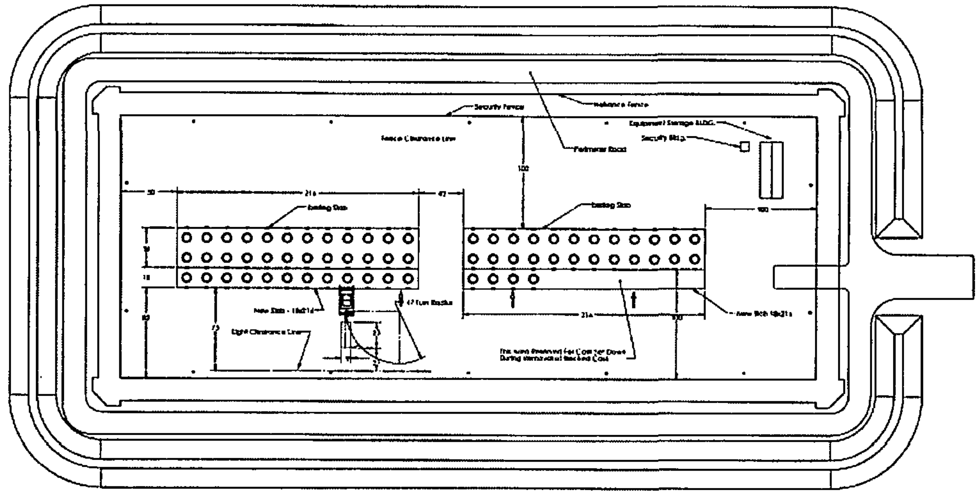


Figure 3-9: Location of New Storage Pads

The approach to the pads consists of 14 inches of MN/DOT compacted Class 5 aggregate with a 2% slope. A 30' x 50' steel frame equipment storage building approximately 30 feet high is located on the ISFSI site. The primary purpose of this building is to store the cask transport vehicle. A smaller block building within the ISFSI houses the security equipment while one outside the ISFSI houses the pressure monitoring equipment. A 17 ft high earthen berm surrounds the ISFSI. The site is monitored with cameras and other security devices. An access road connects the ISFSI to the rest of Prairie Island.

The current NRC licensed capacity of the ISFSI is specific to 48 TN-40 storage casks. The proposed extension of the storage pads will be sufficient to accommodate the additional 16 casks. The storage facility is laid out so that the storage pads could be extended to the north and south to accommodate a total of 100 casks without having to change the security perimeter. The extra space could be used for casks to decommission Prairie Island.

The proposed storage facility is intended for temporary storage. As discussed in the in Section 5 – Alternatives to Proposed Dry Cask Storage, while we do not believe that DOE will begin accepting waste at Yucca Mountain in 2017, we believe that DOE will eventually be successful in meeting its obligations and removing spent fuel from commercial nuclear generating plants. However, we believe the earliest possible date for that would be 2020. The NRC's Waste Confidence proceeding has indicated it will be no later than 2025. In light of this uncertainty and based on DOE's forecasted acceptance rates at Yucca Mountain, we believe

that the spent fuel could be stored at Prairie Island for between fifteen to thirty additional years.

We propose to continue to use dry cask storage containers that hold 40 spent fuel assemblies each. Therefore, in order to ensure Prairie Island can continue to operate through the 20 years of a renewed operating license, up to a total of 64 storage casks will be necessary.

When Prairie Island shuts down and ceases operation, the inventory of assemblies in the reactors and pool must be removed to facilitate decommissioning. It will take a total of 98 casks to store all the spent fuel that has been generated at Prairie Island. The implementation of the power uprate project will not increase the number of casks.

3A.2 Dry Cask Storage System

We propose to use an enhanced version of the current TN-40 bolted cask system called the TN-40HT Dry Fuel Storage system. The TN-40HT is designed, licensed, and manufactured by Transnuclear Inc., and will be licensed for storage and transport. The system will utilize existing equipment to load and move the cask, i.e. lifting yoke, transfer vehicle, and ancillary devices.

The system consists of the following primary components:

- TN-40HT Dry Fuel Cask – an enhanced version of the TN-40 Dry Fuel casks currently used at Prairie Island. The cask is a steel container designed to hold 40 fuel assemblies and accommodate higher enriched and burned fuel assemblies.

- Lifting Yoke – a steel-lifting device that interfaces with the crane to lift the cask.

- Transfer Vehicle – a multi-wheel trailer used to safely support and move the cask from the Auxiliary Building to the concrete storage pads at the ISFSI.

- Ancillary Devices – auxiliary equipment used to dry, and backfill the cask for storage.

- Transport Impact limiters – devices attached to the ends of the cask to lessen the forces on the cask during a hypothetical shipping accident when the casks are ultimately shipped from Prairie Island.

The TN-40 Dry Fuel Cask storage system currently in use at Prairie Island is licensed in accordance with federal regulations, 10 CFR Part 72 for storage. A license Amendment Request ("LAR") to the NRC was submitted on March 28, 2008, that demonstrates that the enhancements to the TN-40HT cask will also comply with the regulations in 10 CFR Part 72. It is anticipated the NRC will issue the amendment to the License in 2009.

In August 2006, Transnuclear applied for approval to license the TN-40 cask with impact limiters as a spent fuel Transportation Package in accordance for 10 CFR Part 71. Approval of this application is expected in 2008. Following NRC's approval, Transnuclear will request license approval of the TN-40HT package for transportation also.

3A.2.1 TN-40 Cask

The TN-40HT cask is an enhanced version of the TN-40 dry fuel storage casks (shown in Figure 3-10). The TN-40HT cask is designed to hold 40 fuel assemblies and enhancements allow for storage of higher enriched and burned fuel assemblies. A cask consists of an internal basket, containment vessel, lid, outer shell, neutron radiation shields, and a weather cover.

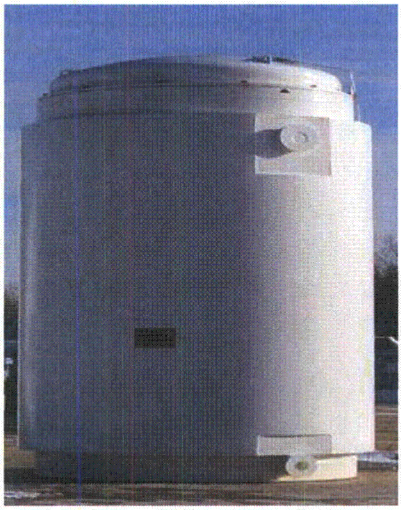


Figure 3-10: TN-40 Cask

The TN-40HT consists of stainless steel boxes separated by heat conduction and neutron absorption plates. The stainless steel box geometry features of the basket provide structural rigidity to support the fuel assemblies. The containment vessel is the inner most cask shell and is a 1.5-inch thick carbon steel cylinder with an integrally welded carbon steel plate at the bottom. At the top of this cylinder is a flange, which provides the positioning and sealing surface for the bolted carbon steel lid. The lid is 10 inches thick and is attached to the upper vessel flange by 48 bolts. Two metallic O-rings are installed on the lid to provide a redundant and highly reliable cask seal between the flange and the lid.

The shell is a 7.25-inch thick steel cylinder with an outside diameter of 89.5 inches. It is welded to a 7.25-inch bottom shield plate and to the containment vessel closure flange, thereby completely enclosing the containment vessel inner shell and bottom plate. Attached to the shell are resin filled containers arrayed vertically and surrounding the shell. The resin contains neutron-absorbing material to reduce the neutron radiation levels. A circular neutron shield disk provides neutron shielding on the lid during storage. In order to keep the cask lid clean and to avoid the accumulation of water in recesses of the cask lid, a torosperical weather cover is provided above the cask lid. The resultant overall dimensions of a cask are an outer diameter of 101 inches and approximately 202 inches tall.

The TN-40 cask is currently licensed to store spent fuel assemblies with a maximum burnup of 45 giga-watt days/metric ton of uranium (GWD/MTU), maximum enrichment of 3.85 wt. % U235, and a minimum cooling time of 10 years after reactor discharge. The TN-40HT cask is expected to be licensed to accommodate a maximum burnup of 60 GWD/MTU, maximum enrichment of 5.0 wt. % U235, a minimum cooling time of 12 years after reactor discharge, and a thermal capacity of 32 kW (0.8 kW per fuel assembly).

The current and projected spent fuel discharges from Prairie Island were evaluated to determine their parameters (burnup, enrichment, cooling time and thermal heat load) that might be reasonably expected for the spent fuel that would be placed into storage. It was determined that there is enough "low burnup" fuel (less than 45 GWD/MTU and 3.85 wt. % U235) to load a total 29 TN-40 casks. Starting with cask number 30, the remaining casks will need to be the TN-40HT casks.

3A.2.2 Lifting Yoke

The TN-40HT casks are being designed such that the existing Lifting Yoke assembly used for the TN-40 casks can continue to be used. (Figure 3-11). The yoke assembly provides the interface between Prairie Island crane and the cask, and

is used to maneuver the cask within the Auxiliary Building. The assembly consists of the crane hook extension and the air operated lift beam. The overall length of the assembly is sufficient to allow placement of a cask into the spent fuel pool without submersing the lifting block of the Auxiliary Building crane. Lifting pins connect the crane hook to the extension and the extension to the lifting beam. The lifting beam is a closed-hook design with two parallel beams fabricated from thick, high-strength steel plate material, with a de-contaminable coating. It is designed to be compatible with the Auxiliary Building crane hook. The lifting yoke engages the upper cask lifting trunnions via air actuated arms.

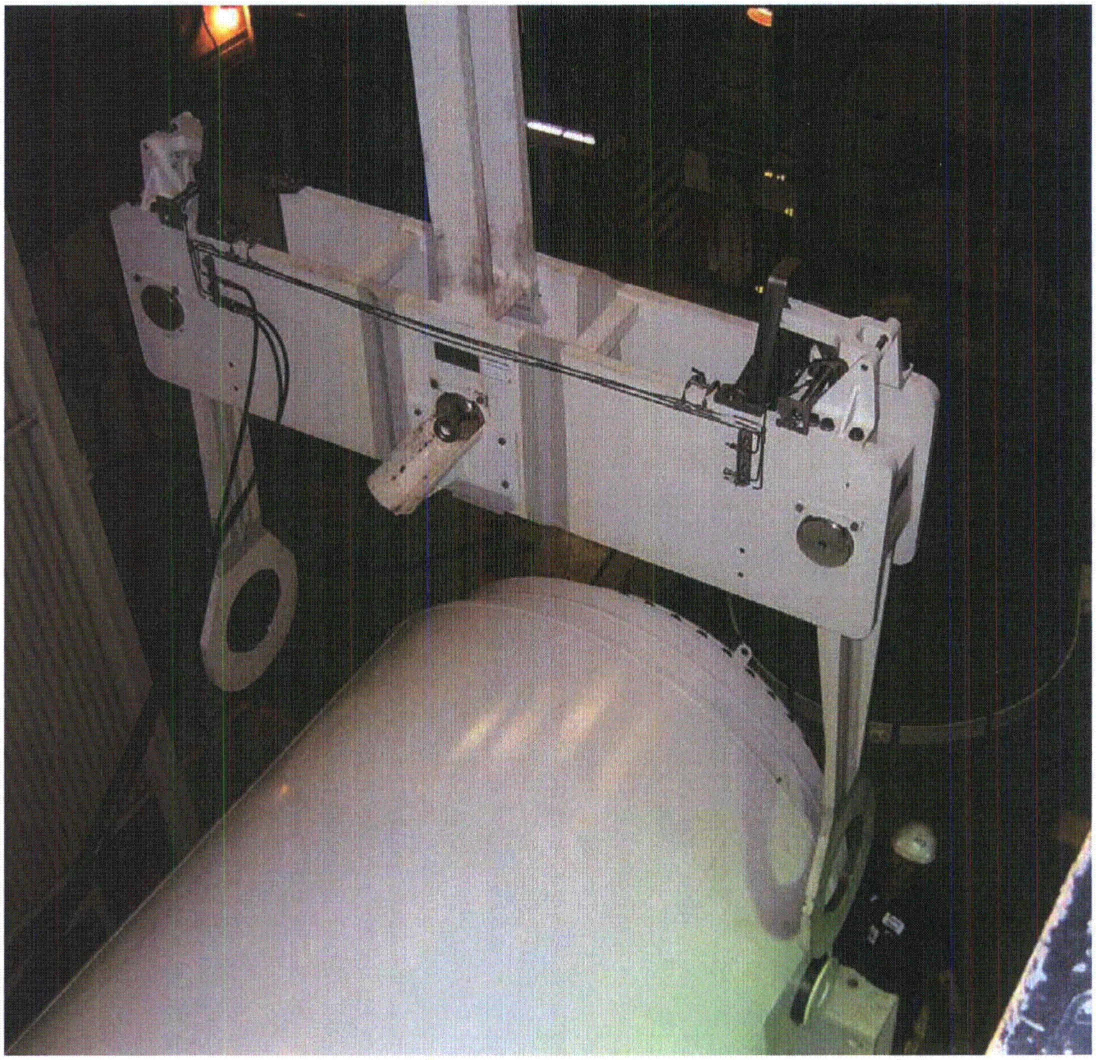


Figure 3-11: Lifting Yoke

The yoke is designed and fabricated as a non-redundant single failure-proof special lifting device for critical loads, in accordance with NRC requirements and applicable standards.

The weight and dimensions are as follows:

- Overall Length of Extension & Lifting Beam 246.83"
- Diameter of Pins 6.875"
- Weight of assembly 8,300 lbs.

3A.2.3 Transfer Trailer

The Cask Transport Vehicle ("CTV") is a trailer used to transport a loaded cask between the Auxiliary Building and the ISFSI. (Figure 3-12). The TN-40HT cask design is such that the current CTV used to transfer the TN-40 casks may also be used to transfer the TN-40HT casks.

Figure 3-12: Transfer Trailer

The CTV spreads the weight of the loaded cask over 8 tires. The wheels are arranged in four pairs. The two front pairs are steered by a tow bar and steering linkage from a separate tow vehicle. The rear wheels are designed to move inward and outward. The wheels are placed in the inward (travel) position to pass through the Auxiliary Building access door and for travel to the ISFSI. The wheels are placed in the outward (load/unload) position to provide clearance to loading and unloading a cask. (Figure 3-13). The overall transporter width in 13'-0" in the travel position and 19'-4" in the load/unload position.

Figure 3-13: The Cask Transport Vehicle

The CTV relies on electro-hydraulic power to operate the vehicle and cask hoist functions. The hoist mechanism consists of a "U" shaped steel lift beam with pivot pins at one end connected to the steel structural frame. The other end is raised and lowered by a 12-inch hydraulic cylinder. The CTV is designed to limit cask lift to a maximum of 10 inches. Hydraulic jacking pads extend to the ground to raise the rear wheels and carry the vehicle weight when changing the position of the rear wheels.

The trailer has a length of approximately 35 feet and a turning radius of 30 ft. The trailer is designed for a maximum speed of 3 mph and is capable of climbing or descending a 5% grade. However, the haul route at Prairie Island is relatively flat with a maximum slope of 2%. The maximum trailer weight with a loaded transfer cask is approximately 390,000 lbs.

3A.2.4 Vacuum Drying System

The Vacuum Drying System (Figure 3-14) removes all the moisture out of the cask after it is removed from the spent fuel pool. It enables the vacuum drying and helium backfilling operations after the fuel has been loaded, the bulk of the water is drained out, and prior to final closure. The vacuum drying system weighs 300 lbs and requires 480V, three-phase electrical power to operate.

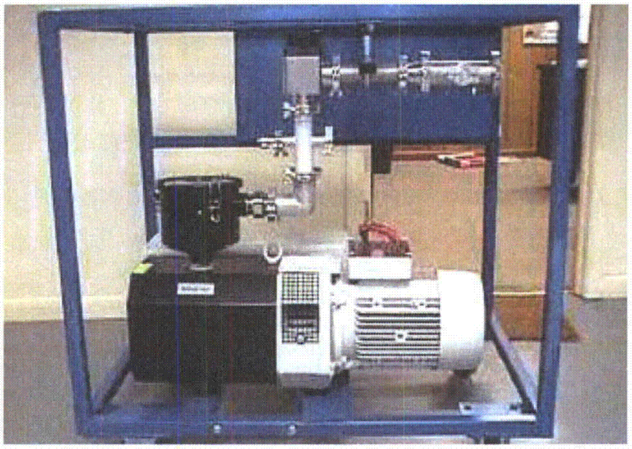


Figure 3-14: Vacuum Drying System

3A.2.5 Transportation Impact Limiters

Following approval from the NRC, a TN-40 or TN-40HT cask may be transported offsite after performing some inspections and testing. The cask would be placed in upending/downending frame and rotated to the horizontal position. The cask would then be placed onto a transport frame and front and rear impact limiters installed. (Figure 3-15). Following final checks and preparation activities, the loaded cask would be ready for offsite shipment.

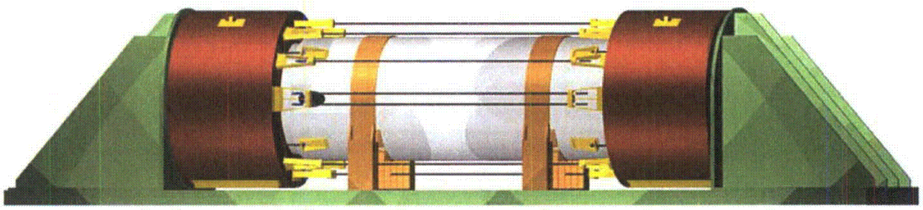


Figure 3-15: Transportation Impact Limiters

Impact limiters mounted on either end of the cask provide impact protection to meet accidental impact requirements of 10 CFR Part 71. The impact limiters absorb energy during an impact event. Each impact limiter has an outside diameter of 144 inches and a height of 50 inches. The limiter is made of wood covered by a

stainless steel shell. The overall weight of the transport package with a loaded cask and impact limiters is approximately 272,000 lbs.

3A.3 Operations

This section provides a description of the fuel loading operations for transferring spent fuel from the pool to the ISFSI, as well as the operational sequence for transporting them off-site.

3A.3.1 Canister Loading

Cask loading includes physically placing the fuel assemblies into the cask, draining, decontamination, securing the lid, and drying, and includes the following sequence of events:

1. Stage the cask inside the rail bay of the Auxiliary Building.
2. Lift the empty cask by its lifting lugs and place it vertically in cask decontamination area. (Figure 3-16).

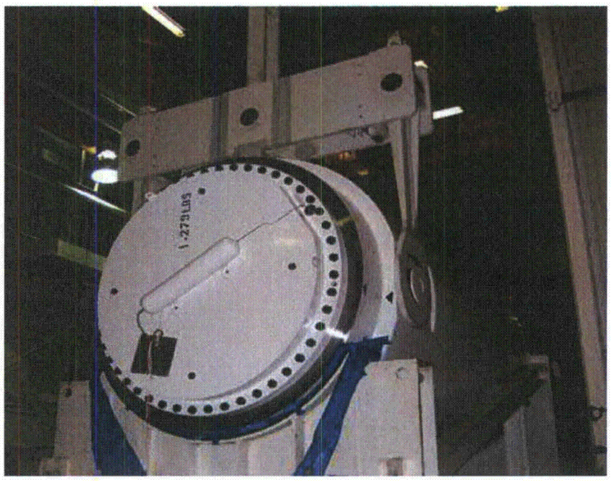


Figure 3-16: Rail Bay Staging

3. Remove the lid and perform the receipt inspections.
4. Engage the lifting yoke with the cask upper trunnions.
5. Lift the cask up to the spent fuel pool.

6. Lower cask into the pool.

7. Load the spent fuel assemblies into the cask.

8. Install the lid underwater.

9. Engage the lifting yoke and lift the cask out of the pool water. (Figure 3-17).

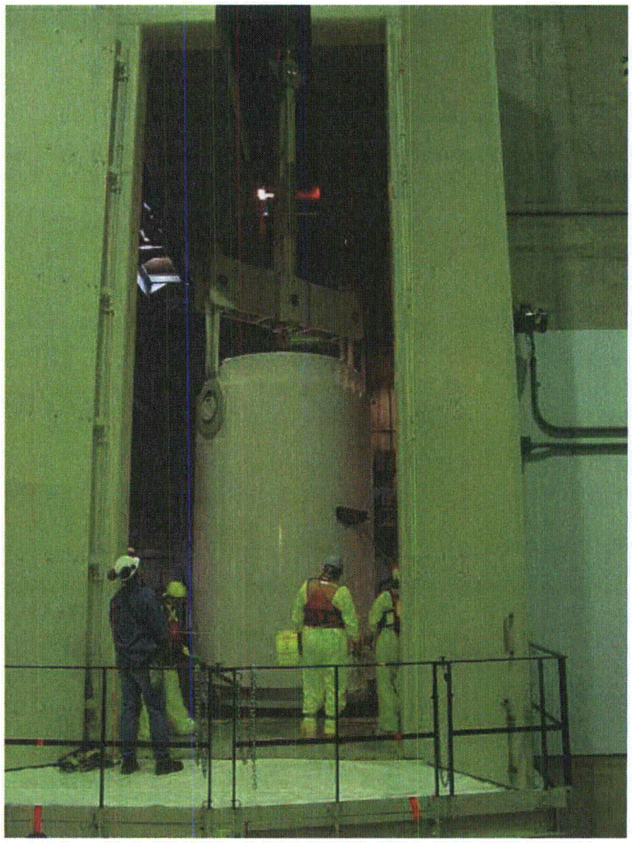


Figure 3-17: Wash Down

10. Drain water from the cask.

11. Wash down the exposed portions of the cask.

12. Move to cask decontamination area. (Figure 3-18).

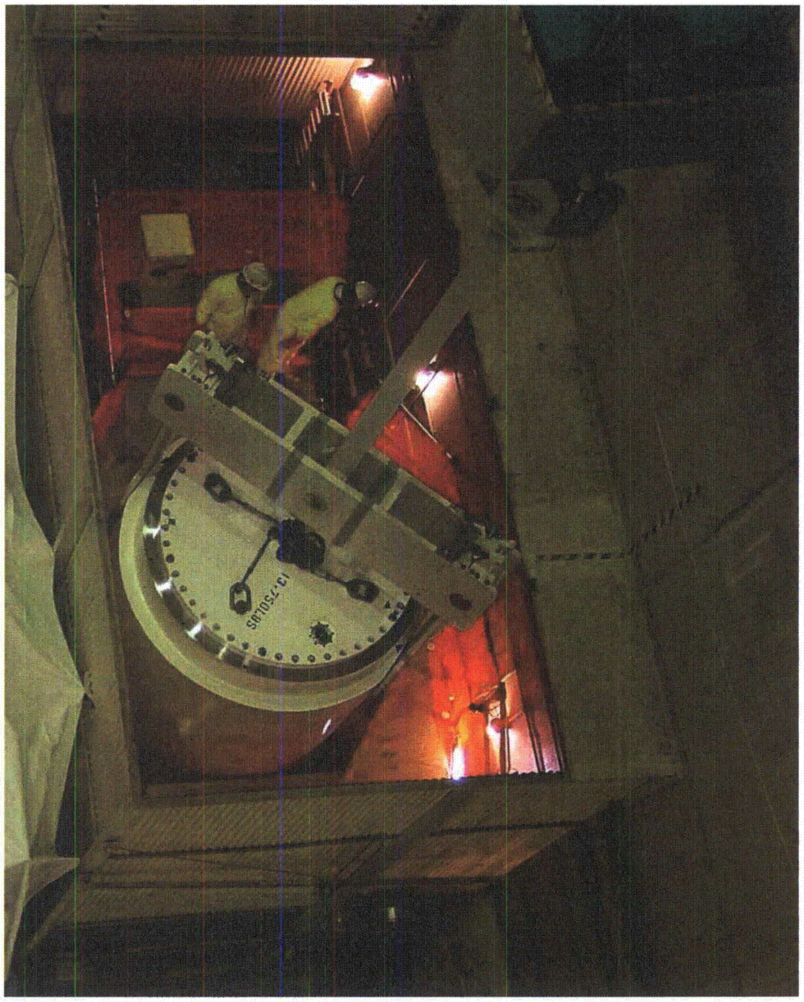


Figure 3-18: Decontamination

13. Decontaminate outer surfaces of cask.

14. Torque lid bolts.

15. Install drain port cover.

16. Connect the vacuum drying system to the vent port.

17. Perform vacuum drying

18. Backfill cask with helium.

19. Install vent port cover.

20. Perform helium leak test of lid seals.

3A.3.2 Transport to the ISFSI

Cask transport operations include transferring the loaded cask to the CTV, installing the top neutron shield, transporting the cask/canister to the ISFSI, and connecting the pressure monitoring system. The operations steps include:

1. Engage the lifting yoke with the cask upper trunnions.
2. Place the cask into the CTV.
3. Install top neutron shield drum.
4. Pressurize the overpressure system to approximately 72 psig.
5. Perform leak test on overpressure system.
6. Install protective weather cover.
7. Use the CTV and tow vehicle to transfer the cask to the ISFSI. (Figure 3-19)

Figure 3-19: CTV Transport

8. At the ISFSI, position the cask over the desired pad location.
9. Lower the cask onto the Pad.
10. Rotate the CTV rear wheels to the unloading position. (Figure 3-20)

Figure 3-20: Dry Cask Storage Pad

11. Remove the CTV.

12. Connect the seal pressure monitoring instrumentation.

3A.3.3 Removal for Offsite Shipment

Following licensing approval from the NRC, a loaded TN-40 or TN-40HT cask may be transported offsite. The activities in support of this operation include placing the cask in an upending/downending frame, rotating to the horizontal position, placing it onto a transport frame, installing front and rear impact limiters, and performing final checks and preparation. This includes the following sequence of events:

1. Disconnect the overpressure system.

2. Move the cask using the CTV to the loading area, e.g. the Auxiliary Building.

3. Remove the protective weather cover and top neutron shield drum.

4. Tighten lid bolts.

5. Adjust cask cavity pressure to desired value.

6. Perform helium leak test of lid seals.

7. Place cask in upending/downending frame, and rotate to the horizontal position.

8. Lift cask horizontally and place in transport frame located on transport vehicle.

9. Install the cask impact limiters.

10. Check that temperatures, radiation levels and contamination levels satisfy regulatory requirements.

11. Release cask for shipment.

3A.3.4 Decommissioning of the Storage Facility

The storage facility will be decommissioned once all spent fuel stored in it has been transported to an off-site facility. Because the storage casks will be licensed for both storage and transportation, they will ultimately be shipped to the federal government for final disposal. This leaves only the concrete storage pads and supporting infrastructure to be disposed of by Xcel Energy. Since the casks are sealed, no radioactive materials will be present once the casks and spent fuel have been shipped. No activation of the concrete in the storage pads is expected. A survey will be conducted to ensure that no activation has occurred. Once it is confirmed that no activation has occurred, the concrete storage pads and infrastructure will be dismantled, and the site will be returned to a green field state.

3A.4 Pressure Monitoring System

Even though the storage system is completely passive during operation, the 10 CFR. Part 72 storage license requires monitoring the pressure between the double seals of the casks.

The cask cavity is pressurized above atmospheric pressure with helium to preclude air in-leakage. When the cask is in storage, a pressure greater than that of the cavity is set up in the gap (interspace) between the double metallic seals of the lid and the lid penetrations. This ensures that any seal leakage will be into rather than out of the cask cavity. The pressure in this gap is monitored and a decrease in the pressure of this system would be signaled by a pressure transmitter mounted at the side of the cask. The pressure transmitter is connected to an alarm panel located outside the ISFSI security fence and is checked daily.

If the monitoring system indicates a loss of pressure due to seal leakage, the cask would be returned to the Auxiliary Building and the seals repaired or replaced as necessary to return the cask to proper operation.

3A.5 Life of the Storage Facility

The NRC's license for the Prairie Island ISFSI terminates 20 years after issuance unless renewed. Since the Prairie Island ISFSI License will expire on October 31, 2013, we will request a renewal of the license prior to October 31, 2011 in accordance with NRC regulations. In order to renew the license, we must demonstrate that the facility can continue to operate safely.

Because of their passive nature, the storage casks will require little, if any, maintenance over the lifetime of the ISFSI. Typical maintenance tasks involve occasional replacement and recalibration of monitoring instrumentation and touchup of some casks with corrosion-inhibiting coatings. No special maintenance techniques are necessary.

The economic life of the ISFSI and storage system (the period over which the investment in the facility will be depreciated) will be based on a judgment about how long it will remain in service. The length of time of operation of the ISFSI depends on how long Prairie Island will operate and the availability of off-site storage or a permanent repository. At this time, since the expansion of the ISFSI is sized to store enough fuel to support operation for twenty years beyond Prairie Island's current license expiration date, it is anticipated that the economic life of the ISFSI will be until October 2034 when the renewed license for Unit 2 expires.

Physically, the facility can be operated indefinitely. The materials used in the storage system (casks and concrete pads), principally steel and reinforced concrete, are sturdy and long-lived. The system requires no active support systems to ensure performance other than simple pressure monitors that are readily replaceable. The supporting infrastructure (intrusion detection, cameras, lights, weed mitigation and access roadways) will be maintained as needed.

3A.6 ISFSI Design, Expansion, Cost and Schedule Information

The Prairie Island ISFSI has been designed and constructed, in accordance with the information provided in Section IV.A of the Application for a Certificate of Need dated April 29, 1991 (and revised June 10, 1991). The ISFSI is currently

constructed to store up to 48 TN-40 casks. The proposed changes would enable the Prairie Island ISFSI to store up to 64 TN-40 or TN-40HT casks.

In order to store the additional 16 casks, two new pads will need to be constructed. Construction of each new pad consists of pouring an 18 ft wide x 216 ft long x 3 ft thick slab. In addition, underground concrete ductbanks and associated electrical conduit will need to be installed from the Cask Monitoring Building to the new pads. The work will include excavation of the pad area, trenching of the ductbank path, pouring the concrete pad and ductbank, and replacing the structural fill. Site preparation will involve using earth moving equipment such as bull dozers, scrapers, backhoes and graders to excavate and level the pad and ductbank areas. Following the leveling of the area, reinforced steel, conduit and forms will be put in place and concrete will be poured forming the storage pads and ductbanks. Concrete trucks will deliver concrete to the site and pumping trucks will place it. The area around the pad and trench over the ductbank will be back-filled and returned to the 2% grade when complete.

Since the cask loading plans do not call for the utilization of these new storage pads until 2022 it is projected that the installation of the pads would not occur until 2020.

The estimated installed cost of the ISFSI in 2008 dollars is $145.7 million. The estimate includes the following component costs:

State Regulatory Processes	$2 million
Cask Licensing	$4.6 million
ISFSI Construction	$3 million
ISFSI Relicensing	$2.8 million
35 TN-40HT Casks	$143.3 million
Total	**$155.7 million**

3B Power Uprate Project Description

3B.1 History of Power Uprates

Several decades of reactor safety technology improvements, plant performance feedback, and improved fuel and core designs have shown that Prairie Island (and many similar reactors throughout the United States) can operate at higher output than allowed under the original NRC license and still remain well within NRC calculated safe operational levels. Therefore, many nuclear power plants throughout the United States have requested power increases above the original NRC approved thermal power level. The NRC's webpage address for power approval status is:

http://www.nrc.gov/reactors/operating/licensing/power-uprates/approved-applications.html.

As of April 2008, the NRC had completed 118 Power Uprate project reviews. This has resulted in producing approximately 5,263 additional MW for our nation's power supply grid. Appendix I contains a list of the power uprates approved by the NRC.

Under NRC terminology, a power uprate of more than seven percent (up to a maximum of 20 percent) over the Original Licensed Thermal Power ("OLTP"), and which requires significant balance-of-plant upgrades is called an "Extended Power Uprate" or "EPU". [11] As of April 2007, the NRC has approved extended power uprates for five pressurized water reactors. Xcel Energy, in conjunction with the designer of Prairie Island, Westinghouse, is evaluating the effects of an extended power uprate on the primary or reactor system at Prairie Island and is evaluating the effects of the uprate on the secondary system with a number of vendors. Based on the NRC's action for a similar reactor, the Ginna plant in New York, it is expected that the NRC evaluation will conclude that sufficient safety and design margins exist such that the rated core thermal power for each unit at Prairie Island can 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 on filing an amendment to Prairie Island's operating licenses to allow for an increase in the licensed core thermal power level to 1805 MWt with the NRC in 2010.

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[11] The Prairie Island power uprate as proposed is technically an extended power uprate. It is being referred to generically as a power uprate within this Application for simplicity.

3B.2 Power Uprate Proposal

The power uprate at the Prairie Island plant will be achieved by : 1) increasing the amount of heat produced in the reactor, which will result in more steam being produced by the steam generators. 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, these systems are reanalyzed to demonstrate that their functions are unaffected by operation at the new conditions, with adequate margin remaining. The increased power levels are achieved by loading more uranium into the reactor at the beginning of each fuel cycle. In order to transfer the additional heat energy out of the fuel, the fuel assemblies themselves will operate at slightly higher temperatures.

The increased reactor coolant temperature results in the need to perform several analyses to demonstrate continued compliance with the design criteria for safe operation. The analyses will demonstrate that adequate margin to regulatory limits are maintained at the increased power level. These analyses will be reviewed and approved by the NRC as part of the operating license amendment process.

A PWR consists of two separate loops of water to produce steam. The primary loop, also known as the Reactor Coolant System ("RCS"), carries high-pressure water, moved by two large reactor coolant pumps, from the reactor to the steam generators where the heat generated by fission in the nuclear fuel is transferred to a second loop of water. The high pressure in the RCS ensures that boiling does not occur in the primary system. The steam generators, which are essentially heat exchangers, transfer the heat through the walls of a series of tubes to heat the water in the secondary system, which operates at a lower pressure. The heat transferred to the secondary loop causes boiling to occur in the secondary side of the steam generators, and the steam produced is sent to the steam turbine, which converts the energy into electricity in the turbine generator. The main steam pressure in the secondary loop will be increased resulting in a corresponding increase in steam temperature.

The balance-of-plant systems that convert the steam produced in the steam generators to electricity will need significant modifications. These modifications will be completed on Unit 1 during the 2012 refueling outage and on Unit 2 during the 2015 refueling outage.

The current average annual heat rate for the Prairie Island units requires 10.46 mbtu/MWh on Unit 1 and 10.476 mbtu/MWh on Unit 2. The anticipated average

annual heat rate for both units following completion of power uprate is 9.936 mbtu/MWh (after steam generator replacement and power uprate).

3B.3 Necessary Plant Modifications

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. The new fuel design will be approved by the NRC prior to use in the Prairie Island reactors.

Very few modifications are required to the reactor and its support systems that produce steam. On the other hand, significant changes will be required to the systems that convert the steam produced in the steam generators to electricity. The modifications will be installed primarily during refueling outages. The major modifications are described below. Additional smaller scope modifications will be identified during the detailed engineering phase of the project.

In the secondary loop and electrical generation systems, several major equipment changes will be required, both to accommodate the additional steam and feedwater flows, and to handle the extra megawatt output. In making the required changes, features have been incorporated to optimize thermal cycle efficiency under the new steam conditions and therefore maximize gross megawatt output.

A. High Pressure Turbines

The high-pressure turbine for each unit will be upgraded. The existing high-pressure turbines are double-flow, partial arc admission, reaction bladed design, that have been in service since plant commissioning. One design under consideration is a full arc admission, single-flow, impulse bladed, balancing gland design. A single-flow turbine has 2 exhausts versus 4 in the existing turbine, so a portion of the exhaust piping below the turbine would be replaced to work with the new configuration. The turbine governor valves will be redesigned and the flow area through the valve throats increased to minimize the pressure drop imposed on the steam.

B. Main Generator Rewinds

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.

C. 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 for power uprate.

D. Moisture Separator Reheaters

The moisture separator reheaters ("MSRs") at Prairie Island function to improve the steam quality of the HP turbine exhaust and superheat the steam before it enters the low-pressure turbines. Replacing the MSRs with larger units with more flow area and heat transfer surface could reduce the pressure drop by 1/2. This would result in higher pressures to the inlet of the LP Turbines, and a corresponding increase in electrical generation.

E. 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 ducts.

3B.4 Impact on Plant Operations

In general, operation of Prairie Island will not change due to the power uprate. However, one of the changes will be an increase in the cooling needs of the circulating water system. This may result in more frequent operation of the cooling towers to supplement the Mississippi River cooling capacity over the course of a year. If extreme conditions warrant, the facility will reduce power to remain within the constraints of existing permits.

During each refueling outage under current power levels, a little more than a third of the 121 total fuel assemblies (typically 48), in a reactor are replaced with new ones. As a result of utilizing the larger diameter fuel rods described in Section 3B3 above, the number of fuel assemblies replaced each refueling outage is not expected to change under power uprate conditions. The projected number of fuel

assemblies to be discharged from Prairie Island reactors in Table 3-1 reflects operations under power uprate conditions.

3B.5 Impact on Spent Fuel Produced

During each refueling outage under current power levels, a little more than a third of the 121 total fuel assemblies (typically 48), in the reactor are replaced with new ones. As a result of utilizing the larger diameter fuel rods described in Section 3B.3 above, the number of fuel assemblies replaced each refueling outage is not expected to change under power uprate conditions. The projected number of fuel assemblies to be discharged from Prairie Island reactors in table 3-1 reflect operations under power uprate conditions.

3B.6 Project Cost, Life and Availability Information

3B.6.1 Capacity Cost

The estimated installed cost of the 164 MW of additional capacity at Prairie Island achieved by power uprate is $2,011/kW. Fuel costs in 2012 following completion of the power uprate are forecast to be 0.00598 dollars per kWh. The variable operating and maintenance costs in 2007 are 0.00040 dollars per kWh. The total costs in 2011 of a kWh hour from this capacity will be 0.03808 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. The estimated nominal heat rate for Prairie Island plant following completion of the power uprate modifications in 2012 and 2015 will be 9.936 Mbtu/MWh.

3B.6.2 Service Life

The service life of the extra capacity will be until 2033 for Unit 1 and 2034 for Unit 2, assuming the necessary federal and state regulatory approvals are granted.

3B.6.3 Average Annual Availability

This capacity should be available 24 hours a day 7 days a week other than during refueling outages, which nominally will occur every 18 to 20 months for duration of approximately 1 month. Assuming a 3 percent forced outage rate annually this

translates into availability factor of 92.4 percent for this capacity. Table 3-2 below, provides the requirements for Minn. R. 7849.0250 in tabular format:

Table 3-2: Power Uprate Operational Information Summary		
Rule Reference	**Description**	**Prairie Island Power Uprate**
Capacity		164 MWe
Annual Capacity Factor		• 88.8% during years with refueling outage • 97% during years without refueling outage • Assumes a 3% forced outage rate
Typical Availability		Because nuclear power plants are dispatched and operated whenever they are available, the capacity factor and availability factors are the same.
7849.0250 A (1)	Nominal generating capability	164 MW
7849.0250 A (2)	Operating Cycle	30 day refueling outage every 2 years
Anticipated annual capacity factor		• 88.8% during years with refueling outage • 97% during years without refueling outage • Assumes a 3% forced outage rate
7849.0250 A (3)	Type of fuel used	Uranium
7849.0250 A (3)	Availability of fuel	Both the OECD and IAEA project uranium supplies are adequate to meet the needs of nuclear power plants worldwide, as well as new reactors anticipated in the next decade. The agencies base their conclusion on official projections from 43 uranium-producing countries, as well as independent studies by the agencies.
7849.0250 A (3)	Alternative fuels	None
7849.0250 A (4)	Anticipated heat rate (efficiency) (ISO Conditions)	10.425 mbtu/MWh
7849.0250 C (1)	Capacity Costs In $/kW	$2,011/kW
7849.0250 C (2)	Service Life	2014 to 2034
7849.0250 C (3)	Estimated Average Annual Availability	97%
7849.0250 C (4)	Fuel Costs ($/kWh)	$0.00598kWh
7849.0250 C (5)	Variable Operating And Maintenance Costs ($/kWh)	0.00040 $/kWh
7849.0250 C (6)	Total Cost ($/kWh)	$0.03808/kWh
7849.0250 C (7)	Estimated Effect On Rates System-Wide Assuming Test Year Beginning With Proposed In-Service Date	$0.00103/kWh
7849.0250 C (8)	Efficiency Expressed In Heat Rate	9.94mmBtu /MWh

4 Alternatives to Continued Operation of Prairie Island

4.1 Section Summary

This Section of our Application describes the evaluation of the generation alternatives to the continued operation of Prairie Island. The authorization of additional spent fuel storage is subject to the approval of a Certificate of Need pursuant to Minn. Stat. § 216B.243. Minn. Stat. § 116C.83, subd. 2 provides that in any proceeding seeking the authorization of additional spent fuel storage, the Commission may make a decision that could result in the shutdown of a nuclear generating facility.

For many years, our Resource Plans have included an analysis of the role our nuclear power plants play in meeting our customers' demand for electrical power. Prairie Island represents approximately 18 percent of the production capacity used to meet electrical demand and provides nearly 10 percent of the electricity our customers use. With uncertainty about the fate of spent fuel being stored at Prairie Island and the pending end of the original 40-year licenses to operate the plant, our 2007 Resource Plan again analyzed the economic and environmental impacts of continuing to operate Prairie Island versus replacing it.

Our evaluation of the alternatives in this Application is consistent with that of the recent Resource Plan: Prairie Island should continue to be part of generation fleet that supplies power to Minnesota and surrounding states. No replacement alternative can provide the financial and environmental benefits that are achieved by the continued operation of Prairie Island. Elimination of Prairie Island will lead to significant increases in carbon and other emissions at a significant increase in cost to our customers.

4.2 Methodology and Tools for Alternative Evaluation

The evaluation was performed using the same methodology and analysis tools used in the Certificates of Need for the Monticello ISFSI project; the Monticello Power Uprate project, and the 2007 Resource Plan. The first half of this Section provides an overview of the evaluation methodology, criteria, and software tool ("Strategist") used to evaluate the generation alternatives.

We also describe the specific evaluation methodology and assumptions used in the analysis. The second half provides an evaluation of the generation options available to replace the current generation capacity of Prairie Island if additional dry cask storage were not approved.

The evaluation of alternatives followed separate processes for the replacement of Prairie Island if the ISFSI expansion is denied versus the addition of 164 MW of capacity from the extended power uprate project. Since we have previously evaluated options for replacing our nuclear power plants,[12] we relied on those analyses to help determine viable alternatives to the continued operation of Prairie Island.

Xcel Energy uses Strategist resource planning software to evaluate large and long-term capacity alternatives. We have used the Strategist model to perform similar resource planning analyses in many other dockets, including: 2007 Resource Plan (Docket E002/RP-07-1752); 2004 Resource Plan (Docket No. E002/RP-04-1752); Certificate of Need to Establish an Independent Spent Fuel Storage Installation at the Prairie Island Generating Plant (Docket E-002/CN-05-123); Emissions Reduction Proposal (Docket No. E002/M-02-633); 2001 All-Source Bid process (Docket No. E002/M-01-1618); 2002 Minnesota Resource Plan filing (Docket No. E002/RP-02-2065); and Blue Lake Certificate of Need filing (Docket No. E002/CN-04-76).

Strategist:

- Develops the optimized selection of resources to meet need, given the input assumptions.
- Calculates the present value of revenue requirements ("PVRR") to measure the economic impacts of various planning scenarios. (The reported values in this plan are in 2008 dollars ["2008$"].)
- Calculates environmental impacts of the plan, using externality values and forecasted emission permit prices.

Strategist is useful as a planning tool in two ways. First, given a set of assumptions about the forecasted demand for electricity and the resources available to meet that demand, Strategist will optimize the operation of existing

[12] 2004 Resource Plan (Docket No. E002/RP-04-1752), 2007 Resource Plan (Docket E002/RP-07-1752), and Nuclear Report filed July 2, 2007 (Docket No. E002/RP-04-1752) and required by Minn. Stat. § 216C.051 Subd. 3 (d) and Minn. Stat. § 116C.772.

resources and add new resources to develop the expansion plan with the lowest PVRR.

Strategist is also used as a tool to determine the PVRRs of alternative cases. In this case, Strategist is "forced" to accept a particular resource or an entire expansion plan, and the resulting PVRRs can be compared to analyze the effects of different resource choices.

The Strategist model also has some limitations. It is not a chronological dispatch model; that is, it does not simulate the operation of the system from hour to hour. The model is not able to simulate the ramp rate of units and other order-dependent variables that may affect the operation of the system. Instead, Strategist simulates system dispatch for each hour independently of what occurs before or after that hour.

4.2.1 Modeling Inputs

In order to run the production simulations, numerous input assumptions are provided to the model. In addition, some issues do not lend themselves well to computer simulation, in which case adjustments to the Strategist output are made after-the-fact. Below we describe some of the key variables we used to analyze Prairie Island's future role in our resource mix.

4.2.1.1 Base Case Assumptions

Since our 2007 Resource Plan was filed December 14, 2007, all Strategist inputs used in the analyses in this Application are the same as the inputs used in the Resource Plan. Thus, the forecast, legislative compliance with the RES and DSM legislation, individual plant information, externalities, fuel forecasts, etc. are all the same for this analysis as submitted in the 2007 Resource Plan.

4.2.1.2 Load Forecast

This Application uses the same forecast that we filed in our 2007 Resource Plan on December 14, 2007 and was used in our February, 14 2008 Power Uprate Certificate of Need for the Monticello Nuclear Generating Plant. The forecast was developed in November of 2007 and reflects the most recent data available. As with previous resource plan modeling, the median or 50 percent

probability forecast for energy, and the 90 percent probability for peak demand were used. The 90 percent probability forecast of peak demand was used to ensure that we have sufficient generation capacity to meet energy demand under most plausible circumstances.[13]

4.2.1.3 Existing Generation Fleet

We model our entire generation fleet in Strategist. Inputs for each unit include: maximum dependable capacity, firm capacity (URGE), heat rate profiles, emission profiles, maintenance schedules, forced outage rates, fuel cost, variable O&M, and fixed O&M.

We recently completed a comprehensive review of Strategist inputs in preparation for the 2007 Resource Plan. The inputs changed included heat rate, emission rates, O&M costs, capacity ratings, and outage schedules. The changes ensure that Strategist is producing the most accurate forecast of system performance possible.

4.2.1.4 Renewables

Wind resources are modeled using representative hourly generation profiles. The nameplate capacity is multiplied by the hourly profile to estimate the unit's generation. This enables Strategist to simulate the variability of wind and to predict the dispatch of thermal units needed to complement these resources.

The Strategist inputs were updated to reflect compliance with Minnesota's new Renewable Energy Standard. Instead of modeling the necessary requirements coming on-line only in the year they are needed, we assumed the addition of 200 MW of wind generation each year. We also reviewed and updated our cost assumptions for future wind energy.

Biomass plants are modeled much like other thermal plants and are dispatched on economic merit. Hydro power is modeled either as run-of-river where energy is provided at a constant rate, or as a dispatchable resource for hydro resources with pooling capabilities

[13] The forecast has been reduced by approximately 1.1 percent to reflect compliance with the DSM goals set by the 2007 Minnesota Legislature.

4.2.1.5 Emissions

Externalities are modeled in accordance with the Commission's Order Establishing Environmental Cost Values in Docket No E-999/CI-93-583 for PM10, CO, and Pb. However, we replaced the Commission's externality value for NOx with a forecast of permit allocations and prices under the Clean Air Interstate Rule (CAIR). CAIR permit allocations and prices are also modeled for SOx and Mercury. The Commission's externality value for CO_2 was replaced with a higher value to reflect our expectations regarding the costs of future carbon regulations. A listing of the emissions assumptions modeled can be found in Table 4-1.

Figure 4.1 Emission Assumptions Modeled

Effluent	
SO_2	$776.54/ton based on the current cost of permits under title IV of the Clean Air Act. This value increases significantly in 2010 with the implementation of the Clean Air Interstate Rule (CAIR).
NOx	$591.54/ton based on the current cost of permits under title IV of the Clean Air Act. This value increases significantly in 2009 with the implementation of the Clean Air Interstate Rule (CAIR).
Mercury	$18,432/ton starting in 2010 with the implementation of the Clean Air Mercury Rule (CAMR).
CO_2	$20/ton starting in 2010. This value is meant to be an estimate of the costs from future carbon regulation.
PM10	$7,094-$923/ton depending on location, based on externality values established by the Minnesota Public Utilities Commission.
CO	$2.17-$0.40/ton depending on location, based on externality values established by the Minnesota Public Utilities Commission.
Pb	$2.17-$0.40/ton depending on location, based on externality values established by the Minnesota Public Utilities Commission.

4.3 Alternatives Evaluation for the Continued Operation of Prairie Island

To evaluate the futures with and without Prairie Island, we first reviewed the previous "life extension" analyses performed for Prairie Island and Monticello contained in our 2004 Resource Plan (Docket E002/RP-04-1752), the Monticello Spent Nuclear Fuel CON (Docket E002/CN 05-0123) and our 2007 Resource Plan (Docket E002/RP-07-1572). This review coupled with the carbon reduction goals established by the 2007 legislature and the need for a replacement generation resource(s) with similar operating characteristics (capacity, energy, reliability and availability) of a nuclear base load plant provided few generation resource alternatives to consider.

Based on that review, we compared continued operation of Prairie Island to a super critical pulverized coal (SCPC) plant with 50% carbon sequestration. In addition, we allowed Strategist to pick the least-cost replacement for Prairie Island ("unconstrained case") based on the generic alternatives available.

We also modeled the various alternatives to the continued operation of Prairie Island under different assumptions regarding fuel and environmental costs (Sensitivities) as discussed below. The resulting total system costs and emission levels were then compared to evaluate the alternatives for cost effectiveness and environmental impact.

4.4 Modeling Assumptions for Additional Dry Cask Storage

In Appendix H of our Application, we discuss the ongoing processes for identifying emerging aging issues, also known as life cycle management, that have been integral to the operation of Prairie Island over the years. In Section 3 we discuss the NRC license renewal process. These discussions provide context for the discussion in this section regarding the capital investments used in the analyses for Prairie Island.

4.4.1 Capital Investments

As part of the operation and management of Prairie Island, we routinely invest and upgrade systems so that the plant maintains safe and highly reliable operations. We invest an average of about $20 million dollars annually ($10 million per unit) in the Prairie Island plant to keep systems operating well. In

our analysis, we have assumed these levels of capital investment will continue to be made in the plant.

In addition to the capital investments routinely made on an annual basis, larger capital investments are sometimes required. These larger capital investments are necessary because of new or evolving regulatory requirements, operating experience at our plants or elsewhere in the industry, parts obsolescence or new technologies becoming available. These types of investments have been considered as part of the process leading to a decision to pursue license renewal. Individuals responsible for system operation at the plant utilize the types of inputs described above, identify and develop recommended large capital improvements that are reviewed, approved and prioritized to ensure continued safe and reliable operations.

The large capital investments include the Unit 2 steam generators, additional spent fuel storage costs, and relicensing costs. No major structural changes to the reactor or the storage pool will be needed for the continued operation of the plant. In total, inputs for large capital investments over and above the $20 million invested each year for life cycle management will amount to approximately $600 million. While not a definitive list as items may be added or removed, it is considered representative of the order of magnitude that we estimate will need to be invested over the 20 years of additional operation. Due to the costs associated with three larger capital projects mentioned above, a brief description of each is provided below.

4.4.1.1 Steam Generator Costs

Both Prairie Island units are two-loop pressure water reactors and each unit includes two steam generators. A high-pressure water cycle transfers heat generated in the reactor core to steam generators, where steam is produced to drive the turbine generator. Steam generators are large vessels that separate high-pressure water circulating through the reactor from the steam cycle used to power turbine generators at the plant. In the steam generator vessels, heat is transferred from the primary reactor water cycle to the secondary steam cycle by passing water through and around 3,388 steel alloy tubes.

Through an aggressive program of inspection and maintenance, Prairie Island has been able to operate its steam generators longer than other plants of similar vintage. However, projections of steam generator tube degradation indicate that while plant safety can be maintained without compromise, the plant could

become uneconomic as early as 2009 due to declining performance of the steam generators. In previous work we determined that replacing steam generators in Unit 1 was cost justified even if the plant operated only to 2013. As a result, in 2004 we replaced Unit 1's two steam generators.

Unit 2 steam generators have experienced less overall degradation than the Unit 1 steam generators. However, it will be necessary to replace the Unit 2 steam generators in order to keep the plant operating economically beyond the current license period. Our Strategist analysis includes steam generator replacement for Unit 2 in those scenarios in which Prairie Island operates beyond 2014. Steam generator replacement is estimated to cost approximately $259 million (current dollars).

4.4.1.2 Dry Cask Storage Costs

Capital investments have been included in the model for increasing spent fuel storage capacity at Prairie Island to accommodate the entire 20 year period of extended operations resulting from the renewal of the operating licenses.

We assumed the continued use of the TN-40 style dry cask storage system currently in place at the plant, but intend on using an enhanced version of the TN-40. The enhanced version called the TN-40HT is described in detail in Section 3. We continue to pursue the licensing changes needed to qualify the TN-40 dry casks for transportation. In August 2007, Transnuclear's application to the NRC to license the TN-40 casks for transport was accepted. The NRC has already approved a similarly designed cask, the TN-68, for transport. The TN-68 is a "sister" cask utilized for boiling water reactor spent fuel while the TN-40 is for a pressurized water reactor spent fuel. We estimate an additional 35 TN-40 casks will be needed to support the 20 years of extended operation. The combined cost of the five casks to operate until the end of the current license and the casks needed to support 20 years of additional operation is approximately $190 million, with the portion related to the additional casks included in the relicensing scenarios only and the portion related to the five casks included in all scenarios.

4.4.1.3 Relicensing Costs

We filed our application for the 20-year operating license extension for Prairie with the NRC on April 15, 2008. The cost to perform the analyses and

process the application to renew the licenses to operate Prairie Island for an additional 20 years will be approximately $20 million.

4.5 Out of Model Adjustments

If the operating life of the Prairie Island plant is not extended, there are some significant shutdown costs that were not taken into account by the Strategist model. These costs could range in the aggregate from $335 million to $390 million, or more. They relate to three specific shutdown activities: (1) the costs associated with retaining key personnel once the announcement is made that the plant will shutdown ($80 million to $135 million, present value); (2) the management of spent nuclear fuel and decommissioning ($141 million, present value); and (3) the changes in the transmission system required to maintain regional transmission stability and serve replacement power resources (approximately $115 million). The rationale for these costs was discussed in detail in our 2002, 2004 and 2007 Resource Plans. We are not repeating that discussion in this Application since our evaluation indicates that continued operation is the most cost-effective option even before these shutdown costs are considered.

In addition to these costs, replacement generation would require significant new transmission investment. These costs would be in the range of $30 million if all replacement generation were located near Prairie Island, or could range from $350 to $900 million if located elsewhere.

4.6 Alternative Screening

The authorization of additional spent fuel storage (Minn. Stat. § 116.83, subd. 2) is subject to the approval of a Certificate of Need, pursuant to Minn. Stat. § 216B.243. Minn. Stat. § 216B.243 requires that the applicant show the demand for electricity cannot be met more cost-effectively through conservation or from renewable resources, or what the consequences are of no facility.

4.6.1 Demand Side Management ("DSM")

DSM includes both our Conservation and Load Management Programs. Our DSM efforts and accomplishments are discussed in detail in Appendix C. The Next Generation Energy Act of 2007 approximately doubled the DSM goals approved in our 2004 Resource Plan. The Act sets a mandatory minimum

savings goal from Conservation Improvement Programs, or "CIP", programs at 1.0 percent of retail sales and an overall goal of 1.5 percent. We are committed to achieving a 1.1 percent energy reduction as our CIP/DSM goal. However, meeting this goal will be very challenging. We will likely launch new conservation programs as well as expand existing programs to meet the 1.1 percent target. However, even after assuming we will reach the 1.1 reduction target, our overall system is growing.[14] Such aggressive expansion of DSM programs pushes the limits of achievable potential in our service territory and creates significant uncertainty regarding the size and timing of actual savings. The Company concludes that an additional 1,100 MW of DSM savings by 2014 to replace Prairie Island is not feasible.

4.6.2 Renewables

Xcel Energy and the State of Minnesota have a long history of encouraging and supporting the development of renewable energy. We began contracting for wind in conjunction with our 1991 Resource Plan. In 1991, mandates for wind requirements were set for the Company. In 2001, the Legislature implemented a Renewable Energy Objective ("REO") for all Minnesota public utilities, requiring a good-faith effort to supply at least one percent of retail energy sales from eligible renewable resources by 2005, and increasing that amount by one percent per year until the utility supplied 10 percent of retail energy sales using renewable energy by 2015. The Minnesota Legislature expanded the mandates for the Company in 2003 and last year, the 2007 Minnesota Legislature adopted the most aggressive Renewable Energy Standard ("RES") in the nation. For Xcel Energy, this standard requires that 30 percent of retail sales must be supplied by qualifying renewable sources by 2020. Of this 30 percent, wind resources must supply 25 percent of retail sales. Other qualifying renewable resources can supply the remaining five percent. In addition to the 2020 requirement, Xcel Energy is also required to meet the following interim renewable goals:

2010 – 15%

2012 – 18%

2016 – 25%

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[14] Appendix B contains a more detailed explanation of how the DSM goals passed by the 2007 Legislature were incorporated into our forecast and the growth after accounting for DSM.

Since we already obtain nearly five percent of our retail sales from biomass and hydroelectric energy either on our system or under contract, our compliance with the RES will stem from new wind resources unless any of these arrangements with other resources change; for example, if we were unable to renew fuel contracts at our refuse derived fuel facilities.[15] Compliance with the new renewable energy standard will be challenging as is, and implementing a significant amount of more wind could pose operational issues on the system. Therefore, we do not consider replacing the energy and capacity from Prairie Island with additional renewable energy as a viable option.

4.6.3 No Facility

Our Application requests approval for additional dry cask storage necessary to operate Prairie Island until 2033 - 2034. The need for on-site dry cask storage is not eliminated if the plant does not operate beyond 2013 - 2014. If a Certificate of Need were not granted, Prairie Island would shut down in 2013 and 2014. In order to decommission the plant, spent fuel would have to be removed from the reactor and spent fuel pool and would require an additional 39 casks to fully decommission the plant. As part of the process of developing a decommissioning plan, we would apply to the Commission for a Certificate of Need for additional on-site dry cask storage, and additional generation resource(s) capable of serving similar amounts of energy and capacity with similar reliability and availability would need to be constructed to replace Prairie Island. We conclude that no facility is not a reasonable option.

4.7 Generation Alternatives

The loss of Prairie Island would require approximately 1,100 MW of replacement capacity and 8,500 GWh of replacement energy. Based upon a review of the previous analyses that have been performed in past Resource Plans and Certificates of Need, the generation alternatives modeled for this Application were a super critical pulverized coal (SCPC) plant with partial carbon sequestration and natural gas fired combined cycle (CC) plants selected by the strategist in the unconstrained scenario.

[15] The RES statute provides that we can meet interim milestones with any qualified renewable resources; however, by 2020, 25 percent of our retail energy sales must be supplied by wind.

4.7.1 Prairie Island Life Extension and Replacement Alternatives

4.7.1.1 Base Case – Continued Operation of Prairie Island

To examine the costs and benefits of extending Prairie Island's operating life by granting the additional storage casks, we compared three scenarios using Strategist. The first scenario modeled was the continued operation of Prairie Island from 2013-2014 to 2033-2034.[16] The plant was modeled to continue operating at 1,095 MW (maximum net generating capacity) with a total of $1.2 billion of additional capital investments during its lifetime.

4.7.1.2 Super Critical Pulverized Coal ("SCPC") Replacement

The second scenario examined replacing Prairie Island with a SCPC with 50 percent carbon sequestration. There is great uncertainty regarding the costs of carbon sequestration, and it is unlikely a unit could be commissioned by 2014 to replace Prairie Island. However, a SCPC was modeled at 1,260 MW[17] (maximum net generating capacity) with a total cost of $6 billion. The cost and performance inputs for the SCPC replacement option were based on an estimate for a conventional coal unit developed for Xcel Energy's 2007 Resource Plan. The inputs for the conventional unit were modified for the expected costs and performance impacts of 50 percent carbon sequestration. Capital costs were increased 17 percent, capacity was decreased by 16 percent, heat rate was increased by 20 percent, annual fixed costs were increased by 9 percent, and variable O&M were increased by 64 percent.

4.7.1.3 "Unconstrained" Replacement

The third scenario allowed Strategist to pick the least-cost replacement for Prairie Island. The model chose two natural gas fired combined cycle ("CC") units with a total capacity of 1,254 MW (maximum net generating capacity) and total cost of $956 million. These units are two-on-one configurations with supplemental duct firing. The expected generation from the CCs is significantly less than that from Prairie Island. In Strategist's dispatch

[16] This scenario does not include the 164 MW proposed extended power uprate project.

[17] Strategist accounted for the fact that the additional 160 MW the CC & SCPC options would provide over the 1100 MW Prairie Island by eliminating a 160 MW CT in the expansion plan.

simulations, the balance of energy comes from other resources on the Xcel Energy system.

4.8 Strategist Analysis & Results

Each scenario was run in Strategist using the Reference Case from the 2007 Resource Plan.[18] The model calculated optimal expansion plans and total system costs for 2008 through 2047. The net present value of revenue requirements ("PVRR") was lowest for the continued Prairie Island operation scenario. The capital costs for the SCPC option were too high for it to be a cost-effective alternative. Conversely, the capital costs for the combined cycle option were moderate, but the replacement energy costs are higher compared to base load energy. See Table 4-1 below.

Table 4-1 PVRR Summary for Life Extension

PVRR Summary	PVRR	Delta
Prairie Island Life Extension	61,875	
Super Critical Pulverized Coal	64,068	2,194
Natural Gas Combined Cycle	62,938	1,063

Table 4-4 compares the total costs of the three alternatives. The total costs for the SCPC and CC options include 'other system costs (benefits)'. This cost category aggregates all the other PVRR cost differentials that are not directly attributed to SCPC and CC plant costs. Most of these costs are additional generation costs from other Xcel Energy plants that help replace the energy from Prairie Island. In the case of the SCPC, there are some years that it outperforms Prairie Island and creates an additional system benefit by displacing gas-fired generation.

Indicating that the Prairie Island life extension has the lowest PVRR and lowest levelized cost comparison implies that this alternative has the smallest possible impact on rates. Table 4-2 also summarizes the expected rate impacts of the three alternatives.

[18] The Reference Case uses our baseline assumptions, including the wind that will be needed to meet the RES. It does not include upgrades at the Sherco and Nuclear Plants or the extension of the Manitoba Hydro Contract. The Reference Case, however, does assume that Prairie Island is extended through 2033 and 2034.

Table 4-2 Total Alternative Cost Comparison ($ in 1000's)

	2014-2034
Total Plant Costs + Other System Costs	Levelized Costs ($1000)
Prairie Island Life Extension	$655,972
Natural Gas Combined Cycle	$834,526
SCPC With Partial CO2 Sequestration	$971,421
Average System Energy	57,100GWh
Prairie Island Life Extension	$11.49/MWh
Natural Gas Combined Cycle	$14.62/MWh
SCPC With Patrial CO2 Sequestration	17.01262697

The continued operation of Prairie Island will also have significant emissions benefits. Table 4-3 summarizes total annual system emissions for the continued operation of Prairie Island scenario and the emission increases for the other two alternatives.

Table 4-3 Emissions Comparison of the Alternatives

	Continued Operation of Prairie Island	Combined Cycle Alternative	SCPC With Partial CO_2 Sequestration
	Total System Emissions (tons)	Additional Emissions	
SOx	484,846	37,183	114,763
NOx	407,059	29,192	78,690
CO_2	528,137,870	87,642,730	106,890,570
CO	86,275	11,096	151,285
PM10	58,942	6,914	18,693
VOC	11,590	1,288	3,546

4.9 Sensitivity Analysis

In order to determine how changes in our assumptions impact the costs or characteristics of different resources, we examine our alternatives under a number of scenarios. If a plan or resource is extremely sensitive to changes in assumptions, it is not a robust course of action for the Company to pursue. Instead, we may propose an alternative that is less sensitive to assumption changes, but slightly more costly. For this Application, we tested the following scenarios.

- Load – The base forecast (unadjusted for DSM) has an average energy growth rate of 1.14 percent. The energy growth rate was adjusted down to average 1 percent and was also adjusted up to average 1.3 percent.

- Fuel Cost – The cost of natural gas, coal, and nuclear fuel were all independently adjusted up and down by 20 percent.

- Externalities – The Commission's low and high externality values were added to test the societal impacts of each alternative. However in place of the Commission's values for NOx the forecasted CAIR permit price was used and the Company's baseline CO_2 hedge value of $20/ton was used in place of the Commission's CO_2 value.

- CO_2 Values – The CO_2 hedge values were varied down to $9/ton and up to $40/ton.

- MISO – Due to the unpredictability of future market conditions, Xcel Energy models itself as a stand-alone system without additional purchases and sales from the MISO day two market. In our sensitivity analysis Strategist's Network Economy Interchange (NEI) submodule was activated to simulate how the system might interact with the rest of MISO. However, this sensitivity requires highly speculative assumptions about supply and demand conditions in the rest of the market. The Company recommends that these results should be viewed as an estimate of one possible outcome, but not a precise prediction of what will occur in the future.

- Capital Cost Escalation – The base assumption in Strategist is that the cost of capital projects will increase at 1.88 percent. Three percent and 5 percent cost escalation scenarios were also run to evaluate expansion plan sensitivity to escalation assumptions.

Table 4-4 presents the results of the sensitivities analysis. The leftmost column lists the PVRR result for the Prairie Island uprate project. The remaining columns list the differences from the Prairie Island project for each of the selected alternatives.

Table 4-4 PVRR Sensitivities
($ In Millions)

	Prairie Island Life Extension	Prairie Island Shut Down, Replace with Combined Cycle	Prairie Island Shut Down, Replace with SCPC with Partial CO_2 Sequestration
	PVRR	PVRR Differences From the Prairie Island Life Extension Scenario	
Base Case	$61,875	$1,063	$2,194
Low Load	$60,635	$1,008	$2,217
High Load	$63,405	$1,111	$2,175
Coal+20 percent	$62,804	$1,103	$2,288
Gas+20 percent	$64,612	$1,659	$1,725
Nuclear+20 percent	$62,215	$912	$2,042
Coal-20 percent	$60,932	$1,017	$2,081
Gas-20 percent	$59,929	$432	$2,419
Nuclear-20 percent	$61,604	$1,208	$2,339
Low Externalities	$61,016	$1,072	$2,201
High Externalities	$62,080	$1,076	$2,204
CO_2 $9/ton	$57,382	$610	$1,611
CO_2 $40/ton	$70,043	$1,892	$3,060
MISO On	$61,726	$924	$2,265
Capital Cost Escl 3 percent	$63,305	$1,002	$2,291
Capital Cost Escl 5 percent	$66,637	$840	$2,475

Under all sensitivity tests the continued operation of Prairie Island scenario is the most costs effective option. The combined cycle scenario performed best in the low gas, \$9/ton CO_2, increase capital cost escalation, and high nuclear fuel scenarios; while the coal alternative had its smallest PVRR differential in the high gas, low coal, and \$9/ton CO_2 scenarios. The reason the coal option did well under the high gas scenario is that the continued operation of Prairie Island has more replacement gas energy after 2033-2034 when the plant retires. The coal scenario assumed that SCPC units continue operation through the end of the study period in 2047, displacing large amounts of gas-fired generation from 2033 through 2047. However, there is ample time to consider replacements other than natural gas for Prairie Island in 2034. One possible alternative was a new nuclear unit, but because current Minnesota legislation prohibits new nuclear units, this option was not allowed to be selected by Strategist.

5 Dry Cask Storage Alternatives for Prairie Island

5.1 Section Summary

In this section of our application, we describe our evaluation of the storage alternatives to the proposed additional dry cask storage.[19] Minn. R. 7855.0120 requires that a Certificate of Need must be granted to an applicant upon determining that four principal criteria are met. The second principle criteria (Minn. R. 7855.0120(B)) states that:

> *"a more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record by parties or persons other than the applicant,. . . ."*

Our analysis of the alternatives indicates that the proposed additional dry cask storage at Prairie Island is the most reasonable storage alternative.

This section discusses the following alternatives and findings:

- **Alternatives to on-site storage.** Our review found no, away-from-reactor, storage alternatives that would eliminate the need for additional on-site storage.

- **Alternatives to increase dry cask storage pool capacity.** The storage capacity of the existing pool can be expanded by a small amount, but not enough to support 20 years of extended operations.

- **Alternative dry cask system technologies**. The four available cask systems licensed for pressurized water reactor spent fuel storage are described. The TN-40HT system was selected based on economic evaluations and experience and familiarity with the TN-40 technology at Prairie Island.

- **Alternatives of a different size.** The proposal for 35 additional casks is intended to support the 20-year license renewal period. Due to the uncertainty surrounding when off-site storage alternatives might become available, the only way to ensure that Prairie Island is available on a reliable basis to facilitate long-term planning is to expand the storage capacity to accommodate the number of dry-storage casks necessary for the full 20

[19] This section provides the information regarding alternatives required by Minn. R. 7855.0610.

twenty years. The proposed addition of 35 casks will fit within the existing ISFSI.

- **Alternative sites.** A study to identify locations at Prairie Island suitable for additional cask storage was performed as part of the Application for a Certificate of Need dated April 29, 1991 (and revised June 10, 1991). The results of that study and the 1991 Certificate of Need process selected the location of the existing dry cask storage facility. Since there is sufficient room within the footprint of the existing dry cask storage area to accommodate the additional storage, the construction of additional dry cask storage at an alternative site was not deemed a preferred alternative.
- **No action alternative.** If a Certificate of Need is not granted, Prairie Island cannot operate beyond 2014 and would be forced to shut down. To complete the decommissioning process, spent fuel would have to be removed from the reactor and pool, which would also require additional on-site dry cask storage. Denying a Certificate of Need for additional dry cask storage that would allow Prairie Island to continue operating does not obviate the need for additional on-site storage, but only changes the purpose of dry cask storage from continued operations support to decommissioning support. The generation alternatives precipitated by the no action alternative are discussed in Section 4.

5.2 Alternatives to On-Site Storage

This section of our application examines four away-from-reactor storage alternatives for spent nuclear fuel: 1) reprocessing of spent nuclear fuel, 2) contracting for additional spent fuel storage capacity at an existing spent fuel storage facility, 3) developing an interim spent fuel storage facility in Utah, and 4) availability of a federally sponsored repository for spent fuel at Yucca Mountain. We conclude that none of the four represent a viable alternative to additional spent fuel storage space at Prairie Island.

5.2.1 Reprocessing Spent Nuclear Fuel

Reprocessing is a method of recovering unused uranium and plutonium from used nuclear fuel and recycling it for use in new reactor fuel. Reprocessing does not result in elimination of all nuclear wastes and radioactivity. However, the volume of high-level waste to be stored is reduced.

When electric power companies first considered using nuclear energy to generate electricity, it was assumed that when the nuclear fuel was used up or "spent", it would be recycled so that useful fuel could be extracted and used again. Approximately 96% of the spent fuel is uranium that could be reprocessed into usable fuel to generate electricity. It is this assumption that led to sizing spent fuel pools to provide the limited space necessary to cool spent fuel for a few years before transporting for reprocessing.

In 1977, President Carter, concerned about the possibility of nuclear proliferation, banned commercial reprocessing for private companies. As a result, the two private reprocessing facilities, then under final construction, were never made operational. President Reagan later lifted the ban, but because of economics of reprocessing compared to fabrication of new fuel and the political uncertainty surrounding reprocessing, no private companies have invested in constructing and operating reprocessing facilities in United States.

Reprocessing is not a viable alternative to establishing on-site dry cask storage at Prairie Island.

5.2.2 Existing off-site storage facilities

The only facility currently storing spent fuel on a contract basis from commercial nuclear power reactors is the General Electric Morris facility in Morris, Illinois. There are no spent fuel assemblies from Prairie Island currently being stored at that facility. The General Electric Morris facility is no longer accepting spent fuel from commercial nuclear power plants and is not a viable alternative to increasing the dry cask storage at Prairie Island.

5.2.3 Private Fuel Storage Initiative

We are pursuing temporary, away-from-reactor storage in Utah as a member of Private Fuel Storage, LLC ("PFS"). PFS is a consortium of eight utilities, including Xcel Energy, which is working to build a spent fuel storage facility on the west central Utah reservation of the Skull Valley Band of Goshute Indians. PFS and the Skull Valley Band of Goshute Indians entered into an agreement in December 1996 that allows for temporary storage of spent fuel from commercial nuclear power plants.

The license application for PFS was submitted to the NRC in June 1997. The NRC staff issued their final Safety Evaluation Report in December 2001. The

NRC issued their Final Environmental Impact Statement in January 2002. Both reports declared that the project design and supporting analyses met the federal regulatory requirements for Independent Spent Fuel Storage Installations.

The NRC's licensing process provides for the opportunity for public hearings before an Atomic Safety and Licensing Board (ASLB) appointed by the NRC. In April 1998 public hearings were granted and 25 contentions or issues brought by intervenors were admitted. The State of Utah and others were admitted as intervenors in the proceeding. The initial hearing was held in June 2000, with additional hearings held from April through July 2003, to consider the issues raised.

By the spring of 2003 all but one licensing contention were judged in PFS's favor. In March 2003, the ASLB ruled that PFS had to conduct additional analyses to consider the consequences of an aircraft crash on site structures such as the storage pads and canisters, and the canister transfer building. These analyses were filed in July 2003. Hearings on this issue were completed in September 2004. The Nuclear Regulatory Commission approved the license for PFS on September 9, 2005.

In September 2006 the U.S. Department of the Interior ("DOI") disapproved the PFS-Goshute lease and the use of public lands for an Intermodal Transfer Facility, which was to be used for a rail spur from the mainline to the storage facility. On July 17, 2007, PFS and the Skull Valley Band of Goshute Indians filed a complaint, in U.S. District Court challenging the September 2006 decision. PFS and the Skull Valley Band asked the Court to vacate the DOI decisions and require DOI to reconsider both issues on a strict timetable, this time adhering to the Department's own regulations as well as other federal laws and policies.

Even if PFS and the Skull Valley Band are successful in their judicial challenge to reverse the DOI decision, the project faces further obstacles. The State of Utah remains opposed to the project. Ultimately the viability of PFS will depend not only on the outcome of the licensing process, legislative activity, and litigation, but also on the interest and commitment to use the facility by utilities with spent fuel. Additional storage needs to be available in 2012 to support ongoing operation at Prairie Island. Even though PFS has a federal license in hand, we cannot be assured PFS will be in service to meet our timetable. Due to the considerable uncertainty surrounding the project, PFS is not an alternative to additional spent fuel storage at Prairie Island.

If PFS were to become available, it may represent an opportunity to reduce the overall number of storage casks used to keep Prairie Island operating beyond 2014 or the length of time that a dry cask storage facility will be needed on-site.

5.2.4 Yucca Mountain

The United States Department of Energy ("DOE") began studying Yucca Mountain, Nevada in 1978 to determine whether it would be suitable for the nation's first long-term geologic repository for spent nuclear fuel and high-level radioactive waste. Such fuel and waste are currently stored at 131 sites around the nation.

On July 9, 2002, after approximately $7 billion dollars in investigations at the site, numerous technical reports, and an Environmental Impact Statement, the U.S. Senate passed the required legislation overriding Nevada's objections to the site and approving the submittal of license applications to the NRC for a repository at Yucca Mountain and on July 23, 2002, President Bush signed House Joint Resolution 87 into law.

The DOE is currently preparing an application to obtain the NRC license to proceed with construction of the Yucca Mountain repository. The DOE intends to submit the license application to the NRC in June 2008 and the NRC will review the application for completeness. We anticipate the proceeding will commence later this year. The DOE has indicated that the repository will not be available prior to 2017, but has not provided an updated assessment of when it might be available.

5.2.4.1 Challenges to the Development at Yucca Mountain

The development of a national geological repository for radioactive waste has significant opposition and the project has faced continual challenges. Every year there are efforts to reduce funding to the program in appropriation debates in Congress. Interveners have challenged every significant decision and milestone in regulatory proceedings and in the courts and will likely continue to do so.

5.2.4.2 Funding Challenges

The development of Yucca Mountain is paid for by funds paid by customers of utilities who own and generate electricity from nuclear power plants. A fee of 1 mil (0.1 cents) for each kilowatt-hour generated by a nuclear power plant is collected and paid to the federal government. These fees are placed into the federal government's general fund and Congress must act each year to appropriate the collected funds to the Yucca Mountain project. Through December 2006, (latest numbers available) Xcel Energy's consumers have paid over $620 million into the

federal Nuclear Waste Fund to finance nuclear waste management. Nationally, consumers have contributed $25.9 billion into the federal Nuclear Waste Fund. Through December 2006, the DOE has only received $6.1 billion in disbursements from the Nuclear Waste Fund. For fiscal year 2008, the DOE requested $495 million and was appropriated $387 million. We continue to work with Congress and industry groups to find a solution, which would provide stable funding for the Yucca Mountain Project in the future.

5.2.4.3. Judicial Challenges

On July 9, 2004, the U.S. Court of Appeals issued a decision on a group of consolidated cases through which Nevada challenged the federal government's program designating Yucca Mountain as the site of the nation's spent nuclear fuel repository. The court rejected all of Nevada's claims, except its challenge regarding the 10,000-year compliance period for meeting U.S. EPA regulatory requirements. The court also stayed its own mandate pending further legal review, allowing work on the repository to continue, with all regulations remaining in effect. On August 23, 2004, the Nuclear Energy Institute (NEI) filed a petition with the U.S. Court of Appeals for the District of Columbia Circuit seeking a rehearing of the July 9, 2004, decision by a three-judge panel on Environmental Protection Agency standards for the planned Yucca Mountain nuclear waste repository. The petition states that the court improperly set aside EPA's choice of a 10,000-year compliance period for evaluating repository performance. The U.S. Court of Appeals has rejected the NEI appeal, and no further appeal is possible. The EPA is currently in rulemaking to establish a new standard to replace the 10,000-year compliance period. The new standard is necessary to support the NRC's review of DOE's application to construct Yucca Mountain. If the new standard is not issued soon, the licensing and developing of Yucca Mountain could be further delayed.

5.2.4.4. Prospects

While the DOE has overcome many challenges in the past and continues to work through current challenges, we do not believe that DOE will begin accepting waste at Yucca Mountain in 2017. Some argue that Yucca Mountain or any permanent repository for nuclear waste will never be available. We do not believe that contention is tenable. The federal government made a legally binding commitment to provide a nuclear waste repository to utilities and the citizens of the United States. As time passes it will become more politically unpalatable to leave spent nuclear fuel and defense-related radioactive waste in the thirty-three states where it

is stored today. The courts have ruled that the federal government is responsible for the costs associated with their failure to meet their contractual obligations to take spent nuclear fuel from commercial reactors. As the costs mount, pressure to overcome political inertia and to act will increase. Nonetheless, controversy surrounding the process of establishing a federal repository is expected to continue which will lengthen the process and delay implementation. We have reflected the possibility of further delay in our analysis of spent fuel storage and its impact on plant operations in the future.

5.3 Alternatives to Increase Pool Storage Capacity

5.3.1 Consolidation

Fuel rod consolidation is a process that reduces the volume of the fuel assemblies by disassembling and repackaging the fuel rods and assembly hardware.

Fuel rod consolidation and hardware processing can be performed in the existing spent fuel pool. During this process, fuel rods are removed from the fuel assembly. The rods are then grouped in a closer-packed array and placed in a container with similar dimensions as a fuel assembly. The assembly hardware is compacted and then packed into separate containers in the pool or in a dry storage configuration.

Fuel rod consolidation has not been widely used and the domestic nuclear industry experience with consolidation is not extensive beyond demonstration projects. Consequently, the technology is not optimized or commercially mature as other alternatives. Rod consolidation would require a complex and site-specific solution, if implemented.

NSP conducted a fuel rod consolidation demonstration project at the Prairie Island Nuclear Generating Plant in 1986. The results of this project were reported in the Prairie Island Certificate of Need Docket No. E-002/CN-91-1. Although some volume reductions for spent fuel were realized, NSP found that predicted compaction ratios for assembly hardware were not achievable. Moreover, the occupational dose was significantly higher than predicted because workers were subject to increased exposure from the many time-consuming and labor-intensive fuel-handling activities. Prairie Island also found that the consolidated assembly hardware had become activated and large portions of the assembly could not be disposed of as Class C waste, which would have reduced volume. The NSP study found that consolidation would also generate significant amounts of radioactive

debris. The study estimated an additional 600 cubic meters of low level radioactive waste containing 2500 curies would be generated from consolidation activities.

In January 2001, the DOE's Office of Civilian Management provided a report to the U.S. Congress entitled, *Spent Fuel Management Alternatives Available to Northern States Power Company Inc. and the Federal Government for the Prairie Island Nuclear Plant Units 1 & 2.* The report contained the following excerpt on rod consolidation at PI:

> *"In the 1980's, DOE, the utility industry, and several nuclear equipment vendors developed consolidation processes and equipment; and several utilities undertook demonstration projects to test the processes and equipment. NSP demonstrated the consolidation of 36 assemblies at Prairie Island in late 1987. These demonstrations encountered numerous and varied difficulties, which were not easily resolvable. To date, no utility has pursued rod consolidation as a means of expanding onsite storage capacity for SNF."*

We are not aware of any recent industry initiatives or design advances that would render rod consolidation to be a more viable alternative. We are also not aware of any domestic nuclear plant owner that is seriously considering rod consolidation as a long-term solution to spent fuel storage.

Therefore, we conclude that consolidation is not a viable alternative to dry storage at Prairie Island.

5.3.2 Extend Operation by Re-racking to Increase Pool Storage

Re-racking is a process by which the storage racks are replaced with storage racks designed to provide a more compact array for storing the spent fuel assemblies. Re-racking has already been performed twice at Prairie Island, once in 1977 and again in 1981. The current licensed storage capacity of the spent fuel pool is 1386 fuel assemblies. In 1995, a feasibility study was performed to assess the potential increase in wet storage capacity via the use of state-of-the-art storage racks. The study concluded that it might be possible to gain up to 790 storage cells within Prairie Island's spent fuel storage pools. An increase in wet storage of 790 spent fuel assemblies is not sufficient additional storage to support 20 years of extended operations.

Therefore, re-racking to increase pool storage is not a viable alternative to establishing dry storage at Prairie Island to support 20 years of extended operations.

5.3.3 Construct a New On-Site Pool

This alternative entails constructing a new building containing a new spent fuel storage pool. The new building and pool structure would be designed and constructed to the same or higher standards as the existing spent fuel storage pool and would be licensed and regulated by the NRC. A transfer cask would be required to transfer spent fuel assemblies from the existing pool to the new pool. Under this alternative, the number of times the spent fuel assemblies are handled would most likely triple; first, to place it in the transfer cask to move it to the new pool; second, to remove it from the transfer cask to place it in the new storage pool and third, into a dry cask for transport offsite.

A new storage pool would require the same components as the existing pool and would rely on active cooling rather than passive cooling systems. These components would include storage racks, pool cooling and filtration systems, pool bridge crane and fuel assembly handling tools, building ventilation systems, radiation monitoring equipment and a cask decontamination area. It would take an estimated three years to design a new pool building and to complete state and federal reviews and approvals. Construction would last approximately two years, and thus, the total design and construction period would be approximately five years. The new storage pool would likely be located at close as possible to the existing spent fuel storage area.

This alternative was evaluated in the 1991 Prairie Island Certificate of Need Application. The estimates of the project costs in 1991 were on the order of $31 million to build, $0.5 million per year to operate, and $50 million to decommission the pool. This estimate did not include costs associated with purchasing hardware or plant personnel to load and transport the spent fuel to Yucca Mountain when it becomes available.

5.4 Alternative Dry Cask System Technologies

Currently, there are four types of storage system technologies available for dry storage of spent nuclear fuel. All four systems rely on passive cooling to remove decay heat from the spent fuel. The four technologies vary in the manner in which they store the spent fuel, how they accommodate the transfer of spent fuel from the power plant, and how they are transported. The four types of systems are as follows:

- Non-Canisterized Storage System

- Horizontal Canisterized Storage System
- Vertical Canisterized Storage System
- Modular Vault Dry Storage System

The following sections present each system and discuss the advantages and disadvantages of each system. A comparison of major attributes of each system is presented in Table 5-1.

5.4.1 Non-Canisterized Storage Systems

The non-canisterized storage system is the proposed system for Prairie Island. The non-canisterized storage system is the system currently used by Prairie Island for storing fuel at the Prairie Island ISFSI. It consists of a single robust metal storage component called a cask that has a lid that is bolted to the cask. The cask is the primary confinement boundary. The casks are designed to store 40 spent fuel assemblies in an internal basket or in storage cells dispersed throughout the cask. The casks are passively cooled. The TN-40 cask currently in use at Prairie Island is licensed for storage under 10 CFR 72. Transnuclear applied for a transportation license for the TN-40 on August 7, 2006. The enhanced version of the TN-40, the TN-40HT, is expected to be licensed for a higher burnup fuel and is expected to be licensed for transportation also.

The thick steel cask body provides physical protection and radiation shielding of the spent fuel. The casks use a bolted closure consisting of a single lid with dual metallic seals. The annulus between the seals is pressurized and connected to a system that monitors the annulus for loss of pressure. The casks are stored outdoors on a concrete pad.

The loading process consists of inserting the cask into the pool, loading the spent fuel, removing the cask from the pool, bolting the lid, drying and inerting the cask with helium, and transporting the cask to the ISFSI.

The advantages of using a non-canisterized storage system at Prairie Island include:

- This system has been in use at Prairie Island since 1994 (TN-40).
- The new cask (TN-40HT) is being designed and licensed for both storage and shipping, eliminating the need to transfer spent fuel between different casks.

- The casks can be loaded and shipped directly offsite without having to repackage the fuel assemblies in the spent fuel pool or transfer a cask.
- No welding is required which reduces loading time and associated worker doses during the loading phase.
- Construction costs to expand the ISFSI concrete pads will be minimal. Changes are not required until 2020.
- Prairie Island has all the necessary equipment, procedures and experience to safely load and transfer a cask to the ISFSI.

The disadvantages of using a non-canisterized storage system at Prairie Island include:

- A pressure monitoring system is required to ensure no leakage of O-ring seals in bolted storage cask lid.

Some of the highlights of the proposed system are:

Location: The non-canisterized system would be located on Prairie Island's site.

Land area and height of facility: Since the proposed non-canisterized system involves using an enhanced version of the existing TN-40 cask design and would be placed within the footprint of the existing ISFSI, there is no change in the land area and height of the facility.

Design capacity: The non-canisterized system would be constructed to support 20 additional years of plant operation.

Construction and In-service dates: The non-canisterized system is the system currently in use at Prairie Island and has been in service since 1994. The system is designed to accommodate 48 TN-40 (or TN-40HT) casks and thus no construction of new storage pads would be necessary until approximately 2020.

Installed costs: The non-canisterized system is the technology that has been used at Prairie Island for storage of spent fuel for over 10 years. The cost for these previous loading campaigns is well documented and provides a good basis for estimates of projected costs for the procurement, loading, ISFSI pad modifications, and transport to the ISFSI pad for the additional 35 casks over the next 26 years.

Sources, types and amounts of waste involved: The nuclear waste involved is spent fuel and associated hardware irradiated at Prairie Island. The proposed system calls for

a total storage of 2,560 spent fuel assemblies to be stored in 29 TN-40 casks and 35 TN-40HT casks.

Maintenance requirement: Typical maintenance tasks involve occasional replacement and recalibration of monitoring instrumentation and touchup of some casks with corrosion-inhibiting coatings. No special maintenance techniques are necessary.

Economic life: The length of time of operation of the ISFSI depends on how long Prairie Island will operate and the availability of off-site storage or a permanent repository. At this time since the expansion of the ISFSI is sized to store enough fuel to support operation for twenty years beyond Prairie Island's current license expiration date it is anticipated that the economic life of the ISFSI will be until October 2034 when the renewed Plant's license will expire.

Reasons the alternative was selected: The proposed system is the system that has been used by Prairie Island to safely store fuel for over 10 years. Thus Prairie Island already has all the equipment, procedures, and infrastructure needed to safely load and transport a cask to the ISFSI. The system is simpler than most of the alternatives, e.g. no welding or transfer of a loaded canister from a transfer cask to a storage vault. The relatively higher number of fuel assemblies that may be stored within a cask, e.g. 40 vs. 24, reduces the number of casks/containers that must be loaded, transferred, and stored in the ISFSI.

Based upon this experience and the minimal impact on Prairie Island to continue with the technology currently being used, the non-canisterized system is the technology that has been determined to be the least-cost over the extended plant life than the other technologies considered. The ISFSI is already designed to accommodate 48 TN-40 style casks and there will only be 29 on-site at the end of the current operating licenses, thus new construction would not be necessary until approximately 2020.

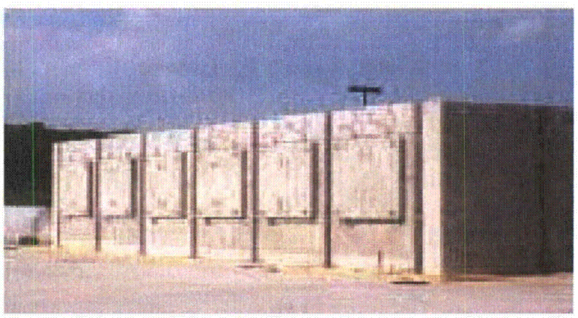
5.4.2 Horizontal Canister Storage System

The horizontal canister storage system consists of a welded sealed metal canister to contain spent fuel assemblies and provide the primary confinement boundary; concrete storage modules that house the canisters; a transfer cask to handle the canisters; and a transportation cask to ship the canisters offsite. The storage module, transfer cask and transportation cask provide radiation shielding and physical protection, during canister transportation, transfer, or storage. A typical canister will hold 24 or 32 PWR spent fuel assemblies.

The transfer cask is used to lift and provide radiation shielding of the canister during spent fuel loading, and storage preparation activities. After the canister is loaded, it is drained, dried, inserted with helium, and welded closed. The canister is then transferred using the transfer cask, moved to the ISFSI, and loaded into the storage module for storage. The canister transfer operation occurs at the ISFSI by sliding the canister from the transfer cask into the storage module. This operation occurs in a horizontal configuration so no overhead crane is required. The individual modules are placed on a concrete base mat next to each other to form a linear array. The modules are designed with a passive natural convection heat transfer system. The process can be reversed to transfer the canister from the storage module directly into a shipping cask. The shipping cask can be loaded onto a railcar for removal offsite.

The concrete storage modules are designed to provide passive heat transfer by natural convection from the canister through air vents built into the module. The air vents require periodic inspection to ensure they do not become blocked and a temperature monitoring system to ensure canister temperatures do not reach levels that could damage the system materials. The concrete storage module is a pre-cast reinforced concrete structure, which is fabricated offsite and shipped to the site where it can easily be placed on a concrete storage pad.

Figure 5-1: NUHOMS Cask



Currently, the only horizontal system available is the TN NUHOMS[20] (Nuclear Horizontal Modular System) designed, licensed and manufactured by Transnuclear, Inc. Figure 5-1. The system is used at several nuclear power plants throughout the United States as well as at several foreign reactors.

The advantages of using a horizontal canisterized storage system include:

[20] This system is currently used at the Monticello Plant.

- Once welded closed, the canister never needs to be opened, which avoids having to expose or handle individual spent fuel assemblies.
- The concrete module is pre-fabricated and shipped to the site where it can easily be placed at the ISFSI.
- All canister transfers between the transfer cask and the storage module can be performed without the use of an overhead crane.
- To ship offsite, the canister needs only to be transferred from the storage module to the shipping cask without having to unload fuel in the fuel pool.

The disadvantages of using a horizontal canisterized storage system include:

- The canisters have to be transferred between transfer casks, storage modules and transportation overpacks, which increases radiation doses to workers.
- The canisters require welding and weld inspection, which increases storage preparation time, which in turn increases worker doses.
- A temperature monitoring system and/or vent blockage inspection are required to ensure proper heat rejection from the canister.
- Currently only the NUHOMS canister design licensed to store the high burnup fuel irradiated at Prairie Island is the NUHOMS-24PTH, which holds only 24 fuel assemblies.
- Transnuclear, Inc. does have a design that holds 32 fuel assemblies, i.e. the NUHOMS-32PTH, but it is not licensed for the type of fuel used at Prairie Island. In order to use this canister design, additional analyses would have to be performed and a NRC license obtained to use the cask with our fuel.
- The maximum ground load of the NUHOMS (130 psi) exceeds the designed load of the ISFSI Access road and buried ductworks (100 psi). Thus, the Access road and buried ductworks would have to be reanalyzed and possibly strengthened.

Some of the highlights of this alternative are:

Location: The horizontal canister system would be located on Prairie Island's site.

Land area and height of facility: The horizontal canister system should be able to be installed within the footprint of the current ISFSI, thus there would be no change in the required land area. The height of the horizontal canister storage system is

comparable to that of the non-canisterized system and thus the height of the facility would not change.

Design capacity: The horizontal canister system could be constructed to support 20 additional years of plant operation.

Construction and In-service dates: To support continued operation during the renewed operating life of Prairie Island, construction needed to transition to the horizontal canister system would need to commence in 2010 to support storing fuel no later than 2012.

Installed costs: The horizontal canister system technology is a viable technology that is used at other nuclear facilities, including at Monticello. Associated costs of this technology from these other utilities have been used to develop the costs of this technology if used at Prairie Island. Comparative evaluations of this horizontal canister system technology and the currently used technology have been conducted and show this technology to be higher in cost. These higher costs are attributed to higher costs for the canister and concrete storage module. Additional increased costs for this technology are attributed to cask loading, personnel radiation impact due to cask loading, modifications to the ISFSI, and extra procedure development and training to accommodate a new technology.

Sources, types and amounts of waste involved: The nuclear wastes involved in this alternative would be identical to those involved in the proposed system.

Maintenance requirement: Ongoing maintenance activities would be similar to the proposed system.

Economic life: The economic life would be similar to the proposed system.

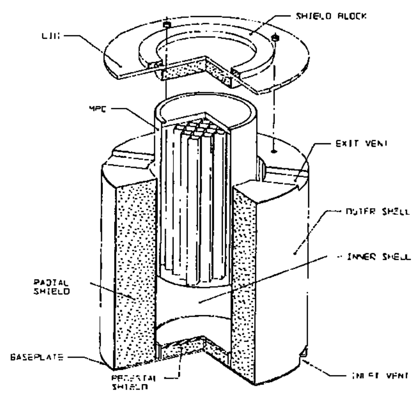
Reasons the alternative was rejected: Transitioning from the non-canisterized system to a canister system would require construction at the ISFSI site to occur approximately 10 years earlier. It would also necessitate the purchase of new major equipment (e.g. a transfer cask, trailer, automatic welding machines, and building to store new equipment). The loading process is more complicated for the canister storage system, e.g. welding and transfer of a canister, which would require new and specialized training for the workers. Currently only the NUHOMS-24 PTH, which only holds 24 fuel assemblies, is licensed to store the high burnup fuel design utilized at Prairie Island. Thus, this system would require 66% more canisters be purchased, loaded, transferred, and stored than casks in the proposed system. Handling more canisters would increase the dose received by the workers and the cost per fuel assembly stored. The number of canisters could be reduced if

the NUHOMS-32PTH could be analyzed and licensed for the high burnup fuel design used at Prairie Island. But, it would still require more canisters than casks.

5.4.3 Vertical Canisterized Storage Systems

The vertical canisterized storage system, as illustrated in Figure 5-2, typically consists of a welded sealed metal canister to contain spent fuel assemblies and provide the primary confinement boundary, concrete or metal storage overpacks to house the canister, a transfer cask to handle the canister, and a transportation cask to ship the canister offsite.

Figure 5-2: Vertical Canisterized Storage System



The storage overpack, transfer cask and transportation cask provide radiation shielding and physical protection, during canister transportation, transfer, or storage. A typical canister will hold 24 to 32 PWR spent fuel assemblies. The systems are typically licensed under 10 CFR 72 for storage and 10 CFR 71 for transportation.

The transfer cask is used to lift and provide radiation shielding of the canister during spent fuel loading, and storage preparation activities.

After the canister is loaded, it is drained, dried, inserted with helium, and welded closed. The canister is then transferred from the transfer cask to the storage overpack and moved out to the ISFSI for storage. The canister transfer operation would typically occur in the rail or truck bay of Prairie Island. However, as this operation requires a supporting floor that can handle upwards of 500,000 lbs., many plants cannot support that magnitude of load. If the floor cannot be modified to support the load, a separate canister transfer structure would be built to provide the transfer. This structure typically consists of a large crane component

to lift the transfer cask on top of the storage overpack and to move the canister between the transfer cask and storage overpack. The same process is required to move the canister between the storage cask to a transfer cask to a shipping cask.

The concrete storage overpacks, shown in Figure 5-3, are designed to provide passive heat transfer by natural convection from the canister through air vents built

Figure 5-3: Concrete Storage Overpacks

into the overpack. The air vents require periodic inspection to ensure they do not become blocked or a temperature monitoring system to ensure canister temperatures do not reach levels that could damage the system materials. Metal storage overpacks provide passive heat transfer by conduction through the overpack body. The overpacks are stored outdoors on a concrete pad. Concrete overpacks are shipped to the site as a steel frame where concrete is poured in-place to provide a radiation shield.

Currently, vertical systems are provided by two companies; Holtec International and NAC Inc. They are in use at several nuclear power plants throughout the United States.

The advantages of using a vertical canisterized storage system include:

- Once welded closed, the canister never needs to be opened, which avoids having to expose or handle individual spent fuel assemblies.
- To ship offsite, the canister needs only to be transferred from the storage cask to the shipping cask without having to unload fuel in the fuel pool.

The disadvantages of using a vertical canisterized storage system include:

- The canisters have to be transferred between transfer casks, storage modules and transportation overpacks, which increases radiation doses to workers.

- The canisters require welding and weld inspection, which increases storage preparation time, which in turn increases worker doses.
- A temperature monitoring system and/or vent blockage inspection are required to ensure proper heat rejection from the canister.
- The storage overpacks must be filled with concrete at the site requiring on-site fabrication work and a fabrication area.
- A transfer vehicle would have to be specifically designed and fabricated to transport the overpack through the narrow auxiliary building door.
- The canister transfer process requires a robust floor to support all the components or a separate structure with a robust base and overhead lifting component such as a crane.

The following discussion highlights some of the aspects of this alternative:

Location: The vertical canister system would be located on Prairie Island's site.

Land area and height of facility: The vertical canister system should be able to be installed within the footprint of the current ISFSI, thus there would be no change in the required land area. The height of the vertical canister storage system is comparable to that of the non-canisterized system and thus the height of the facility would not change.

Design capacity: The vertical canister system would be constructed to support 20 additional years of plant operation.

Construction and In-service dates: To support continued operation during the extended operating life of Prairie Island, construction needed to transition to the vertical canister system would need to commence in 2010 to support storing fuel no later than 2012.

Installed costs: The vertical canister system technology is a viable technology that is used at other nuclear facilities. Associated costs of this technology were developed from a 2002 feasibility study that evaluated converting from the non-canister system currently used at Prairie Island to a vertical canister system. The Comparative evaluations of the vertical canister system technology and the currently used technology show the vertical canister technology to be higher in cost. These higher costs are attributed mainly to higher costs for the canisters and overpacks. Additional increased costs for this technology are attributed to the

purchase of additional major equipment and extra procedure development and training to accommodate a new technology.

Sources, types and amounts of waste involved: The nuclear wastes involved in this alternative would be identical to those involved in the proposed system.

Maintenance requirement: Ongoing maintenance activities would be similar to the proposed system.

Economic life: The economic life would be similar to the proposed system.

Reasons the alternative was rejected: Transitioning from the non-canisterized system to a canister system would require construction at the ISFSI site to occur approximately 10 years earlier. It would also necessitate the purchase of new major equipment (e.g. a transfer cask, trailer, automatic welding machines, building to store new equipment, a fabrication facility to construct the concrete storage overpacks). The existing concrete storage pads may not meet the designed requirements for the vertical canister system thus requiring construction of more storage pads within the ISFSI. The loading process is more complicated for the canister storage system, e.g. welding and transfer of a canister, which would require new and specialized training for the workers. Currently, only the canisters licensed to hold 24 or 32 assemblies are licensed to store fuel to the burnup levels needed to store the spent fuel irradiated at Prairie Island. Thus, this system would require that more canisters be purchased, loaded, transferred, and stored than casks in the proposed system. Handling more canisters would increase the dose received by the workers and the cost per fuel assembly stored.

5.4.4 Modular Vault Dry Storage System

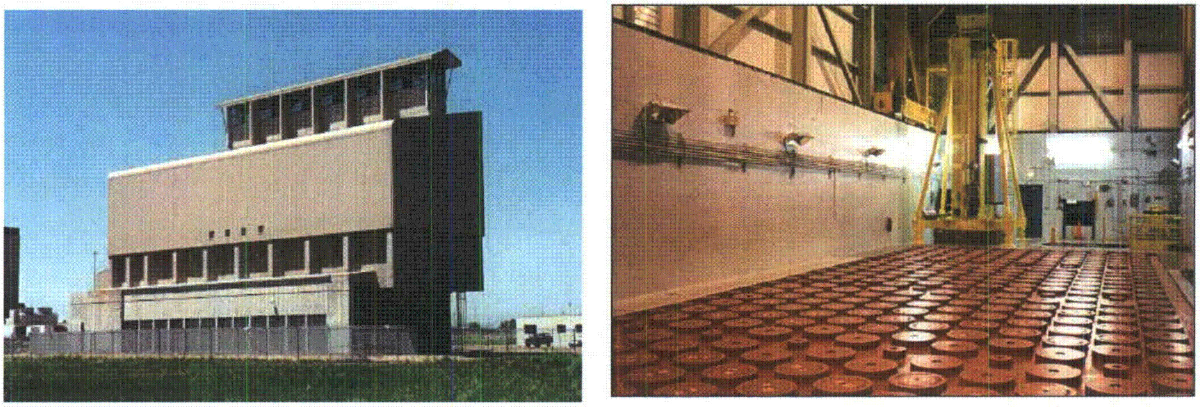
The modular vault dry storage (MVDS) system is a large concrete storage vault designed to store several storage containers of spent nuclear fuel. MVDS differs from the other systems in that, rather than storing individual casks on a concrete storage pad outdoors, the spent fuel is stored in tube like containers within the concrete storage vault. The facility is licensed under 10 CFR 72 for storage and would require the use of shipping casks licensed under 10 CFR 71 for spent fuel shipping offsite.

The MVDS system consists of the storage vault, which is really a large concrete building, fuel storage containers to hold the spent fuel assemblies, a container handling machine to transfer the containers, a charge face structure that supports the fuel containers, and an overhead crane to lift the container handling machine.

(Figure 5-4) Several vaults can be constructed end-to-end to provide a longer vault. Each vault is designed to hold up to 83 PWR fuel assemblies within shielded storage tubes. MVDS also relies on passive cooling.

The MVDS is offered by Foster Wheeler Energy Applications, Inc. The system is in use at the decommissioned Ft. St. Vrain nuclear plant.

Figure 5-4: MVDS System



The advantages of using an MVDS system include:

- The MVDS system design is currently licensed for use at a plant that has been decommissioned.
- Once sealed, the canister should never need to be reopened to expose or handle individual spent fuel assemblies, which avoids potential contamination to the environment and workers.

The disadvantages of using an MVDS system include:

- The extended schedule associated with the construction of the large MVDS building.
- The high number of spent fuel transfers between the fuel pool and MVDS or from the MVDS to offsite because the fuel storage containers only hold a single spent fuel assembly.
- Additional radiation exposure to workers associated with the increased number of container handling transfers.
- Inspections of the MVDS building to ensure no inlet duct vents are blocked.

A high initial capital cost to construct a MVDS building to store all the fuel.

- Not currently licensed to store the high enrichment and high burnup fuel used at Prairie Island.

Some of the highlights of this alternative are:

Location: The vault system would be located on Prairie Island's site but may not be able to be located within the footprint of the existing ISFSI due to the need to maintain accessibility to the TN-40 casks with the cask transport vehicle.

Land area and height of facility: The required land area for the MVDS system would be slightly less than the current ISFSI footprint since accessibility to the side of the vaults is not required, i.e. do not need to account for turning radius of cask transport and tow vehicle. While the height of the MVDS system itself is taller than the TN-40 casks due to the need for the overhead container handling machine, the tallest structure would be the light poles and these would be essentially the same as the height light poles.

Design capacity: The vault system would be constructed to support 20 additional years of plant operation.

Construction and In-service dates: The MVDS system is currently used by a single user. Currently the system is not designed and licensed to store the high enrichment high burnup fuel that Prairie Island needs to store. Thus more analyses would be required followed by obtaining an NRC license. These activities could take 3 or more years to complete. Currently there is no market for this method of onsite storage and thus the licensing and construction would be developed specifically for Prairie Island. It's anticipated that the system could be constructed and the transfer system fabricated within 24-36 months after obtaining an NRC license.

Installed costs: Since there is no market for this method of onsite storage, there are no bids to be evaluated for comparison. However, the installation cost for this system would be much higher than the proposed system since the building and vault modules are sized and placed in service during the initial construction rather than being installed on an as needed basis. In addition it may not be able to be located within the footprint of the existing ISFSI and thus require a new ISFSI site to be constructed. Therefore the cost of this system is expected to be significantly higher than the proposed system.

Sources, types and amounts of waste involved: The nuclear wastes involved in this alternative would be identical to those involved in the proposed system.

Maintenance requirement: Ongoing maintenance activities would be similar to the proposed system.

Economic life: The economic life would be similar to the proposed system.

Reasons the alternative was rejected: The MVDS System is expected to have greater upfront costs both for the design & licensing effort as well as the initial installation when compared to the proposed system. The vault system has a single user and its primary use was to support a decommissioning effort for the Fort St. Vrain plant compared to the proposed system, which has been utilized by Prairie Island since 1994. Transferring fuel to the MVDS system would be much more time consuming and complicated since only a single fuel assembly is placed in a storage tube and transfer of the tube involves additional handling compared to the proposed system.

Table 5-1: Comparison Of Dry Cask Storage Systems[1]

Storage System	Primary Components	Transfer Method	Closure Type	Monitor Req'mts	Storage Method	Transport Method	SFA Capacity
Non-Canisterized Storage System	Storage/Transportation Cask	N/A	Bolted cask w/ O-rings	Helium Pressure	Metal Cask	Metal Cask	40 PWR
Horizontal Canisterized Storage System	Metal canister Concrete storage module Transfer cask Shipping cask	Canister Transfer	Welded canister	Temp. and/or Vent Blockage	Canister in Concrete Module	Metal Shipping Cask	24-32 PWR
Vertical Canisterized Storage System	Metal canister Concrete or metal storage overpack Transfer cask Transportation cask	Canister Transfer	Welded canister	Temp. and/or Vent Blockage	Canister in Concrete or Metal Overpack	Canister in Shipping Cask	24-32 PWR
Modular Vault Dry Storage System	Metal storage container Vault building Transportation cask	Canister Transfer	Bolted container w/ O-rings	Pressure and Vent Blockage	Fuel Storage Container in Concrete Vault	Container in a Shipping Cask	1 PWR

NOTES:
1. Based on existing designs that are currently licensed.

5.5 Alternatives of a Different Size

This Certificate of Need addresses the question of the need for additional spent fuel storage to support 20 years of plant operation beyond the end of the current operating license. There is considerable uncertainty surrounding when off-site storage alternatives might become available. No other viable on-site alternatives (besides utilizing a dry cask storage system) have been identified. The only way to ensure that Prairie Island is available on a reliable basis to facilitate long-term planning for our ratepayers is to expand the allowed storage of the facility to allow the 20 years of continued operation. In addition, if the expansion is not granted to support additional 20 years of operation, additional storage will still be necessary to support decommissioning. The footprint of the existing ISFSI will accommodate either outcome without changing size of the existing ISFSI.

5.6 Alternative Site

Minnesota law requires that spent nuclear fuel storage be limited to the Prairie Island site at which the fuel is used (Minn. Stat. § 116C.83 subd. 4b). Therefore, in order to extend the operation of Prairie Island, additional dry cask storage must be established on the Prairie Island Nuclear Generating Plant site. Northern States Power Company undertook a study to identify locations on the Prairie Island site suitable for cask storage as part of the Application for a Certificate of Need dated April 29, 1991 (and revised June 10, 1991). The results of that study and the 1991 Certificate of Need process selected the location of the existing ISFSI located at Prairie Island. Since there is sufficient room within the footprint of the existing ISFSI to store all 64 casks, the construction of a new ISFSI at an alternative site is not necessary.

6 Alternatives to Extended Power Uprate

6.1 Section Summary

This Section describes the evaluation of the generation alternatives to the power uprate project at Prairie Island.[21] Minn. R. 7849.0120 requires that a Certificate of Need must be granted to an applicant upon determining that four principal criteria are met. The second of these criteria states that:

> *"a more reasonable and prudent alternative to the proposed facility has not been demonstrated by preponderance of the evidence on the record,…."*

The analysis in Section 4 "Alternatives to the Continued Operation of Prairie Island" clearly indicates that the continued operation of Prairie Island will provide significant financial benefits to our customers and significant environmental benefits to the state and region. Granting our request for additional dry cask storage to support the continued operation is necessary to realize those benefits and is a prerequisite to our proceeding with the power uprate. The power uprate project proves to be a unique opportunity for us to cost-effectively meet our customers' future energy needs and the environmental goals of the legislature by acquiring additional low-cost, carbon-free base load energy.

This section discusses the following alternatives and findings and Table 6-8 at the end of this chapter provides the requirements for Minn. R. 7849.0250 in tabular format:

- **Selection of alternatives.** Our analysis included a review of alternatives that do not rely on the construction of a central power station, as well as alternatives that have similar energy and capacity characteristics as Prairie Island. We also allowed Strategist to select the lowest cost generic units available to fill the capacity need in the "unconstrained" case.

- **Alternatives to power uprate.** Our analysis identified two feasible alternatives to the power uprate: a 164 MW biomass plant and a 164 MW long-term coal purchased power agreement ("PPA"). Additionally,

[21] This section provides the information regarding alternatives required by Minn. R. 7849.0250(B).

Strategist selected a 160 MW natural gas combustion turbine in the "unconstrained" case.

- **Costs of alternatives.** Our analysis indicates that the proposed power uprate is considerably more cost-effective than the alternatives considered under a wide spectrum of model assumptions.
- **Environmental impacts of alternatives.** Our analysis indicates that the proposed power uprate will result in significantly lower system emissions than all the alternatives evaluated.

6.2 Need Discussion

The analysis contained in this section focuses on how best to meet our customers' growing demand for energy. Our system demand and energy requirements continue to grow at approximately 1 percent per year, or 133 MW and 556 GWH. This estimated growth is after factoring in our compliance with the aggressive new RES and DSM legislation. By 2010, we estimate we will have a 126 MW deficit that will grow to over a 2,800 MW deficit by 2022. Assuming our request to relicense Prairie Island another 20 years and our request for additional dry cask storage are granted, this analysis considers the option of implementing an extended power uprate project at Prairie Island that will result in an addition 82 MW of output from each unit.

6.3 Methodology for Evaluating Alternatives

The evaluation of the power uprate employs the same methodology used in the Certificate of Need for the Monticello Power Uprate project (Docket No. E002/CN-08-185).

To determine the alternatives to the power uprate, we followed a two-step screening process.

- First, we reviewed alternatives that do not rely on the construction of a central power station.
- Second, we performed a qualitative screening to identify alternatives that have similar energy and capacity characteristics to Prairie Island. Alternatives that were not reasonably applicable to the need or that were

deemed to be excessively risky or costly were screened out from further consideration.

Based on the results of the qualitative screening, we selected options to model in Strategist for a more thorough quantitative assessment along with the Prairie Island power uprate. (See Section 4 for a more detail description of the Strategist planning software used for quantitative evaluation.)

6.3.1 Evaluation Criteria

Four evaluation criteria were ultimately considered during the evaluation of alternatives process. The first two, Reliability and Applicability, were considered during the second step of the Qualitative analysis; the second two, Cost and Environmental Impacts were considered during the Quantitative analysis. Each are defined below.

- Reliability — Prairie Island has a record of high reliability. Prairie Island also has a 5-year average capacity factor of 90.2 percent and the uprate is not expected affect this level of performance.
- Applicability — The 164 MW Prairie Island power uprate project will help fill NSP's growing capacity needs. Our forecast shows we have a resource deficit starting in 2010 that steadily grows to over 2,800 MW in 2022. The low-cost base load energy from this project will help keep NSP's average costs down and will provide a hedge against natural gas prices.
- Cost — We compared the cost of the power uprate to the other available alternatives considered. In addition, the costs for the Prairie Island extended power uprate project are more certain and involve less risk than other projects.
- Environmental Impacts — Power uprate at Prairie Island will reduce carbon emissions. As a non-carbon producing generation source, Prairie Island is superior to fossil fuel alternatives that produce carbon from an emissions perspective. Since Prairie Island is a low-cost energy resource, it is dispatched prior to other fossil fuel plants in our analysis. This remains true even after power uprate. Continued use of Prairie Island does not increase carbon like fossil fuel replacement alternatives, and the power uprate project displaces carbon that would have been emitted if a fossil fuel source were implemented in place of the power uprate project.

In addition, the continued use of an existing power plant site eliminates the need to develop greenfield sites for new generation facilities.

6.3.2 Non-Construction Alternatives

The Certificate of Need Rules require that we evaluate several alternative approaches to meeting the need that do not rely on the construction of a new central power station. We examined the following types of alternative approaches.

6.3.2.1 Demand-Side Management

As discussed in Section 4, DSM includes both Conservation and Load Management Programs, which are presented in detail in Appendix C.

Consistent with the Next Generation Energy Act of 2007, we are committed to achieving a 1.1 percent energy reduction as our CIP/DSM goal. Meeting this goal will be very challenging. We will likely launch new conservation programs as well as expand existing programs to meet the 1.1 percent target. Such aggressive expansion of DSM programs will push the limits of achievable potential in our service territory and creates significant uncertainty regarding the size and timing of actual savings.[22] Until we have implemented our plan to meet the 1.1 percent target and gained some experience operating a significantly larger DSM portfolio, it is unreasonably risky to rely on increased DSM in order to replace the energy and capacity from the Prairie Island uprate project. If the DSM alternative was selected and the company failed to achieve the necessary savings, we would be forced to buy replacement capacity and energy from the market.

Therefore, the Company concludes that additional DSM saving beyond our target of 1.1 percent is not a feasible alternative to the power uprate project.

6.3.2.2 Increased Efficiency of Existing Facilities

We have identified and are pursuing uprate/upgrade projects for our existing generation resources including the Monticello and Sherco generation plants and

[22] Our forecast already includes the assumed DSM savings necessary to meet our aggressive 1.1 percent target and still forecasts a deficit starting 2010.

have incorporated estimates of these projects in this analysis. Our next three largest plants King, Riverside, and High Bridge are all part of our Metro Emission Reduction Program ("MERP") and have either undergone or will undergo modifications to reduce their emissions and increase their electrical output. Between the MERP plants, the Monticello Power Uprate CON, this CON for power uprate, and our proposed changes at Sherco, we have already increased the MW output of our six largest power plants. This leaves few opportunities for additional efficiency projects and therefore increased efficiencies at existing plants were not considered further.

6.3.2.3 Long-Term Purchased Power

Long-term purchased power agreements have historically been an important part of our resource mix. We are unaware of a specific long-term purchase opportunity, but we did model an estimate of a long term PPA from a coal-based resource to include as a possible alternative. The hypothetical coal PPA price was modeled to have the same cost, performance, and emission characteristics of a new conventional coal plant. The PPA may have similar capacity and energy characteristics to the uprate and therefore was selected for inclusion in the quantitative evaluation.

6.3.2.4 Short-Term Purchased Power

Historically, we have depended on short-term power purchases to cover about the last 5 to 10 percent of our projected capacity and energy needs. While there are some concerns about firm transmission service and about the continued recognition of MISO Network Transmission service being approved for accreditation of resources by MAPP, we believe the same level of short-term power purchases can be achieved for the near future.

Our resource planning process explicitly recognizes the level of short-term purchases that can reliably contribute to our overall resource portfolio. (The 2007 Resource Plan analysis (and this analysis) incorporates 750 MW of short-term purchases.) We will continue to pursue short-term power purchases as a valuable portion of our power supply portfolio. However, our assessment is that it would be too risky to extend further into the short-term market than is already accounted for. Therefore, short-term purchases are not a prudent resource option to meet the current need.

6.3.2.5 New Transmission Lines

Additions to or improvements in the electric transmission system are not viable alternatives to the Prairie Island power uprate proposal. The underlying assumption with this alternative is that additional transmission infrastructure would provide access to additional capacity resources. However, since the capacity construction boom of the late 90's there had been relatively little capacity built in the region. The result has been very tight capacity markets with little or no excess capacity available. Thus, no opportunities exist for new transmission to bring in additional capacity.

6.3.2.6 Distributed Generation

Pursuant to Minn. Stat. § 216B.2426, the use of distributed generation was also considered to meet the need. However, we are not aware of available distributed generation resources in the quantities that would be necessary to fill the current need. We reviewed the distributed generation information requests and analyses we performed (DOC-18 and DOC-19) in the Monticello Spent Fuel Storage Certificate of Need (Docket No. E002/CN-05-123). Our review indicated that a significant percentage of the distributed generation from those analyses was either wind or DSM. Considering the new RES and DSM legislation, once those two resources were excluded, the main sources of distributed generation to be considered were biomass, biodiesel and small hydro. Based on available cost estimates, these distributed generation resources are not likely to be cost-effective alternatives and were therefore excluded from further consideration.

However, while we did not identify individual distributed generation projects that would meet the 164 MW need, we did model a 164 MW biomass alternative for comparison purposes. Due to its size though, we did not categorize it as distributed generation.

Pursuant to the Commission's July 28, 2006 order in the 2004 Resource Plan, the Company has contracted with a consultant for a new study of distributed generation. This study, together with related studies initiated by the 2007 Legislature, will define what a comprehensive distributed generation strategy would entail and will help identify the total potential for distributed generation within our service territory.

6.3.2.7 Reduced Project Size

The power uprate project will net a capacity increase of approximately 164 MW. This is the optimal, achievable capacity increase at the Prairie Island facility. If any reduction in the capacity of the project were feasible, it would result in higher costs per MW and would also require additional projects to meet our customers' growing needs. Therefore, alternative smaller uprate projects were not deemed reasonable.

6.3.2.8 No Facility

If the power uprate project were not undertaken and no other alternative were pursued, there would be a 164 MW gap in our capacity coverage and the system would be significantly short on energy. Our system shows a capacity deficit starting in 2010 and growing to over 2,800 MW by 2022. Due to our requirement to provide safe, adequate and reasonable electric service pursuant to Minn. Stat. § 216B.04, "no facility" is not an option as we would experience a deficit in 2011 and beyond if the proposal or an alternative is not undertaken.

6.3.2.9 Summary of Non-Construction Alternatives

The results of the qualitative screening for alternatives that are not based on central power stations are summarized in Table 6-1. Our assessment shows that a long-term power purchase agreement is the only alternative approach that might be a reasonable alternative to the Prairie Island power uprate.

Table 6-1: Alternative Approach Screening Summary

Does this technology have the characteristics to be a reasonable alternative? + Likely O Possibly - Not likely								
	Demand Side Management	Increased Efficiency of Existing Facilities	Long-Term Power Purchases	Short -Term Power Purchases	New Transmission Lines	Distributed Generation	Reduced Project Size	No Facility[23]
Applicability: Does this resource have characteristics similar to the Prairie Island Uprate Project?	O	-	+	O	-	-	-	-
Reliability: Will this resource be available as needed and provide benefits to the grid?	-	-	+	-	-	O	-	-
Is this approach feasible?	No	No	Yes	No	No	No	No	No

6.3.2.10 Qualitative Screening of Alternatives

The qualitative screening was further performed by grouping resource alternatives into three categories: fossil fuel resources, renewable resources and emerging technologies. Appendix D presents detailed descriptions of the fossil fuel, renewable resource and other emerging generation technologies screened along with a discussion of the evaluation factors for each technology. The conclusions of that screening process are discussed below.

[23] The No-Facility scenario allows Strategist to pick the most applicable resource from those available when it is needed. This is called the "unconstrained" scenario.

6.3.2.11 Fossil Fuel Technology Screening

Fossil fuel technologies considered in the screening include an integrated gasification combined cycle (IGCC), a coal-fired boiler, and a natural gas-fired advanced combined cycle. These units have similar operating characteristics to the Prairie Island project and are potentially viable alternatives. Even though the fossil fueled alternatives have similar operating characteristics, the IGCC, coal, and combined cycle units cannot economically be built to the appropriate 164 MW scale. Additionally, the advanced combined cycle is currently not a commercially viable technology. Table 6-2 summarizes the initial evaluation of each fossil fuel technology's characteristics.

Table 6-2: Characteristics of Fossil Fuel Technologies

	IGCC	Coal-Fueled Boiler	Advanced Natural Gas-Fueled Combined Cycle
+ Likely	O Possibly		- Not likely
Applicability: Does this resource have appropriate characteristics to meet 2011 need	-	-	-
Reliability: Will this resource be available as needed and provide benefits to the grid?	-	-	-
Is further consideration warranted?	**No**	**No**	**No**

6.3.2.12 Renewable Resource Technology Screening

Renewable resource technologies considered as potential alternatives include wind, solar, biomass, hydropower, and landfill gas. Table 6-3 summarizes the initial screening of each renewable resource technology's characteristics.

Table 6-3
Initial Screening of Renewable Resource Technologies

Does this technology have the characteristics to be a reasonable alternative? + Likely O Possible - Not Likely					
	Wind	**Solar**	**Biomass**	**Hydro-power**	**Landfill Gas**
Applicability: Does this resource have appropriate characteristics to meet 2011 need?	-	-	+	O	O
Reliability: Will this resource be available as needed and provide benefits to the grid?	-	-	O	-	-
Is further consideration warranted?	No	No	Yes	No	No

A biomass-fueled resource may have the appropriate characteristics and reliability to fill the same need as the power uprate project and was included as an alternative for further evaluation.

6.3.2.13 Emerging Technology Screening

Other technologies screened as potential alternatives include fuel cells, microturbines and several energy storage technologies. Table 6-4 summarizes the initial screening of these emerging technologies.

Table 6-4: Initial Screening of Emerging Technologies

Does this technology have the characteristics to be a reasonable alternative? + Likely O Possibly - Not likely			
	Fuel Cells	**Micro-Turbines**	**Stored Energy**
Applicability: Does this resource have appropriate characteristics to meet the need?	O	O	O
Reliability: Will this resource be available as needed and provide benefits to the grid?	-	-	-
Is further consideration warranted?	No	No	No

None of the emerging technologies warrants further consideration as an alternative to the Prairie Island power uprate project.

6.4 Quantitative Modeling or Alternatives

As a result of the qualitative screening process, we identified two alternatives that have operating characteristics similar to the Prairie Island power uprate project; a 164 MW Biomass Plant and a 164 MW long-term coal PPA. In addition, an "unconstrained" scenario was included as an alternative to the Prairie Island power uprate project. The unconstrained scenario consisted of allowing Strategist to select lowest-cost generic units available to fill the capacity need. Strategist selected a 160 MW natural gas combustion turbine ("CT"). The CT selected and other existing resources were used to generate the equivalent energy of the Prairie Island power uprate project.

The next step was to more thoroughly evaluate the economic and environmental factors associated with each alternative through a series of modeling scenarios. The scenarios were then tested to determine their sensitivity (Sensitivities) to changes in various input variables.

6.4.1 Base Case

The Prairie Island power uprate project was first compared against the selected alternatives using the 'base case' assumptions in Strategist. This base case assumes Prairie Island's life extension is approved through 2033/2034. The base case assumptions are the same assumptions used for the base case in our 2007 Resource Plan and the Monticello Power Uprate Certificate.[24] The base case assumptions include the reference case expansion plan, the median fuel forecasts, the 1.1 percent DSM goal and the 30 percent RES, \$20/ton CO_2 hedge value, and no externalities.

6.4.2 Prairie Island Power Uprate Project

The Prairie Island power uprate project is described in detail in Chapter 3. In summary the project will increase the capacity of the Prairie Island nuclear facility by approximately 164 MW through enhanced steam production. The uprate project for Unit 1 will be completed during the 2012 refueling outage and Unit 2 will be completed during the 2015 outage. Total cost in nominal dollars are forecasted to be \$322 million, or approximately \$2,011 per kW.

[24] The base case uses the same forecast, individual plant information, externality values, and fuel forecasts, and assumes compliance with the RES and DSM legislation.

6.4.3 Hypothetical 164 MW Biomass Plant

A 164 MW base load type biomass plant was determined to be a reasonable alternative to the Prairie Island power uprate project. Such a plant will have roughly the same capacity and energy characteristics, but lower expectations for reliability and availability due to technology and fuel supply considerations. The capital costs for a new biomass plant are expected to be similar to other base load type steam plants. This analysis assumed that a plant commissioned in 2013 would cost $3,182 per kW or $522 million. The fuel costs and operating characteristics were based on our existing plants and fuel forecasts.

6.4.4 Hypothetical 164 MW Coal PPA

The cost and availability of a 164 MW long term coal-based PPA are highly speculative. This scenario assumed a capacity charge equivalent to the levelized revenue requirements of a new plant and energy charges equivalent to the cost of fuel at a 10 mmBtu/MWh heat rate plus small variable O&M costs. The contract is assumed to deliver 164 MW continuously for a 20-year period. It is expected that a coal-based contract would be structured such that responsibility for the associated emissions would be assigned to the buyer. The emission rates for the hypothetical coal PPA are based on typical emission rates for our existing coal units.

6.4.5 Unconstrained

The "unconstrained alternative" alternative is not a specific resource. In this scenario, the Strategist model is allowed to select the most cost-effective combination of resources from the available generic resources including coal, natural gas combined cycle, and natural gas simple cycle resources. In this analysis, the capacity need was filled by the addition of natural a gas CT. New and existing resources filled the energy needs.

6.5 Economic Comparison of Alternatives

Table 6-5 below presents a comparison of the differences in the present value of revenue requirements (PVRR) for the Prairie Island upgrade project and the selected alternatives under the base case assumptions. The Prairie Island uprate is considerably more cost effective than the alternatives considered. Nuclear capacity at a price of about \$2,000/kW proves to be economically superior to all other generation capacity that could be employed. The biomass alternative shows to be particularly uneconomic due to high capital, fuel, emission costs. This analysis made the conservative assumption that CO_2 emissions from biomass would be subject to the same regulations as other types of fuel and therefore had the fuel CO_2 hedge value applied to them. This adds \$610 million to the PVRR of the biomass alternative using the \$20/ton CO_2 hedge value.

Table 6-5: Present Value of Revenue Requirements (PVRR) Base Case Assumptions (\$ millions)

	Prairie Island Uprate Project	164 MW Coal PPA	164 MW Biomass	Unconstrained
PVRR	**\$61,356**	**\$61,974**	**\$62,535**	**\$61,875**
PVRR difference from Prairie Island Project	**-**	**\$619**	**\$1,179**	**\$519**

6.6 Sensitivity Analysis

In order to determine how changes in our assumptions impact the costs or characteristics of different alternatives, numerous assumptions were changed and the Strategist model was rerun. If the lowest-cost option is extremely sensitive to changes in assumptions, we may propose an alternative that is less sensitive to assumption changes, but slightly more costly. Under the base case assumption the Prairie Island power uprate project was determined

to be the least-cost option. Under all sensitivities the power uprate project was determined to be the least-cost resource. The sensitivities tested were:

- Load Growth
- Fuel Price
- Externality Costs
- Carbon Regulation Costs
- MISO Market Interactions
- Capital Cost Escalations

The sensitivity changes performed for the power uprate project evaluation are the same as those discussed in Section 4 "Alternatives to Continued Operation of Prairie Island".

Table 6-6 presents the results of the sensitivities analysis. The leftmost column lists the PVRR result for the Prairie Island uprate project. The remaining columns list the differences from the Prairie Island project for each of the selected alternatives.

Table 6-6: Power Uprate Sensitivity Analysis

	Prairie Island Uprate Project	**164 MW Coal PPA**	**164 MW Biomass**	**Unconstrained (Natural Gas CT)**
	PVRR	PVRR Differences From the Prairie Island Uprate Project		
Base Case	$61,356	$619	$1,179	$519
Low Load	$60,139	$617	$1,177	$496
High Load	$62,859	$518	$1,182	$546
Coal+20 percent	$62,275	$619	$1,181	$529
Gas+20 percent	$63,964	$619	$1,189	$648
Nuclear+20		$603	$1,164	$504

	Prairie Island Uprate Project	164 MW Coal PPA	164 MW Biomass	Unconstrained (Natural Gas CT)
	PVRR	PVRR Differences From the Prairie Island Uprate Project		
percent	$61,711			
Coal-20 percent	$60,424	$619	$1,178	$509
Gas-20 percent	$59,522	$619	$1,171	$407
Nuclear-20 percent	$61,071	$633	$1,193	$533
Low Externalities	$61,495	$620	$1,181	$521
High Externalities	$61,558	$620	$1,182	$522
CO_2 $9/ton	$56,948	$449	$836	$434
CO_2 $40/ton	$69,344	$931	$1,809	$699
MISO On	$61,248	$617	$1,174	$488
Capital Cost Escl. 3 percent	$62,795	$607	$1,192	$510
Capital Cost Escl 5 percent	$66,149	$583	$1,218	$488

The sensitivity analysis shows that the Prairie Island uprate is the least-cost alternative under a wide spectrum of model assumptions. The coal PPA alternative comes closest to being economically competitive under the low CO_2 cost assumption and the unconstrained case improves considerably under the assumption of low natural gas costs. However none of the assumption sensitivities change the result that the Prairie Island power uprate is the lowest cost alternative.

6.7 Rate Impact

The base case PVRR savings for the Prairie Island uprate project are $519 million in comparison to the next lowest cost alternative, which was the

addition of a natural gas CT from the unconstrained scenario. The "unconstrained" scenario fills the capacity need with combustion turbine capacity and fills the energy from existing resources, which translates to a modest impact on rates. For the period 2008-2035, the average annual cost savings of the uprate is $64 million. During this same period the average annual sales are forecasted to be 59,900 GWh. The result is an average decrease of about $0.0011 kWh or 0.85 percent.

Because the PVRR differences for the coal PPA and biomass alternatives were even higher, the average rate impact would be even larger for the Prairie Island power uprate in comparison to those alternatives.

6.8 Emission Comparison of Alternatives

Table 6-7 presents a comparison of the total system emissions for each alternative evaluated in this filing. Emission totals were calculated summing the forecasted emissions from our entire existing and planned generation fleet over the study period 2008 to 2035. The table compares differences between the total emissions for the preferred plan and each of the alternatives considered by setting the Prairie Island Power Uprate project as the baseline (in other words "0") and by showing how much higher or lower other alternatives are.

Table 6-7: Total System Emissions for Each Alternative

2008 – 2035 Emissions Differences	NOx Tons	PM10 Tons	CO_2 Tons	SO_2 Tons	VOC Tons	CO Tons
Prairie Island Uprate Project	0	0	0	0	0	0
164 MW Coal PPA	24,110	3,158	32,290,370	39,616	578	4,767
164 MW Biomass	103,722	4,701	65,357,790	21,551	837	18,498
"Unconstrained" Natural Gas Combustion Turbine	7,580	1,370	16,059,200	9,526	283	2,235

The Prairie Island power uprate project is projected to result in significantly lower system emissions than all the alternatives evaluated.

6.9 Operating Information of Alternatives

Table 6-8 contains the operating information of the alternatives to the Prairie Island Power Uprate project required by Minn. R. 7849.0250.

Table 6-8: Power Uprate Alternatives Operating Information

Rule Reference	Description	Coal PPA Alternative	Biomass Alternative	Unconstrained Optimization (Gas CT + System Energy)
Capacity		164 MW	164 MW	168 MW
Annual Capacity Factor		• 95%	• 86%	• 88.8% - 97% • Modeled such that system energy replaces the energy from the IP EPU.
Typical Availability		• 95% • Assumed 5% forced outage rate	• Assumed 5% forced outage rate. • Assumed 4 weeks of maintenance per year.	• Because energy is from anywhere in Xcel's existing system, availability is 100%
7849.0250 A (1)	Nominal generating capability	164 MW	164 MW	168MW
7849.0250 A (2)	Operating Cycle	Baseload	Baseload	Peaking unit for capacity plus system energy equivalent to a 164 MW baseload unit.
Anticipated annual capacity factor		• 95%	• 86%	• 88.8% - 97% • Modeled such that system energy replaces the energy from the PI EPU.

Table 6-8: Power Uprate Alternatives Operating Information

Rule Reference	Description	Coal PPA Alternative	Biomass Alternative	Unconstrained Optimization (Gas CT + System Energy)
7849.0250 A (3)	Type of fuel used	• PPA contract based on characteristics of coal plant	• Wood	• System energy primarily from coal and gas units.
7849.0250 A (3)	Availability of fuel	• The alternative was model to have sufficient fuel to meet its 95% capacity factor.	• The alternative was model to have sufficient fuel to meet its 95% capacity factor.	• Subject to typical system wide fuel availability.
7849.0250 A (3)	Alternative fuels	None	None	• None
7849.0250 A (4)	Anticipated heat rate (efficiency) (ISO Conditions)	Energy costs estimated based on an assumed heat rate of 10mmBtu /MWh	17mmBtu/MWh	• 8.38mmBtu/MWh based on implied gas heat rate.
7849.0250 C (1)	Capacity Costs In $/kW	$2,924/kW	$3,182/kW	$589/kW
7849.0250 C (2)	Service Life	2014 to 2034	2014 to 2034	2014 to 2034
7849.0250 C (3)	Estimated Average Annual Availability	95%	87%	100%
7849.0250 C (4)	Fuel Costs ($/kWh)	$0.0178/kWh	$0.0204/kWh	$0.0411/kWh

Table 6-8: Power Uprate Alternatives Operating Information

Rule Reference	Description	Coal PPA Alternative	Biomass Alternative	Unconstrained Optimization (Gas CT + System Energy)
7849.0250 C (5)	Variable Operating And Maintenance Costs ($/kWh)	$0.00223/kWh	$0.0057/kWh	$0.0057/kWh
7849.0250 C (6)	Total Cost ($/kWh)	$0.0959/kWh	$0.1477/kWh	$0.0805/kWh
7849.0250 C (7)	Estimated Effect On Rates System-Wide Assuming Test Year Beginning With Proposed In-Service Date	$0.0025/kWh	$0.0035/kWh	$0.0017/kWh
7849.0250 C (8)	Efficiency Expressed In Heat Rate	10 mmBtu /MWh	17 mmBtu /MWh	8.38 mmBtu/MWh based on implied gas heat rate.

6.10 Alternatives Evaluation Summary

Prairie Island Power Uprate is the best alternative available from both a financial and an environmental perspective.

We evaluated an exhaustive list of alternatives in selecting this project. First, we qualitatively screened a wide range of approaches and technologies to identify potential viable resources for meeting our resource needs. Next, for the resource alternatives that were found to be feasible, we conducted a quantitative analysis of the economic and environmental factors associated with each resource. We also allowed Strategist to pick the best generic resource based on cost. The Prairie Island power uprate performed the best on both the economic and environmental analysis. We are pleased to have identified a resource that meets our needs and furthers the environmental and policy goals of the Company and the State.

7 Additional Spent Fuel Storage Environmental Information

7.1 Section Summary

This section provides environmental information as required in the Commission's application content rules for nuclear waste storage facilities (Minn. R. Parts 7855.0640 to 7855.0670) and feasible alternatives. Minn. R. 7855.0640 outlines environmental information to be provided for the proposal and any alternative sites.

Construction of the two additional concrete pads to accommodate additional cask storage capacity at the Prairie Island ISFSI is not expected to disturb any additional land area. Therefore, the environmental impact of the additional pads and casks is minimal. The only potential environmental affect of the additional pads and cask involves storm water run-off. However, no additional storm water permitting is required for the project.

The environmental impacts of the continued operation of the Prairie Island plant are addressed in Appendix J, the Environmental Report for the License Renewal Application to the NRC.

7.2 Existing ISFSI Site Description

As discussed in Section 5, the additional casks contained in this proposal will fit within the footprint of the existing ISFSI. Alternate sites at Prairie Island were evaluated when the existing ISFSI was permitted by the State. Alternative sites were not re-evaluated for this application. For convenience, the environmental information for the existing site is presented in this Section.

7.2.1 Topography

The Prairie Island Nuclear Generating Plant (Plant) site is situated on the southeastern portion of Prairie Island, an outwash terrace above the Mississippi River. The Plant site is located at an elevation of about 690 feet above mean sea level (msl), 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. There are a few scarps along the Mississippi River shoreline that have resulted from river scouring. Figure 7-1 is an aerial view of the site, and Figure 7-2 is the USGS topographic map of the site area. *(Due to their size, all Figures in the Section are located at the end of the Section.)*

7.2.2 Soils

Figure 7-3 presents the soils map for the Plant and the ISFSI site, using the US Department of Agriculture, Natural Resources Conservation Service (NRCS) soil taxonomy system, which groups soils into categories based on each soil's morphology (appearance and form). Classification is based on climatic, chemical and physical soil properties observed in the field or inferred from those observations, or from laboratory measurements. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistency, moisture equivalent, slope, and permanent cracks. Beginning with the broadest, these categories are the Order, Suborder, Great Group, Subgroup, Family, and Series. The soil series consists of soils with horizons that are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

For land use planning purposes, soils are further subdivided into mapping units, which are also called "phases of series." These mapping units are not considered as a classification category of the system, as soil taxonomy terminates at the series level. It is important to recognize that soil mapping units can represent a kind of soil, a combination of soils, or miscellaneous land types due to limitations imposed by the scales of county soil survey maps. This is stressed by the NRCS in the following statement: "*Enlargement of these maps…could cause misunderstanding of the detail of the mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown on a larger scale.*" Soil mapping units are named for the prominent soil series or land type within the unit.

As shown on sheet No. 8 of the Soil Survey of Goodhue County, Minnesota (Poch 1976) (Soil Survey) the Plant area is mapped with 13 mapping units. Table 7-1 lists the mapping units in the vicinity of the Plant site. The prevalent soil phases mapped in the vicinity of the Plant are Sparta loamy sand, 0 to 3 percent slopes (SpA), which is the major soil in the northern and southern

parts and Plainfield loamy sand, 0 to 6 percent slopes (PaB), which comprises most of the central area.

Alluvial land, frequently flooded (Af) and Marsh (Md) are listed by the NRCS as hydric soils. Hydric soils are defined as "*soils formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part*" (Federal Register, July 13, 1994). Hydric soil indicators are formed predominantly by the accumulation or loss of iron, manganese, sulfur, or carbon compounds. The presence of hydrogen sulfide gas is a strong indicator of hydric soil. In areas where soils are formed from parent material with low iron and manganese concentrations, features related to accumulations of organic carbon are typically used to determine hydric soils. Alluvial land, frequently flooded (Af) is mapped as narrow areas along the shorelines of Sturgeon Lake and the Mississippi River. Marsh (Md) occupies a narrow depression that extends southwest from an unnamed lagoon located south of Sturgeon Lake. While marsh soils are near the ISFSI, they are not present on the site of interest.

Of the soils shown in the vicinity of the Plant, three are mapped within the ISFSI location; these soils mapped are outlined below, as described in the Soil Survey.

Plainfield loamy sand, 0 to 6 percent slopes (PaB) – This is a nearly level to steep, excessively drained soil on benches and escarpments along major streams. This soil formed in sandy outwash. Permeability is rapid and water capacity is low in this soil, and the hazard of drought is severe with respect to crops. The hazard of erosion or soil blowing is moderate in areas without vegetative cover. This is the dominant soil mapped in the ISFSI area, comprising the entire northern and central portions of the essentially inverted triangle-shaped site.

Sparta loamy sand, 0 to 3 percent slopes (SpA) – This is a nearly level, excessively drained soil on benches of major streams. This soil formed in sandy outwash. Slopes are smooth and decline in the direction of the escarpments adjacent to the flood plain. Permeability is very rapid and water capacity is low in this soil, and the hazard of drought is severe with respect to crops. The hazard of erosion or soil blowing is also severe in areas without vegetative cover. Some deep gullies occur along escarpments where surface runoff spills over. This soil is mapped in the southern part of the ISFSI.

Alvin fine sandy loam, 0 to 3 percent slopes (AvA) – This is a nearly level, well-drained soil on river terraces. This soil formed in glacial outwash.

Permeability is moderate and water capacity is moderate and high in this soil, and the hazard of drought is moderate with respect to crops. Areas where the slope may be gently sloping have slight erosion hazard. This soil is mapped in a small area in the southeast part of the ISFSI. The mapping unit itself is a relatively large area that extends to the east from the ISFSI.

Table 7-1:
Soils Mapped in the Vicinity of the ISFSI

Map Symbol	Mapping Unit	Components of Mapping Unit	Subgroup	Order
Af	Alluvial land, frequently flooded	Stratified sand, loamy sand, silt, sandy loam, loam, sandy riverwash	NA	NA
AvA	Alvin fine sandy loam, 0 to 3 percent slopes	Alvin Series	Typic Hapludalfs	Alfisols
		Some soils less than 38" deep to gravel	NA	NA
AxA*	Ankeny sandy loam, 0 to 3 percent slopes	Ankeny Series	Cumulic Hapludolls	Mollisols
		Poorly drained soils along outer edge of flood plains	NA	NA
BrA	Burkhardt loam, 0 to 3 percent slopes	Burkhardt Series	Typic Haplaquolls	Mollisols
		Dakota Series	Typic Argiudolls	Mollisols
		Lilah Series	Psammentic Hapludalfs	Alfisols
		Salida Series	Entic Hapludolls	Mollisols
EsC	Estherville soils, 6 to 18 percent slopes	Estherville Series	Typic Hapludolls	Mollisols
		Salida Series	Entic Hapludolls	Mollisols
LlA	Lilah sandy loam, 0 to 6 percent slopes	Lilah Series	Psammentic Hapludalfs	Alfisols
Md	Marsh	Bremer Series	Typic Argiaquolls	Mollisols
		Houghton Series	Typic Medisaprists	Histosols
		McPaul Series	Mollic Udifluvents	Entisols
		Orion Series	Aquic Udifluvents	Entisols
		Alluvial land, frequently flooded	NA	NA
		Somewhat poorly drained sandy soils SW of Cannon Falls (outside of study area)	NA	NA
		Some very steep areas	NA	NA

Table 7-1, continued
Soils Mapped in the Vicinity of the ISFSI

Map Symbol	Mapping Unit	Components of Mapping Unit	Subgroup	Order
Mp	McPaul silt loam	McPaul Series	Mollic Udifluvents	Entisols
		Chaseburg Series	Typic Udifluvents	Entisols
PaB*	Plainfield loamy sand, 0 to 6 percent slopes	Plainfield Series	Typic Udipsamments	Entisols
PaD	Plainfield loamy sand, 6 to 25 percent slopes	Plainfield Series	Typic Udipsamments	Entisols
		Salida Series	Entic Hapludolls	Mollisols
		Some severely gullied areas	NA	NA
		Some very steep areas	NA	NA
SaE	Salida gravelly coarse sand, 12 to 45 percent slopes	Salida Series	Entic Hapludolls	Mollisols
SpA*	Sparta loamy sand, 0 to 3 percent slopes	Sparta Series	Entic Hapludolls	Mollisols
Zu	Zumbro loamy sand	Zumbro Series	Entic Hapludolls	Mollisols

* Mapped within the ISFSI Location

7.2.3 Geology

The Plant site occupies an outwash terrace formed on the Minnesota side of the Mississippi River. The type of bedrock beneath the area is predominantly composed of sedimentary rock of the St. Lawrence and Franconia Formations, both within the Upper Cambrian System.

The St. Lawrence Formation is comprised of tan to gray, well-cemented, thin- to medium-bedded silty dolostone and siltstone. There are also thin shale beds. The dolostone in this formation contains variable amounts of clay, silt, sand and glauconite. Thin to medium beds of very fine grained sandstone are common, particularly in the upper 20 feet of the formation. This formation is typically about 40 to 50 feet in thickness.

The Franconia Formation is mostly comprised of glauconitic, feldspathic, very fine to fine-grained sandstone. There is also green and gray shale, and pink or tan, sandy, glauconitic dolostone. Intraclasts and burrow mottling are common

in this formation. The Franconia Formation is generally coarser grained and more poorly cemented than the St. Lawrence Formation. This formation is typically about 165 to 175 feet in thickness. Three members of the Franconia Formation are recognized; these are the Reno Member, the Tomah member and the Birkmose member.

The Reno Member comprises the upper 90 to 100 feet of the Franconia Formation. It consists of very fine grained to fine-grained glauconitic sandstone interbedded with siltstone and shale.

The Tomah Member comprises the medial 40 feet of the Franconia Formation. It consists of interbedded, very fine-grained sandstone, siltstone and shale, with minor amounts of the mineral glauconite. This member is finer grained and has more shale than adjacent members.

The Birkmose Member comprises the basal 30 feet of the Franconia Formation. It consists of very fine grained to fine-grained sandstone, with abundant glauconite. Dolomite cement and sandy dolostone beds are common.

The depth to bedrock beneath the ISFSI site is about 100 feet. Overlying the bedrock is sand and gravel of the Holocene and Pleistocene age Grey Cloud terrace. The Grey Cloud terrace is comprised of coarse, clean sand and gravel derived from the Mississippi valley train and reworked by the swift water of the River Warren, an ancient river formed by the meltwater of the combined ice lobes of the Minnesota and western Wisconsin glaciers.

7.2.4 Groundwater

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 bottomlands is essentially parallel to the stream gradient.

Normal pool elevation, approximately on the Mississippi River adjacent to the site is controlled by Lock and Dam Number 3. Due to the permeable nature of

the sandy alluvial soils forming Prairie Island, the groundwater table responds quickly to changes in river elevation.

The groundwater table in the vicinity of PINGP is generally within 5 to 20 feet, at approximately elevation 675, of ground surface and slopes to the southwest. The ISFSI was constructed at 694 feet above mean sea level.

The Franconia Formation, which is located approximately 100 feet beneath the site, is approximately 70 ft. thick. The upper portion of this formation is used as an aquifer under shallow conditions. Much of the lower portion of this formation has very low hydraulic conductivity even under shallow conditions and is considered a confining unit.

7.2.5 Terrestrial Ecology

On November 13 and 14, 2006, the ISFSI site at the Plant was inspected for general site conditions, vegetation, wildlife habitat and proximity to cultural and ecologically sensitive areas.

The ISFSI site has been disturbed by past vegetative clearing and land grading. The observed vegetation is listed below in Table 7-2. All of the species observed were common plants of the area, and several are non-native and/or invasive species.

Table 7-2

**Vegetation Observed on and near the ISFSI Site
November 13 and 14, 2006**

Scientific Name	Common Name
Herbaceous	
Abutilon theophrasti	Velvetleaf
Achillea millefolium	Common yarrow
Ageratina altissima	White snakeroot
Amaranthus sp.	Amaranth

Table 7.2, continued Vegetation Observed on and near the ISFSI Site November 13 and 14, 2006	
Scientific Name	**Common Name**
Herbaceous	
Artemisia sp.	Wormwood
Bromus japonicus (=*B. arvensis*)	Field brome
Cirsium sp.	Thistle
Conyza canadensis	Horseweed
Coronilla varia	Crown vetch
Dichanthelium sp.	Witch-grass
Elymus canadensis	Canada wild-rye
Eragrostis sp.	Love grass
Lespedeza capitata	Roundheaded bushclover
Medicago lupulina	Black medick
Monarda sp.	Bergamot
Nepeta cataria	Catnip
Oenothera biennis	Common evening-primrose
Panicum virgatum	Switch-grass
Rudbeckia sp.	Black-eyed Susan, Coneflower
Setaria sp.	Bristle grass
Solidago sp.	Goldenrod
Sorghastrum nutans	Indian grass
Symphyotrichum pilosus	Hairy white oldfield aster
Verbascum thapsus	Common mullein
Verbena stricta	Hoary vervain
Trees, Shrubs and Woody Vines	
Acer negundo	Box elder
Celastrus scandens	American bittersweet
Celtis occidentalis	Common hackberry
Fraxinus pennsylvanica	Green ash
Gleditsia triacanthos	Honey locust
Juglans nigra	Black walnut
Juniperus virginiana	Eastern red cedar
L. tatarica	Tartarian honeysuckle
Pinus resinosa	Red pine (planted near existing ISFSI)

Table 7.2, continued
Vegetation Observed on and near the ISFSI Site
November 13 and 14, 2006

Scientific Name	Common Name
Pinus strobus	White pine
Populus deltoides	Cottonwood
Prunus serotina	Black cherry
Quercus ellipsoidalis	Northern pin oak
Quercus macrocarpa	Bur oak
Rhamnus cathartica	Common buckthorn
Rhus glabra	Smooth sumac
Ribes missouriense	Missouri gooseberry
Rubus occidentalis	Black raspberry
Smilax rotundifolia	Common greenbriar
Toxicodendron rydbergii	Poison ivy
Ulmus pumila	Siberian elm
Vitis riparia	Riverbank grape
Zanthoxylum americanum	Northern prickly ash

Of the plants indicated in Table 7-2, the dominant observed species established within the limits of the ISFSI site were the herbaceous species field brome, bristle grass, velvetleaf, common yarrow, black-eyed Susan, goldenrod, white snakeroot, amaranth, wormwood, common mullein and hoary vervain. The dominant woody species were Siberian elm (the dominant upland tree in the vicinity of the Plant), black raspberry, and saplings of honey locust.

Based upon the site inspection, the vegetative cover of the ISFSI site can best be classified, in accordance with the dichotomous key provided in the Minnesota Land Cover Classification System (MLCCS) User Manual, as "*Non-native Dominated Herbaceous vegetation with Sparse Deciduous Trees.*" This designation is assigned the numerical classification of 62140 in the MLCCS. As defined in the MLCCS, this classification is for habitats with 10-70% cover by trees (of which < 25% is conifer), where > 30% of non-tree cover is herbaceous and dominated by non-native species. The ground layer is often dominated by brome (as in this instance) or Kentucky bluegrass. Common shrubs include sumac and Tartarian honeysuckle, which is found throughout the Plant area. Almost any tree species can be found, but elms, cottonwoods, green ashes, box elders and bur oaks are common. As indicated in Table 7-2, all of these tree species are in the vicinity of the ISFSI site.

7.2.6 Land Use

Land use data for Goodhue County were obtained through the Minnesota Department of Natural Resources (DNR). The DNR data were derived from 1990 aerial photography. Land use was interpreted by the DNR using US Fish and Wildlife, National Wetlands Inventory maps, US Department of Agriculture Stabilization and Conservation Service (ASCS) low altitude aerial photography, and Landsat satellite imagery. (The ASCS was a former operating unit of the USDA that was grouped with other operating units in 1994 to form the Farm Service Agency.) Land Use mapping is not currently available in GIS format for Goodhue, Dakota or Pierce Counties. Therefore, it is assumed that land use within five miles of the site has a similar distribution as the County-wide data described below.

7.2.6.1 Goodhue County, Minnesota

The Plant is located in Goodhue County which is located southeast of the Minneapolis-St. Paul metropolitan area along the Minnesota-Wisconsin border. The County covers approximately 499,369 acres of land. Existing land use in the County is as follows: agricultural land - 64 percent, deciduous forests - 20 percent, grassland - 10 percent, farmsteads and other rural developments - 2 percent, areas that are urbanized or industrialized -1 percent, wetlands - 1 percent, and other – 2 percent.

Goodhue County uses a comprehensive land use plan, and zoning and subdivision ordinances to guide development. The ordinances promote the public health, safety, and general welfare of residents; protect agricultural land from urban sprawl; and provide a basis for orderly development. The ordinances require building permits, conditional use permits, plat development, zoning district controls, and variance requests. The County, however, has no formal growth control measures

7.2.6.2 Dakota County, Minnesota

Dakota County is located west of the site and covers approximately 371,200 acres. A very small portion of this County falls within five miles of the Plant. This area is classified as Vacant/Agricultural on the Dakota County Land Use and Cover map, State of Minnesota 1990. This classification comprises 74% of Dakota County. This information was compiled by the Land Management

Information Center and is the most recent Land Use data available for this county.

7.2.6.3 Pierce County, Wisconsin

Pierce County covers approximately 378,240 acres, and is currently in the first phase (data collection) of developing a countywide comprehensive plan. Pierce County GIS contains a rudimentary land cover classification of field and non-field. Additional land use mapping is not planned at this time because of the nonexistent relationship between township zoning classifications and land use.

Predominant land use within five miles of the Plant are Agricultural, and water (Mississippi River). Until a comprehensive land use plan is complete, the County's municipalities through the use of local zoning and subdivision regulations guide land development activities.

7.2.7 Water Resources

The most prominent hydrologic feature within five miles of the site is the Mississippi River. The Plant is located approximately at River Mile (RM) 798, one and a half miles upstream of Lock and Dam Number 3. Lock and Dam Number 3 is a navigation dam and lock on the Mississippi River constructed and placed in operation July 1938. The dam is made of concrete and is 365 feet long with four roller gates and more than 2,000 feet of earth embankment with a series of upstream spot dikes. The lock is 110 feet wide by 600 feet long. The system underwent major rehabilitation from 1988 through 1991. Its position on a bend in the river makes it a navigational safety hazard. The US Army Corps of Engineers has been working to remedy the problems at this location and has identified an effective and environmentally acceptable combination plan to improve navigation safety and to strengthen the Wisconsin embankments. The project was funded in FY06 and an EIS was issued in November 2006.

Mississippi River tributaries within five miles of the site include the Trimbelle River, the Vermillion River, and the Cannon River. The Trimbelle River is located east of the Plant in Wisconsin; its mouth on the Mississippi River is located about 2.7 miles to the east. The Vermillion River flows through a valley west of the Plant, and eventually becomes obscured within a complex of wetlands and lakes as it approaches the Mississippi River, where it is known as the Vermillion Slough. It enters the Mississippi River below the dam (see

Figure 7-4). The Cannon River, a major tributary to the Mississippi River, meanders eastward in a highly sinuous pattern. The Cannon River's mouth is located in a large wetland complex about three miles southeast of the Plant.

Many other wetlands, streams, lakes and ponds are depicted on US Fish & Wildlife Service, National Wetlands Inventory (NWI) mapping. The most prominent lakes are Sturgeon Lake and North Lake, located to the north of the Plant. A list of the resources mapped by the NWI is included as Table 7-3, and the NWI mapping of the area within five miles of the site is presented on Figure 7-5.

Prior to the establishment of the system utilized by the NWI, the US Fish & Wildlife Circular 39 Document (Shaw and Fredine, 1956) outlined a means of classifying the wetlands of the United States. It describes 20 types (exclusive of rivers and lakes), of which eight are found in Minnesota. These are briefly outlined below, each with a cross-reference to the type of NWI resource(s) that fall within the Circular 39 classifications.

- **Seasonally Flooded Basin or Flat -** Soil is well drained during much of the growing season. These areas are covered with water or waterlogged during variable seasonal periods. Vegetation varies greatly according to season and duration of flooding from bottomland hardwoods to herbaceous plants. Note that the term seasonally flooded does not have the same meaning in Circular 39 and NWI. NWI wetland types that fall into this category include PEMA, PFOA and PUS.

- **Wet Meadow -** Soil is saturated or nearly saturated during most of the growing season. These areas are usually without standing water during most of the growing season, but are waterlogged within at least a few inches of the surface. Meadows may fill shallow basins, sloughs, or farmland sags. Vegetation includes grasses, sedges, rushes and various broad-leaved plants. These areas may border shallow marshes on the landward side and include low prairies, sedge meadows and calcareous fens. The NWI wetland type that falls into this category is PEMB.

- **Shallow Marsh -** Soil is usually waterlogged early during the growing season. These areas are often covered with as much as six inches or more of water. Vegetation includes species of grass, bulrush and spikerush, and various other marsh plants such as pickerelweed and species of cattail, arrowhead, and smartweed. These marshes may nearly fill shallow lake basins or sloughs. They may border deep marshes on the landward side, and are common as seep areas on irrigated lands.

NWI wetland types that fall into this category are PEMC, PEMF, PSSH, PUBA and PUBC.

- **Deep Marsh** - Soil is usually covered with six inches to three feet or more of water during the growing season. Vegetation includes wild rice and species of cattail, reed, bulrush and spikerush. In open areas, species of pondweed, naiad, coontail, water-milfoil, waterweed, duckweed, waterlily or spatterdock may occur. These deep marshes may completely fill shallow lake basins, potholes, limestone sinks and sloughs. They may border open water in such depressions. Several NWI wetland types fall into this category, including L2ABF, L2EMF, L2EMG, L2US, PABF, PABG, PEMG, PEMH, PUBB and PUBF.

- **Shallow Open Water** - The soils are inundated by water usually less than 10 feet deep. Shallow ponds and reservoirs are included in this type. These habitat types may occupy shallow lake basins and may border large open water basins. The water of these habitats may be fringed by a border of emergent vegetation including species of pondweed, naiad, coontail, water-milfoil, waterweed, duckweed, waterlily, bladderwort, or spatterdock. Several NWI wetland types fall into this category, including L1, L2ABG, L2ABH, L2EMA, L2EMB, L2EMH, L2RS, L2UB, PABH, PUBG and PUBH.

- **Shrub Swamp** - Soil is usually waterlogged during the growing season and is often covered with as much as six inches of water. These occur along sluggish streams and drainage within drainage depressions, and occasionally on flood plains. Vegetation includes alders, willows, buttonbush and dogwoods. NWI wetland types that fall into this category are PSSA, PSSC, PSSF, PSSG, PSS1, PSS5 and PSS6B.

- **Wooded Swamp** - Soil is waterlogged within a few inches of the surface during the growing season. These areas are often covered with as much as one foot of water, and the water table is at or near the surface. Forest vegetation includes tamarack, northern white cedar, black spruce, balsam fir, red maple and black ash. Deciduous sites frequently support beds of duckweed and smartweed. These occur mostly in ancient lake basins, old river oxbows, flat terrains and along sluggish streams. NWI wetland types that fall into this category are PFO1, PFO5, PFO6B, PFOC and PFOF.

- **Bogs** – Soil is usually waterlogged and the water table is at or near the surface. The woody and herbaceous (or both) species support a spongy covering of mosses. Woody vegetation of these habitats includes leatherleaf, Labrador tea, cranberry and other heath shrubs, and may include stunted black spruce and tamarack. The herbaceous species may include sedges (including cottongrass) and Sphagnum mosses. These habitats are mostly on shallow glacial lake basins and depressions, flat terrains, and along sluggish streams. NWI wetland types that fall into this category are PFO2, PFO4, PFO7B, PSS2, PSS3, PSS4 and PSS7B.

As mentioned above, water resource types that are not included in the system presented in Circular 39 include rivers and lakes. The NWI describes these as follows.

- **Riverine System** - The Riverine System includes all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens; and (2) habitats with water containing ocean-derived salts in excess of 0.5 percent. A channel is "an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water" (Langbein and Iseri 1960:5).

- **Lacustrine System** – The Lacustrine System includes wetlands and deepwater habitats with all of the following characteristics: (1) situated in a topographical depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% areal coverage; and (3) total area exceeds eight hectares (ha) (about 20 acres). Similar wetland and deepwater habitats totaling less than eight ha are also included in the Lacustrine System if an active wave-formed or bedrock shoreline feature makes up all or part of the boundary, or if the water depth in the deepest part of the basin exceeds two meters (about 6.6 feet) at low water. Lacustrine waters may be tidal or non-tidal, but ocean-derived salinity is always less than 0.5 percent.

Several recreation, waterfowl and wildlife areas that make use of the abundant water resources present in the area are described in Sections 7.2.9.1 (Federally Designated Sensitive Environmental Resources), 7.2.9.2 and 7.2.9.3 (State Designated Sensitive Environmental Resources) and 7.2.11 (Cultural and R

Mapped Wetlands

The NWI maps of the following USGS quadrangles indicate numerous wetland systems within five miles of the ISFSI site:

- Diamond Bluff East, WI-MN;
- Red Wing, MN-WI;
- Welch, MN; and
- Diamond Bluff West, WI-MN

The ISFSI site is located on the Welch, MN quadrangle. There are no wetlands or other water bodies located within the boundaries of the ISFSI, although these resources are located on the Plant property. Essentially, wetlands within five miles of the ISFSI are established within the floodplains of the major river systems: the Mississippi, the Cannon and the Vermillion Rivers all have well-established and often extensive wetlands associated within their respective corridors. It is anticipated that construction of the two new ISFSI storage pads would not necessitate impacts to wetlands or water bodies. Table 7-3 lists the resources indicated on the four NWI maps. Due to the small scale of the maps, and the inherent accuracy limitations imposed by the NWI system, it is not possible to calculate wetland acreage of the resources depicted by the NWI maps.

Table 7-3
Wetland Types Mapped within Five Miles of the ISFSI Site

Wetland Symbol	System	Subsystem	Class	Subclass	Regime	Soil	Special Modifiers
L1UBHh	L - Lacustrine	1 - Limnetic	UB - Unconsolidated Bottom	H - Cobble/Gravel	-	-	h – Diked /Impounded
L1UBHhx	L - Lacustrine	1 - Limnetic	UB - Unconsolidated Bottom	H - Cobble/Gravel	-	-	h - Diked/ Impounded x - Excavated
L2AB4Gh	L - Lacustrine	2 - Littoral	AB - Aquatic Bed	4 - Aquatic Moss	G - Intermittently Exposed	-	h - Diked/ Impounded
L2UBGh	L - Lacustrine	2 - Littoral	UB - Unconsolidated Bottom	G – Sand	-	-	h - Diked/ Impounded

Table 7-3
Wetland Types Mapped within Five Miles of the ISFSI Site

Wetland Symbol	System	Subsystem	Class	Subclass	Regime	Soil	Special Modifiers
L2UBGhx	L - Lacustrine	2 - Littoral	UB - Unconsolidated Bottom	G – Sand	-	-	h - Diked/ Impounded x - Excavated
L2UBHh	L - Lacustrine	2 - Littoral	UB - Unconsolidated Bottom	H – Sand	-	-	h - Diked/ Impounded
L2USAh	L - Lacustrine	2 - Littoral	US - Unconsolidated Shore	A – Sand	-	-	h - Diked/ Impounded
R2UBG	R - Riverine	2 - Lower Perennial	UB - Unconsolidated Bottom	-	G - Intermittently Exposed	-	-
R2UBGx	R - Riverine	2 - Lower Perennial	UB - Unconsolidated Bottom	-	G - Intermittently Exposed	-	x - Excavated
R2UBH	R - Riverine	2 - Lower Perennial	UB - Unconsolidated Bottom	-	H - Permanently Flooded	-	-
R2USA	R - Riverine	2 - Lower Perennial	US - Unconsolidated Shore	-	A - Temporarily Flooded	-	-
R4SBC	R - Riverine	4 - Intermittent	SB - Stream Bed	-	C - Seasonally Flooded	-	-
R4SB3C	R - Riverine	4 - Intermittent	SB - Stream Bed	3 - Cobble/Gravel	C - Seasonally Flooded	-	-
PABFh	P - Palustrine	-	AB - Aquatic Bed	-	F - Semipermanentl y Flooded	-	h - Diked/ Impounded
PABGh	P - Palustrine	-	AB - Aquatic Bed	-	G - Intermittently Exposed	-	h - Diked/ Impounded
PEMA	P - Palustrine	-	EM - Emergent	-	A - Temporarily Flooded	-	-
PEMAh	P - Palustrine	-	EM - Emergent	-	A - Temporarily Flooded	-	h - Diked/ Impounded
PEMBh	P – Palustrine	-	EM – Emergent	-	B – Saturated	-	h – Diked/ Impounded
PEMBgh	P –	-	EM – Emergent	-	B – Saturated	g – Organic	h – Diked/

Table 7-3
Wetland Types Mapped within Five Miles of the ISFSI Site

Wetland Symbol	System	Subsystem	Class	Subclass	Regime	Soil	Special Modifiers
	Palustrine						Impounded
PEMC	P – Palustrine	-	EM – Emergent	-	C – Seasonally Flooded	-	-
PEMCh	P – Palustrine	-	·EM – Emergent	-	C – Seasonally Flooded	-	h – Diked/ Impounded
PEMCx	P – Palustrine	-	EM – Emergent	-	C – Seasonally Flooded	-	x – Excavated
PEMFh	P – Palustrine	-	EM – Emergent	-	F – Semipermanentl y Flooded	-	h – Diked/ Impounded
PFO1A	P – Palustrine	-	FO – Forested	1 – Broad-leaved Deciduous	A – Temporarily Flooded	-	-
PFO1Ah	P – Palustrine	-	FO – Forested	1 – Broad-leaved Deciduous	A – Temporarily Flooded	-	h – Diked/ Impounded
PFO1C	P – Palustrine	-	FO – Forested	1 – Broad-leaved Deciduous	C – Seasonally Flooded	-	-
PFO1Ch	P – Palustrine	-	FO – Forested	1 – Broad-leaved Deciduous	C – Seasonally Flooded	-	h – Diked/ Impounded
PSS1A	P – Palustrine	-	SS – Scrub-shrub	1 – Broad-leaved Deciduous	A – Temporarily Flooded	-	-
PSS1C	P – Palustrine	-	SS – Scrub-shrub	1 – Broad-leaved Deciduous	C – Seasonally Flooded	-	-
PSS1Ch	P – Palustrine	-	SS – Scrub-shrub	1 – Broad-leaved Deciduous	C – Seasonally Flooded	-	h – Diked/ Impounded
PSS1Fh	P – Palustrine	-	SS – Scrub-shrub	1 – Broad-leaved Deciduous	F – Semipermanentl y Flooded	-	h – Diked/ Impounded
PUBF	P – Palustrine	-	UB – Unconsolidated Bottom	-	F – Semipermanentl y Flooded	-	-
PUBFh	P – Palustrine	-	UB – Unconsolidated	-	F – Semipermanentl	-	h – Diked/ Impounded

Table 7-3
Wetland Types Mapped within Five Miles of the ISFSI Site

Wetland Symbol	System	Subsystem	Class	Subclass	Regime	Soil	Special Modifiers
			Bottom		y Flooded		
PUBFx	P – Palustrine	-	UB – Unconsolidated Bottom	-	F – Semipermanently Flooded	-	x – Excavated
PUBFhx	P – Palustrine	-	UB – Unconsolidated Bottom	-	F – Semipermanently Flooded	-	h – Diked/ Impounded x – Excavated
PUBG	P - Palustrine	-	UB - Unconsolidated Bottom	-	G - Intermittently Exposed	-	-
PUBGh	P - Palustrine	-	UB - Unconsolidated Bottom	-	G - Intermittently Exposed	-	h - Diked/ Impounded
PUBGhx	P - Palustrine	-	UB - Unconsolidated Bottom	-	G - Intermittently Exposed	-	h - Diked/ Impounded x - Excavated
PUBGx	P - Palustrine	-	UB - Unconsolidated Bottom	-	G - Intermittently Exposed	-	x - Excavated
PUSA	P - Palustrine	-	US - Unconsolidated Shore	-	A - Temporarily Flooded	-	-
PUSAh	P - Palustrine	-	US - Unconsolidated Shore	-	A - Temporarily Flooded	-	h - Diked/ Impounded

Source: US Fish and Wildlife Service, National Wetland Inventory maps of the following USGS quadrangles: Diamond Bluff East, WI-MN; Red Wing, MN-WI; Welch, MN and Diamond Bluff West, WI-MN.

The nearest water resource into which liquid contaminants from the site could flow is located south and east of the ISFSI. The potential contaminant pathway is an excavated ditch that receives effluent from the Plant cooling towers, arranged in four parallel structures. This area between the ISFSI and the cooling towers supports a floodplain forest, the hydrology of which has been partially altered by the construction of the ditch. The forest canopy of the floodplain is dominated by box elder, green ash and eastern cottonwood. The ditch conveys cooled effluent northeasterly and into the Mississippi River.

7.2.8 Transportation

The Plant is served by a transportation system that includes US Highways, Minnesota State highways, county roads and local access roads. Figure 7-6 presents the transportation system in the vicinity of the site. U.S Highway 61 is a two and four lane roadway which runs north/south from the Minneapolis / St. Paul Metropolitan area to the junction of Minnesota State Routes 50 and 20 where it turns east to Red Wing and the Mississippi River. From US 61, County Road 19 and 18 provide direct access to the site just north of Red Wing.

Route 61 continues south from Red Wing along the Mississippi to La Crosse, Wisconsin. US Highway 63 crosses the Mississippi River at Red Wing north to Hager City, Wisconsin. Route 63 continues north to Ellsworth and ends just south of Lake Superior. Wisconsin State Highway 35 follows the Mississippi River in the vicinity of the plant. Numerous county and local roads feed the major roadway system in both Minnesota and Wisconsin.

The Red Wing Municipal Airport is located approximately seven miles southeast of the site. The Red Wing Regional Airport is located in Wisconsin, five miles East of Red Wing. The airport is currently completing a major expansion. The airport has a runway 5,010 feet long by 100 feet wide, with full night landing facilities. The airport is now an all-weather operation with state of the art Instrument Landing Systems. Minneapolis-St Paul International/Wold-Chamberlain Airport (MSP) is the closest international airport to Plant and is approximately 50 miles northwest of the site.

The Federal Aviation Administration high and low altitude enroute charts were reviewed to determine if there are air traffic corridors within five miles of the site. The site is located approximately 3 miles southwest from low altitude VFR airway V2-97 and high altitude airway J36, both which run on a similar path. V2-97 is used for primarily private airplane flights between Minneapolis/St. Paul, MN and Red Wing, MN, Winona, MN, or La Crosse, WI. J36 is primarily used for commercial jet traffic between Minneapolis/St. Paul, MN and Chicago, IL. Due to the number of flights and altitudes of these airways, there would not be a significant risk of any aircraft crashing into a storage cask at the Prairie Island ISFSI.

7.2.9 Sensitive Environmental Resources

The Plant is located on the southwest bank of the Mississippi River. The river affords the area numerous recreational, environmental and cultural opportunities.

7.2.9.1 Federally Designated Sensitive Environmental Resources

There are no National Parks, Monuments, Landmarks, Wilderness Areas, Forests, Trails or Water Fowl Production Areas within five miles of the site. The portion of the Mississippi that passes by the Prairie Island Generating Station is not federally designated as wild and scenic. Resources that have federal recognition are as follows:

The Mississippi Flyway

The Mississippi Flyway is a bird migration route that generally follows the Mississippi River in the United States and the Mackenzie River in Canada. The main endpoints of the flyway include central Canada and the region surrounding the Gulf of Mexico. Some birds even use this flyway to migrate from the Arctic Ocean to Patagonia.

Birds use this route along the Mississippi River typically because no mountains or ridges of hills block this path over its entire extent. Good sources of water, food, and cover exist over its entire length. About 40% of all North American migrating waterfowl and shorebirds use this route as well as many birds of prey. The longest migration route of any in the Western Hemisphere lies in this flyway. Its northern terminus is on the Arctic coast of Alaska and its southern end in Patagonia. During the spring migration some shorebirds travel the full length of the flyway and several species that breed north in Yukon and Alaska cover the larger part of it twice each year. This route is used by large numbers of ducks, geese, shorebirds, blackbirds, sparrows, warblers, thrushes, hawks, owls, and eagles.

Great River Road

The Federal Department of Transportation, Federal Highway Administration has designated the Mississippi River Corridor throughout the State of Minnesota as a scenic byway known as the "Great River Road." This designation, recognized by the U.S. Congress, is based upon the existence of one or more archaeological, cultural, historic, natural, recreational or scenic

qualities. In the vicinity of the Plant, the Great River Road is comprised of U.S. 61 in Hastings south to LaCrescent on the Minnesota side of the Mississippi River and Wisconsin Route 35 on the Wisconsin side of the river. This designation is attributed to certain highways and byways in order to preserve, promote and enhance the scenic, historic and recreational resources of the Mississippi River (Figure 7-7).

Mississippi National River and Recreation Area

The Mississippi National River and Recreation Area (MNRRA), a unit of the National Park Service, extends southward to the border of Dakota and Goodhue Counties, but is approximately 5.5 miles from the Plant at its closest point.

7.2.9.2 Minnesota Designated Sensitive Environmental Resources

There are no Minnesota State Parks, Wayside Parks, Recreational Areas, State Trails, Zoos, or trout lakes or streams located within five miles of the Plant. Figure 7-7 presents the location of Minnesota state designated sensitive environmental resources. Resources that have Minnesota recognition are as follows:

State Critical Areas

There are no State Critical Areas within five miles of the Plant. The Mississippi River Critical Area Corridor extends southward to the border of Dakota and Goodhue Counties, but is approximately 5.5 miles from the Plant at its closest point. The Mississippi National River and Recreation Area (MNRRA), a unit of the National Park Service, has been designated as a State Critical Area. The boundaries of the Mississippi River Critical Area Corridor and that of MNRRA are the same.

State Wild and Scenic Rivers Program

The Cannon River from Faribault, Rice County to its confluence with the Mississippi River just north of Red Wing, was added to Minnesota's Wild and Scenic Rivers Program in 1980. The mouth of the Cannon River at the Mississippi River, the nearest the Cannon River is to the Plant, is located in a large wetland complex known as the Rice Lake Bottoms, approximately 2.7 miles south of the site. The purpose of the State Wild and Scenic Rivers Act (Minn. Stat. § 103F.301 et seq.) is to preserve and protect the outstanding

scenic, recreational, natural, historical, and scientific values of certain Minnesota rivers and their adjacent lands. The Act's intent is not to restore pre-settlement conditions, but rather to prevent intensive development and recreational overuse from damaging these rivers. The legal extent of lands covered by the program is a maximum of 320 acres per each river mile on both sides of the river. All state, local, and special governmental units (councils, commissions, boards, districts, agencies, etc.), and all other authorities must exercise their powers to further the purpose of the act and adopted management plans. Since the Cannon River does not pass directly by the site, management plans associated with this river do not affect the Plant.

The Cannon River has been designated as a Minnesota Wild and Scenic River because of its outstanding scenic and recreational value. The portion of the river within five miles of the site is considered to be "scenic." The scenic designation is attributed to those rivers that exist in a free-flowing state and where adjacent land is largely undeveloped. Regulations, which are generally more restrictive than shore-land rules, have been established to protect the river in its present condition. In addition, the Cannon Valley offers a diversity of recreational opportunities to area residents. Biking, camping, hunting, and fishing attract thousands of people each year. As described in the Red Wing Comprehensive Plan, the city recognizes the importance of maintaining the Cannon Bottoms in its natural state.

State Forests

The Richard J Dorer Memorial Hardwood State Forest surrounds the Plant. According to the DNR Internet site, state forest campgrounds have evolved from traditional camping areas within working forests. They provide access to many self-directed activities in forested areas. Unlike state parks, forest campgrounds do not have resident managers, organized nature programs, or modern facilities such as showers and flush toilets. They are semi-modern areas, designed to furnish the basic needs and provide opportunities for recreationists to pursue a variety of unstructured outdoor activities. Campgrounds are patrolled regularly to provide security and service to visitors. While camping is allowed throughout state forests, there are no designated state forest campgrounds near the Prairie Island site. All designated campgrounds in the forest are south and southeast of the site.

Only 45,000 acres of the nearly 2 million acres of this state forest are owned by the state of Minnesota. The use of mountain bikes, horses, OTVs and ATVs is restricted to designated trails only.

State Scientific and Natural Areas

The DNR oversees the Scientific and Natural Areas (SNA) program which serves to preserve natural features and rare resources of exceptional scientific and educational value. SNAs are open to the public for nature observation and education, but are not meant for nor do they support intensive recreational activities. The DNR has identified three types of SNAs in the state of Minnesota: Prairie grasslands, deciduous woods, and coniferous forest. Within five miles of the Plant, there are two SNAs that are designated as the deciduous woods type. These are described below:

- Cannon River Turtle Preserve – The Cannon River Turtle Preserve, created in 1985, is located along a significant reach of the lower Cannon River. The closest the Cannon River Turtle Preserve is to the Plant is its eastern limit in Harliss, Goodhue County, about 3.2 miles south of the Plant. This 909-acre area contains floodplain forest dominated by silver maple and cottonwood. The site supports habitat for the state-listed threatened wood turtle, which nests on the river's sand bars. This area is accessed by the Cannon Valley Bike trail.

- Spring Creek Prairie – The Spring Creek Prairie SNA is located approximately five miles south-southeast of the Plant. This 145-acre site consists of sandstone and limestone outcrops overlooking open, sandy draws where streams once cut their way down to the Mississippi. At the south edge of the SNA, a small maple-basswood community thrives with maiden-hair fern, hepatica, trillium, blood root, and other woodland species. The southwest-facing bluff gives rise to a bedrock bluff prairie as it climbs to a narrow ridge top. The silvery bladderpod, a state-endangered species, grows in one of its largest known populations.

State Wildlife Management Areas

Wildlife Management Areas (WMAs) are part of Minnesota's outdoor recreation system and are established to protect and enhance land and water bodies that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses. Much of the wildlife managers' work is directed toward protecting and enhancing wildlife habitat on WMA lands. For instance, prairie and grasslands are planted to provide prime nesting cover critical to waterfowl and pheasant production. Wetlands are restored and enhanced to benefit waterfowl and other wetland wildlife species.

- Gore's Pool #3 – Gore's Pool #3 is located three miles north of the Plant. This 6,449-acre site consists of flood plain marshes, forest and backwater marshes associated with the Mississippi and Vermillion Rivers. The purpose of this WMA is to preserve this natural resource and provide recreational opportunities (fishing and boating) in this unique environment, as well as provide habitat for waterfowl and furbearers. There are three boat launches located within the area and its vicinity. There is a designated Migratory Waterfowl refuge at the southern end of the property, which is off limits to all recreational activities.

- Espen Island – Espen Island is located about 4.9 miles south of the Plant. This 13-acre site is comprised of bottomland hardwood forest. The purpose of the area is primarily for forest wildlife species and riparian/riverine wildlife species. Wildlife viewing and hunting for small game and waterfowl are allowed in this area.

State Canoe and Boating Rivers

The state of Minnesota administers several canoe and boating rivers. Two of these are within five miles of the Plant site and are described below

- **Cannon River** - The Cannon River has few rapids and several dams. Downed trees and logjams are hazards in high water. The river varies in width from 50 to 200 feet. Stream flow usually peaks in early April. Very heavy rains can cause the river to flood. From Faribault to its mouth, the Cannon falls 280 feet, an average of 4.8 feet per mile.

  Bounded by rolling hills, bluffs, farmland and woods in its upper reaches, the Cannon River enters a broad gorge below Cannon Falls, where it is flanked by bluffs up to 300 feet high.

- **Mississippi River (Hastings to the Iowa border)** - From Hastings, Minnesota to the Iowa border the river requires some paddling skills in order to avoid snags and downed trees, especially in the backwaters. Motorboats and barges often throw large waves that can "swamp" canoes. Because the river is so wide, the current can be deceptively swift.

  Spring runoff normally brings the river to its highest flow of the year. Though some stretches are fast and can be dangerous, others are

restrained by dams and have little current. The water level in this stretch is always sufficient for canoeing, though winds can be strong.

This segment of the river is towered on the right and left by spectacular bluffs. The main river channel will be along the east bank at times and along the west bank at other times. Extensive backwaters often extend to the bluffs on the side opposite the main channel.

7.2.9.3 Wisconsin Designated Sensitive Environmental Resources

There are no Wisconsin State Parks, Wayside Parks, Recreational Areas, State Trails, Zoos, or trout lakes or streams located within five miles of the Plant. Figure 7-7 presents the location of Wisconsin state designated sensitive environmental resources. Resources that have Wisconsin recognition are as follows:

State Natural Areas

The SNA Program is administered by the Wisconsin Department of Natural Resources' Bureau of Endangered Resources and advised by the Natural Areas Preservation Council. The purpose of SNAs is to protect outstanding examples of native natural communities, significant geological formations, and archaeological sites. They harbor natural features essentially unaltered by human-caused disturbances or that have substantially recovered from disturbance over time. SNAs also provide the refuges for rare plants and animals. More than 90% of the plants and 75% of the animals on Wisconsin's list of endangered and threatened species are protected on SNAs.

Public use of SNAs is two-fold: scientific research and compatible recreation. These areas are not appropriate for intensive recreation such as camping or mountain biking, but they can accommodate low-impact activities such as hiking, bird watching, and nature study. As such, many SNAs contain few or no amenities such as parking areas, restrooms, or maintained trails.

- Trenton Bluff Prairie (Area #136) – Trenton Bluff Prairie State Natural Area is located in Wisconsin just north of Hager City and roughly four miles from Plant. This site is owned by the Wisconsin DNR and was established as a State Natural area in 1977. Trenton Bluff Prairie is comprised of two separate dry prairies situated on steep Mississippi River sandstone bluffs, which are capped by massive limestone cliffs and are some of the best examples of prairie remaining in the region. The

western unit has two prairie openings separated by a wooded draw, while the steeper eastern portion contains open cliff which transitions to shrubby oak woods. The bluff summit rises some 300 feet above the flat, sandy river terrace below with vertical cliffs. Dominant grasses include Indian grass, little blue-stem, big blue-stem, side-oats grama, and needle grass. Near the far western edge of the area, several Great Plains species can be found: foothill bladder-pod prairie sage-wort, ground plum, plains muhly, and prairie larkspur. The state-threatened prairie thistle is also found here. The upper cliff area has numerous outcrop crevices that harbor several fern species including slender lip fern and smooth cliff brake. Animal species of concern that inhabit this area include the state-listed endangered peregrine falcon, bullsnake, hognose snake and two butterfly species – olive hairstreak and Reakert's blue.

7.2.10 Historic and Archaeological Resources

The Plant is located adjacent to the Prairie Island Indian Community Reservation. In 1936, the federal government officially recognized Prairie Island Indian Community (PIIC) as a reservation for the Mdewakanton, awarding them 534 acres. The Prairie Island Indian Community is a Federally Recognized Indian Tribe organized under the Indian Reorganization Act (25 USC 476). Currently, the reservation population is approximately 160, while the total enrollment of the tribal community is 486. The Tribal government employs about 100 members on a variety of service projects. The PIIC owns and operates Treasure Island Resort and Casino, employing about 1500 people.

The Treasure Island Resort and Casino includes a 250-room hotel and convention center that is currently being expanded to include an additional 230 rooms (Treasure Island Resort and Casino undated). The expansion includes a 24-lane bowling center and a multi-use event center with a maximum seating capacity of 2,800. Treasure Island Resort and Casino offers gaming, dining, live entertainment, a 95- space RV park, a 137-slip marina to accommodate visitors arriving by the Mississippi River, and sightseeing and dinner cruises on their river boat (Minnesota Indian Affairs Council 2006).

There are six National Register historic sites located within five miles of the Plant. Five of the sites are in Goodhue County and one is in Pierce County Wisconsin. These properties are listed on Table 7-4 and located on Figure 7-8. There are no Minnesota Historical Society Sites within 5 miles of the site.

No archaeological resources are known to exist at the existing site. According to original licensing documents no archeological resources were found in the vicinity of the ISFSI site during investigations conducted during the licensing.

Table 7-4
National Register Sites within Five Miles of the Plant

Name of Historic Site	Location	Approximate Distance from the Plant	Comments
Bartron Archaeological Site	Undisclosed location on Prairie Island	0-1 miles	Prehistoric site
Metro Archeological District	Pierce County Wisconsin Restricted Address	1-2 miles	810 acres prehistoric site
Mendota to Wabasha Military Road	Cannon Bottom Road, Red Wing, MN	2-4 miles	48 acre military roadway
Alexander Anderson Estate	West of Red Wing on U.S. 61	2-4 miles	50 acres, brick, stone structure of architecture and engineering significance
Cross of Christ Lutheran Church	U.S. 61 Red Wing	4.5 miles	50 acres, architecture, engineering, religious significance.
Silvenale Site	Goodhue County Restricted Address	4-5 miles	No Information available

7.2.11 Cultural and Recreational Resources

This section identifies areas within five miles of the site designated by regional or local authorities as having recreational, cultural, or scientific significance.

7.2.11.1 Federal and State Cultural and Recreational Resources

Federal and State resources that have designated cultural and recreational value are identified and discussed in Section 7.2.9 above. Those resources include:

- Great River Road
- Mississippi National River and Recreation Area

- Minnesota State Wild and Scenic Rivers Program
- Minnesota State Forests
- Minnesota State Wildlife Management Areas
- Minnesota State Canoe and Boating Rivers

7.2.11.2 County and Local Parks and Recreational Areas

There is one county designated park and recreational area within five miles of the Plant. The A.P. Anderson County Park is located approximately 4.5 miles south of Plant. There are no other known county operated resource areas located within five miles of the site. Goodhue and Pierce Counties maintain numerous boat launches and hiking, biking and snowmobiling trails within 5 miles of the site. There are no county forests located within 5 miles of the Plant.

The Red Wing Wildlife League manages and operates 2,800 acres of bottomland and floodplain just south of Plant along the Mississippi River. As the largest landowner in Goodhue County, the League funds restoration and maintenance of its land through membership dues, charitable gambling, donations and usage fees. On its property the League supports hunting, fishing and an environmental learning center.

Red Wing has numerous community parks and playgrounds located within the city limits and along the river, however these are all located greater than five miles from Plant. A portion of the Cannon Valley Trail is located within five miles of Plant. This trail, which follows the Cannon River offers biking, hiking, in-line skating, skateboarding and cross-country skiing opportunities. As discussed in Section 7.2.10, the Prairie Island Indian Reservation supports several recreational resources including a marina and camp ground.

The City of Red Wing, as part of its Comprehensive Plan published in 2006 has developed policies for the continued development and enhancement of parks, trails, open space and public art. These policies are focused on conserving and establishing a network of "Green Infrastructure" in order to improve quality of life for its citizens and provide wildlife habitat.

7.2.12 Demography

Population information was obtained from Census Bureau Topologically Integrated Geographic Encoding and Referencing system (TIGER) /Line File, Version 2000. The 2000 TIGER/Line file uses town and city boundaries as of January 1, 2000. Figure 7-9 presents this data for the permanent population within 50 miles of the Plant by minor civil divisions. Each civil division is color coded by range of population. Based upon this information, the total permanent population within 50 miles of the Prairie Island Plant is calculated to be 2,949,234. This estimate is slightly conservative since, where the 50-mile radius bisects a civil division; the entire population of the civil division has been included.

The License Renewal Application Environmental Report prepared by Nuclear Management Company, LLC (NMC) provides detailed information on demographic characteristics within 50 miles of the site.

A report entitled "Evacuation Time Estimate Study for the Prairie Island Nuclear Generating Plant Emergency Planning Zone" was prepared in September of 2003 by TOM COD Data Systems for NMC. This report provided both the 50-mile EPZ population data and the 10-mile EPZ data. The 10-mile EPZ population is presented in Table 7-5. The sub areas represent the approximate distance and direction from the plant.

Table 7-5
Permanent Population for Sub Areas in the Prairie Island 10-Mile EPZ***

SubArea	Population based on 2000 U.S. Census
Goodhue County (MN)	
2 (171 Pierce County; 281 Goodhue County)	452
5S	2,981
5W	697
10SE	14,203
10SW	729
Dakota County (MN)	
10W	3,584
Pierce County, (WI)	
5E	870
5N	308
10NW	1,388
10N	422
10NE	1,497
10E	2,110

Table 7-5
Permanent Population for Sub Areas in the Prairie Island 10-Mile EPZ*

SubArea	Population based on 2000 U.S. Census
GoodhueCounty MN Total	18,891
Dakota County, MN Total	3,584
Minnesota Total:	22,475
Pierce County WI Total	6,776
Total 10-Mile EPZ Permanent Population	29,241

*** Source: TOM COD Date Systems, Evacuation Time Estimate Study for Prairie Island Nuclear Generating Plant Emergency Planning Zone, 2003.

7.3 Wastes and Emissions

Minnesota Rule 7855.0650 requires information relating to wastes and emissions from the facility. The dry storage system used at the Prairie Island ISFSI (TN-40 and TN-40HT casks), including the proposed expansion, is a passive system that does not have any discharges associated with it. The following section lists requirements of the rule and provides information for categories that apply to this proposal.

7.3.1 Radioactive Wastes

There will be no radioactive wastes produced or released by operation of the facility. The spent fuel is stored in metal casks (both TN-40 and TN-40HT) that are sealed and closed before the cask leaves the Auxiliary Building to ensure that no radioactive materials can escape. In addition, the casks are continually monitored to ensure that the inert helium gas inside the cask has not escaped.

Additionally, Minnesota Statutes § 116C.83, Subd. 5 – Water standards, establishes that the requirements of Section 116C.76 – Nuclear waste depository release into groundwater, Subd. 1, clauses (1) to (3), applies to an independent spent fuel storage installation. Such an installation must be operated in accordance with those standards. There is no liquid, solid, or gaseous radioactive waste associated with the ISFSI and no release to or contamination of the groundwater.

7.3.2 Human Exposure Due to Operation

7.3.2.1 Direct Radiation

The spent fuel in the casks will emit low levels of radiation to the environment surrounding the site. This is a result of the heavy neutron and gamma shielding provided in the cask design as well as shielding afforded by the 17 foot high earthen berm that surrounds the ISFSI. Due to this shielding, and the distances from the ISFSI to the nearest residences (0.45 mile NW of the ISFSI to the nearest residence), radiation doses to the population around the site will be extremely low. Radioactive material associated with the spent fuel to be stored is completely contained in the casks, so that no radioactive material is released from the spent fuel to the environment under both normal and postulated accident conditions (e.g., earthquakes, tornadoes, fires, etc). Therefore, there would be no uptake of radioactive material by personnel working onsite or people living nearby by means of inhalation or ingestion, and contamination of soil in the vicinity of the site would not occur. Further discussion of radiation issues are presented below and in Appendices E and F of this application.

7.3.2.1.1 On-site Radiation Doses

While shielding is provided in the design of the casks, personnel will receive some radiation exposure during spent fuel handling, cask loading, preparing casks for storage, onsite transport operations, and placement of the casks at the ISFSI. The requirements of 10 CFR 20 for protecting personnel from radiation exposure and minimizing exposures will be strictly adhered to during all activities related to spent fuel storage.

7.3.2.1.2 Off-site Radiation Doses

Figure 7-10 illustrates portions of the Prairie Island site boundary, which is also the Prairie Island exclusion area boundary and the ISFSI controlled area boundary defined in 10 CFR 20.1003 and 10 CFR 72.3. The nearest residence from the ISFSI is located 0.45 mile NW of the ISFSI. The annual radiation dose resulting from spent fuel storage operations to the nearest residence is expected to be quite low and will meet the restrictive criteria set forth in 10 CFR 72.104 as well as U.S. EPA standards 40 CFR 190.

The Prairie Island ISFSI is currently designed and licensed to store up to 1,920 spent fuel assemblies in 48 of Transnuclear's TN-40 metal storage casks (each cask holds 40 spent fuel assemblies). As discussed in Section 4.8, we have submitted an application to the NRC to amend the ISFSI license to permit use of the enhanced TN-40HT storage cask. An amendment will be submitted in the future to increase storage beyond the 48 casks currently licensed. Not only would dose rates increase from those previously analyzed as a result of the greater number of casks stored at the ISFSI, but also due to use of the TN-40HT storage system which has the capability to store "hotter" spent fuel than the TN-40 cask, i.e. high burnup > 45,000 MWD/MTU.

This Petition proposes to store up to a total of 64 TN-40 and TN-40HT casks at the existing ISFSI site. A conservative dose rate calculated from the proposed ISFSI to the nearest resident using Prairie Island specific spent fuel was calculated to be 0.36 mrem/annually. Note that some of the conservatisms in this calculation include assuming all the fuel as been burned to an exposure of at least 50,000 MWD/MTU and less decay than will actually occur. This calculation shows that the dose rates to the nearest resident will be significantly less than that used in the radiation risk assessment contained in Appendix F.

The analyses of normal, off-normal, and accident conditions (Section 8 of the Prairie Island ISFSI SAR) have shown that, owing to the robust design of the TN-40 casks, no credible conditions can breach the TN-40 cask confinement boundary, including the double lid seals. There are no changes in the enhanced version of the cask, i.e. the TN-40HT that will alter this conclusion.

7.3.2.2 Radiation Protection Program

A radiation protection program is implemented at the Prairie Island ISFSI, in accordance with the requirements of 10 CFR 72.126. The program is based upon the extensive radiation protection program in effect at the Plant. The Plant's radiation protection program is applied to the ISFSI, where applicable, to address the specific radiation protection needs of the ISFSI.

The primary goal of the radiation protection program is to minimize exposure to radiation such that the total individual and collective exposure to personnel in all phases of ISFSI design, construction, operation and maintenance are kept As Low As Reasonably Achievable (ALARA). This is achieved by integrating ALARA concepts into design, construction, and operation of the facility.

Trained personnel develop and implement the radiation protection program and assure that all procedures are followed to meet company and regulatory requirements. Training programs in the basics of radiation protection and exposure control are provided to all facility personnel whose duties require working in radiation areas.

Three basic objectives of the ALARA program are:

1. Protection of Personnel, including surveillance and control over internal and external radiation exposure and maintaining the exposure of all personnel within permissible limits and as low as reasonably achievable (ALARA).

2. Protection of the Public, including surveillance and control over all conditions and operations that may affect the health and safety of the public. All activities related to the storage of spent fuel are controlled to ensure off-site doses are ALARA, including monitoring by means of an environmental radioactivity monitoring plan.

3. Protection of the Facility, including monitoring the facility for physical changes and trends that could lead to exposure hazards and determining changes or improvements needed to maintain exposure ALARA.

The radiation protection staff is responsible for and has the appropriate authority to maintain occupational exposures as far below the specified limits as reasonably achievable. Formal reviews are performed periodically to determine how exposures might be reduced. The program ensures that spent fuel storage facility personnel receive sufficient training and have sufficient authority to enforce safe station operation. Modifications to operating and maintenance procedures, as well as spent fuel storage facility equipment and facilities will be made when they will substantially reduce exposures at a reasonable cost. The program will also ensure that adequate equipment and supplies for radiation protection work are provided.

We are committed to a strong ALARA program. Spent fuel storage facility personnel are trained and updated on ALARA practices and dose reduction techniques. Design, operation and maintenance activities are reviewed to ensure ALARA criteria are met for the spent fuel storage facility. The ALARA program ensures that:

1. An effective ALARA program is administered at the spent fuel storage facility that appropriately integrates management philosophy and NRC regulatory requirements and guidance.

2. Spent fuel storage facility design features, operating procedures and maintenance practices are in accordance with ALARA program guidelines; and that written reviews of the radiation protection program ensure the objectives of the ALARA program are attained.
3. Pertinent industry and research information concerning radiation exposure of personnel are reflected in the design and operation of the facility.
4. Appropriate experience gained during the operation of nuclear power stations relative to in-plant radiation control is factored into revisions of procedures to assure that the procedures continually meet the objectives of the ALARA program.
5. Necessary assistance is provided to insure that operations, maintenance, and decommissioning activities are planned and accomplished in accordance with ALARA objectives.
6. Trends in spent fuel storage facility personnel and job exposures are analyzed in order to permit corrective actions to be taken with respect to adverse trends.

Prairie Island personnel are responsible for ensuring that activities are planned and accomplished in accordance with the objectives of the ALARA program. Staff ensures that procedures and their revisions are implemented in accordance with the objectives of the ALARA program, and ensure compliance with applicable requirements of 10 CFR 72 and 10 CFR 20.

Operational requirements for surveillance are incorporated into the storage system design. The storage systems are configured in the ISFSI array to allow ease of surveillance and are heavily shielded to minimize occupational exposure.

The spent fuel storage facility contains no systems that process liquids or gases. Therefore, maintaining exposures ALARA requires only the proper management of the storage and transportation systems.

7.3.2.2.1 Storage System Design Description

A description of the ISFSI, including layout and characteristics is provided in Section 3.

The ISFSI has a number of design features, which ensure that exposures are ALARA, including the following:

- There will be no radioactive systems in the spent fuel storage facility other than the storage casks.
- The spent fuel is stored inside sealed, heavily shielded TN-40 and TN-40HT casks. The most significant radiation protection design consideration is the heavy gamma and neutron shielding to minimize personnel exposures.
- The storage casks contain no active components requiring periodic maintenance or surveillance.
- The casks will be loaded, sealed, and decontaminated prior to transfer to the spent fuel storage facility. Decontamination of the cask exterior before leaving the Auxiliary Building minimizes exposure of personnel to surface contamination.
- The fuel will not be unloaded nor will the casks be opened at the spent fuel storage facility.
- The fuel will be stored dry inside the casks, therefore no radioactive liquid is available for leakage.
- The casks will be sealed airtight, so that no radioactive gases or particulates are available for release. Radioactive gaseous releases are not considered credible due to the lid seal design with double metal O-ring seals whose interspace is pressurized with helium above cask cavity pressure by means of the overpressure tank, with seal interspace pressure continuously monitored.
- An annunciator panel monitoring cask pressure is located outside of the ISFSI protected area. This minimizes time required for periodic cask surveillance and reduces personnel exposure.
- The ISFSI site is within the exclusion area of the Plant site. The location of the ISFSI is of sufficient distance from frequently occupied areas of the Plant such that the dose contribution to plant personnel from the ISFSI is not significant.

In addition, the ISFSI is not normally occupied. Therefore, no personnel areas, equipment decontamination areas, contamination control areas, or health

physics facilities need be located at the ISFSI. These types of facilities are available at the Plant.

7.3.2.2.2 Shielding

The storage cask provides the majority of the radiation shielding in the storage system. The TN-40 and TN-40HT casks are designed with materials and of sufficient thickness to keep dose levels within the requirements specified in 10 CFR 20 and 10 CFR 72. No special features or remote handling of the casks at the ISFSI are required. In addition to the heavy shielding of the spent fuel provided by the TN-40 and TN-40HT casks, an earthen berm surrounds the ISFSI, providing substantial additional shielding of direct radiation. The berm is a minimum of 17 feet high. The berm essentially eliminates the direct radiation component of both neutron and gamma radiation, leaving only "skyshine" radiation, or radiation that travels upwards from the storage casks and is reflected back down to the ground off the atmosphere, which represents a small fraction of the total radiation emitted from a cask.

7.3.2.2.3 Radiation Monitoring System

There are no credible events that could result in releases of radioactivity from the TN-40 or TN-40HT cask cavity, nor in unacceptable increases in direct radiation due to loss of cask shielding. Therefore, area radiation and airborne radioactivity monitors are not required at the ISFSI. Thermo-luminescent Dosimeters (TLDs) are located on the outer (nuisance) fence around the ISFSI, used to record dose rates at positions along this fence. Workers and visitors entering the storage facility are provided with dosimetry to accurately measure and record radiation dose exposure.

7.3.2.2.4 Emergency Plan

Emergency response for accidents associated with the Prairie Island ISFSI is governed by the Prairie Island Emergency Plan, which complies with 10 CFR 72.32 requirements for ISFSI emergency planning. The Prairie Island Emergency Plan, which is used for any radiological emergencies that may arise at the ISFSI, describes the organization, assessment actions, conditions for activation of the emergency organization, notification procedures, emergency facilities, equipment, training, provisions for maintaining emergency preparedness, and recovery criteria for off-normal and accident conditions.

7.3.3 Non-Radioactive Solid and Liquid Wastes

The ISFSI contains no systems that process non-radioactive solids or liquids. There will also be no water or sewage services at the ISFSI.

7.3.4 Non-Radioactive Gaseous and Particulate Emissions

Dry storage of spent fuel is a passive operation, which requires no air or water resources. Ambient air is used for natural convective cooling of the fuel casks, but it is not consumed nor is its quality compromised.

7.3.4.1 Air Quality

The air quality in Goodhue County is generally very good. The U.S. Environmental Protection Agency (EPA) has adopted ambient air quality standards (AAQS) for six air pollutants known as criteria pollutants. In addition, the Minnesota Pollution Control Agency (PCA) has adopted standards for the criteria pollutants as well as for hydrocarbons and hydrogen sulfide. Ambient air monitoring data collected by the PCA at several monitoring stations throughout the state are used to determine whether or not these AAQS are being met. Areas where the standards are attained are referred to as "attainment" areas and those areas not attaining the standards are called "nonattainment" areas. This project is located in the Southeast Minnesota-La Crosse (Wisconsin) Interstate Air Quality Control Region, which is in attainment for all criteria pollutants.

Emissions during construction and from infrequent vehicular traffic will not result in significant effects on air quality at the ISFSI site.

7.3.4.2 Clean Air Act

The Clean Air Act requires an application for Construction of a Stationary Source per 40 CFR Part 61, Subpart A, which establishes National Emission Standards for Hazardous Air Pollutants (NESHAPs). However, there are no stationary sources added for this project, therefore, no applications will be required.

7.3.5 Fugitive Dust

The only sources of fugitive dust will be from construction activities and will be controlled by wetting exposed soil areas and covering stockpiles. During operation of the ISFSI, the only fugitive dust source will be that produced by the train car during the infrequent delivery of casks to the site. This is considered to be a negligible source of fugitive dust.

7.3.6 Non-Radioactive Discharge to Water

The ISFSI does not have any non-radioactive discharges to water. There are no dewatering requirements anticipated during construction.

7.3.7 Runoff and Receiving Waters

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

7.3.8 Heat Rejection

Each TN-40 cask is designed and licensed to reject up to 27 kW (0.675 kW per assembly) of heat generated by the spent fuel. The Prairie Island ISFSI Technical Specifications ensure that these maximum heat load requirements are not exceeded by specifying the following limits on characteristics of Plant spent fuel permitted to be stored in the ISFSI:

Minimum cooling time	10 years
Maximum assembly average burnup	45,000 MWD/MTU
Maximum initial enrichment	3.85 wt% U-235

Each TN-40HT cask will be designed and licensed to reject up to 32 kW (0.80 kW per assembly) of heat generated by the spent fuel. The cask will be licensed for the following limits on characteristics of Plant spent fuel:

Minimum cooling time	12 years
Maximum assembly average burnup	60,000 MWD/MTU
Maximum initial enrichment	5.00 wt% U-235
Maximum heat load	0.80 kW

Magnitudes of 27 kW for the TN-40 and 32 kW for the TN-40HT of heat rejection to the atmosphere per cask will not adversely affect the surrounding environment.

7.3.9 Noise

A sound level survey was conducted on November 15-16, 2006 to document the existing ambient sound levels at the closest residents to the plant. This data was used to assess the noise impact of the construction and operation of the spent fuel storage facility. The plant was operating during the ambient survey, but the cooling towers were not. The wind was mostly calm to 3.5 mph from the north, the temperature around 39° F, with overcast skies and a 46% RH.

7.3.9.1 Noise Standards

The State of Minnesota has noise standards found in Minnesota Rule 7030.0040, Subp. 2. These rules limit the daytime L50 sound level to 60 dBA1. The L50 is the sound level exceeded 50 percent of the time.

7.3.9.2 Ambient Sound Levels

Six noise measurement locations were used and are shown in Figure 7-11. The measured ambient sound level data are summarized in Table 7-6. As indicated in the table the daytime sound levels are mostly controlled by local traffic and trains. The highest sound levels were at Location #3 near the casino, which were in the 43-46 dBA range because of casino related traffic. The quietest levels were generally the more distant locations, such as #1 and #6, which were mostly in the 32-36 dBA range, or about 10 dBA quieter than the levels near the casino. Locations #2 and #4 were in between, in the range of 40 dBA.

The power plant was only audible at Location #1, with what sounded like ventilation fan noise.

Table 7-6: Summary of Measured Ambient L90s

	Daytime				Ambient Noise Sources
LOCATION	11-15-06		11-16-06		
	Morn.	Aftnoon	Morn.	Aftnoon	
#1. C. Suter Residence	34	34.6	31.9	32.3	Vents from plant
#2. 1754 Messiah Rd.	38.2	40.7	37.8	37.5	Local vehicle and train traffic
#3. Casino parking lot	42.5	46.1	43.8	43.3	Local vehicle and train traffic and casino vent fans on roof
#4. 1960 Edoka St.	39.9	41.7	40	39.9	Local vehicle and train traffic
#5. 1824 Edoka St.	35.3	35.7	32.2	33.5	Local vehicle and train traffic
#6. 5390 Sturgeon Lake Rd.	36.1	33.1	34.5	40.7	Local vehicle and train traffic

7.3.9.3 Construction Sound Levels

The first phase of construction will consist of excavation and site preparation for the duct banks and the new storage pads. The second phase of construction will include concrete trucks pouring the duct banks and pads.

The construction equipment used in the analysis is listed in Table 7-7 by phase. The 50 ft Lmax sound level for each item of equipment is as per Thalheimer2. This maximum level occurs only when the equipment is operating at full power. However, not all equipment will be operating all the time, and, when operating, will often be in a quieter, low power mode. An "Acoustic Usage Factor" (AUF) was therefore applied to the maximum sound level to correct the levels for the time the equipment is not operating at full power.

The AUF for the tabulated equipment is 40 percent or –4 dBA2. The reduced corrected sound levels were then converted to sound power levels, which represents the total acoustical energy of the source. The sound power levels were used in a computer model to calculate the expected sound levels at the nearest noise sensitive receptors. The calculation took into consideration hemispherical spreading and atmospheric absorption.

Table 7-7: Construction and Operation Equipment Sound Levels and Acoustic Usage Factors

Equipment	Phase 1	Phase 2	Phase, Operation	Lmax , 50 ft. dBA	Acoustic Usage Factor
Bulldozer	1			85	-4 dB
Scraper	1			85	-4 dB
Dump Trucks	2			84	-4 dB
Grader	1			85	-4 dB
Backhoe	1			80	-4 dB
Concrete Trucks		1		85	-4 dB
Water Truck	1			84	-4 dB
Light Trucks	1			55	-4 dB
Front End Loader			1	80	-4 dB
Cask Transport Vehicle			1	84	0

The predicted sound levels for residences near the Construction Site are shown in Table 7-8 for the two phases of construction, along with the existing operation and ambient sound levels. It can be seen that the predicted levels are higher than the ambient sound levels at all locations. However, all the construction sound levels are well below the Minnesota daytime code limit of 60 dBA2.

Table 7-8: Comparison of Construction and Operational Sound Levels with Daytime Ambient L_{90}s.

LOCATION	Phase 1 L_{eq}	Phase 2 L_{eq}	Operational L_{eq}	Lowest daytime L_{90}	Max dBA above ambient
#1. C. Suter Residence	47.9	41.2	43.2	31.9	16
#2. 1754 Messiah Rd. Residence	54.0	47.3	49.2	37.5	16.5
#3. Casino parking lot	44.5	37.8	39.8	42.5	2
#4. 1960 Edoka St. Residence	47.3	40.6	42.6	39.9	7.4
#5. 1824 Edoka St. Residence	51.5	44.8	46.7	32.2	19.3
#6. 5390 Sturgeon Lake Re. Res.	48.0	41.3	43.3	33.1	14.9

7.3.9.4 Operational Sound Levels

During normal operation the ISFSI has no operation activities and therefore has no noise impact on the area. The expansion of the ISFSI will not result in any increase in sound levels during operation. When spent fuel is moved from the plant to the concrete pad there is some noise impact due to the operation of a truck or front end loader.

To be conservative, the Front End Loader was given an AUF of zero dB and the Truck was assigned a value of –4 dB. Table 7-8 presents the estimated operational sound level in the community. All of the operational sound levels at the receptors are well below the Minnesota daytime code limit of 60 dBA.

7.3.9.5 Conclusions

The construction and operational sound levels of the facility will be above the existing residential daytime L90 sound levels but well below the Minnesota daytime code limit of an L50 of 60 dBA.

Additional survey information, including the times of data collection, the L10 and L50 levels, and the audible noise sources are given in Tables 7-9 through 7-12.

Table 7-9: Morning Sound Level Survey, November 15, 2006
Ten Minute Samples

LOCATION	TIME	L_{90}	L_{50}	L_{10}	L_{eq}	Controlling Noise Sources
#1. C. Suter Residence	10:15a.m.	34	35.8	40.3	48.1	Vent fans from plant
#2. 1754 Messiah Rd. Residence	10:36a.m.	38.2	39	41.2	40.4	Local vehicle and train traffic
#3. Casino parking lot	11:25a.m.	42.5	44.5	52.1	48.1	Local vehicle and train traffic and casino vent fans on roof
#4. 1960 Edoka St. Residence	11:45a.m.	39.9	41.6	46.1	49.8	Local vehicle and train traffic
#5. 1824 Edoka St. Residence	12:02p.m.	35.3	36.8	42.6	39.1	Local vehicle and train traffic
#6. 5390 Sturgeon Lake Re. Residence	12:51p.m.	36.1	42.9	53.4	58.6	Local vehicle and train traffic

Table 7-10: Afternoon Sound Level Survey, November 15, 2006
Ten Minute Samples

LOCATION	TIME	L_{90}	L_{50}	L_{10}	L_{eq}	Controlling Noise Sources
#1. C. Suter Residence	13:25p.m.	34.6	38.4	43.6	49.8	Vent fans from plant
#2. 1754 Messiah Rd. Residence	15:02p.m.	38.1	39.1	41.4	40.6	Local vehicle and train traffic
#3. Casino parking lot	14:40p.m.	46.1	50.8	56.2	53.3	Local vehicle and train traffic and casino vent fans on roof
#4. 1960 Edoka St. Residence	13:45p.m.	41.7	45.4	54	49.1	Local vehicle and train traffic
#5. 1824 Edoka St. Residence	14:02p.m.	35.7	38.6	43.3	40	Local vehicle and train traffic
#6. 5390 Sturgeon Lake Re. Residence	14:21 p.m.	33.1	35.4	38.1	36.6	Local vehicle and train traffic

Table 7-11: Morning Sound Level Survey, November 16, 2006
Ten Minute Samples

LOCATION	TIME	L_{90}	L_{50}	L_{10}	L_{eq}	Controlling Noise Sources
#1. C. Suter Residence	9:15a.m.	31.9	34.6	67	63.3	Vent fans from plant
#2. 1754 Messiah Rd. Residence	8:50a.m.	37.8	39.4	47.4	47.5	Local vehicle and train traffic
#3. Casino parking lot	7:31a.m.	43.8	43.9	56.2	52.1	Local vehicle and train traffic and casino vent fans on roof
#4. 1960 Edoka St. Residence	8:16a.m.	40	42.8	50.1	54	Local vehicle and train traffic
#5. 1824 Edoka St. Residence	8:33a.m.	32.2	33.8	37	35	Local vehicle and train traffic
#6. 5390 Sturgeon Lake Re. Residence	7:50a.m.	34.5	38.2	41.4	40.3	Local vehicle and train traffic

Table 7-12: Afternoon Sound Level Survey, November 16, 2006
Ten Minute Samples

LOCATION	TIME	L_{90}	L_{50}	L_{10}	L_{eq}	Controlling Noise Sources
#1. C. Suter Residence	12:20p.m.	32.3	34.4	38.2	36	Vent fans from plant
#2. 1754 Messiah Rd. Residence	12:44p.m.	37.5	39	44.4	48.6	Local vehicle and train traffic
#3. Casino parking lot	13:16p.m.	43.3	47.2	56.5	53	Local vehicle and train traffic and casino vent fans on roof
#4. 1960 Edoka St. Residence	13:35p.m.	39.9	42.4	47.8	49	Local vehicle and train traffic
#5. 1824 Edoka St. Residence	13:53p.m.	33.5	35.9	39.4	37.1	Local vehicle and train traffic
#6. 5390 Sturgeon Lake Re. Residence	14:14p.m.	40.7	43.3	48.5	46.2	Local vehicle and train traffic

7.4 Pollution Control and Safeguards Equipment

In the following section, we provide information on the pollution controls and safeguards as required in Minnesota Rule 7855.0660.

7.4.1 Management of Radioactive Materials

Radioactive materials will be sealed in a cask via a double metallic seal bolted lid. Analyses of normal, off-normal, and accident conditions in spent fuel storage system Safety Analysis Reports have determined that no credible conditions can breach the cask shell or fail the double metallic seals. The casks are designed and tested to meet the criteria of ANSI N14.5 with leakage rates not exceeding 1 E-5 standard cubic centimeters per second (scc/sec). The casks are designed to maintain confinement integrity during normal conditions of storage, and off-normal and postulated accident conditions, including earthquake, tornado, tornado missile, and drop of the storage cask.

7.4.2 Contingency Plans in the Event of an Accidental Release of Radioactive Materials

An emergency plan is required for the Prairie Island spent fuel storage facility, in accordance with 10 CFR 72.32(c). The 10 CFR 50.47 emergency plan already in effect for the nuclear power plant is applied to the ISFSI and was modified to address potential accidents associated with the ISFSI. The Prairie Island emergency plan describes the organization, assessment actions, activation of the emergency organization, notification procedures, emergency facilities, training, provisions for maintaining emergency preparedness, and recovery criteria for off-normal and accident conditions.

7.4.3 Recycling Methods to Dispose of Solid or Liquid Wastes

The Prairie Island spent fuel storage facility contains no systems that produce either solid or liquid wastes. Therefore, no recycling methods are proposed or required for this facility.

7.4.4 Emission Control Devices and Dust Control Measures

There are no air emissions expected from the site. Although the construction and operational sound levels during cask transfer at the site will be above the existing daytime L90 ambient sound levels, they will be well below the Minnesota daytime code limit of an L50 of 60 dBA. Therefore no noise impact will occur at the nearest noise sensitive receptors and no noise control devices will be required.

The only sources of dust will be from construction activities and will be controlled by wetting exposed soil areas and covering stockpiles. During operation of the ISFSI, the only fugitive dust source will be that which is produced by the train car during the infrequent delivery of casks to the site. This is considered to be a negligible source of fugitive dust.

7.4.5 Water Pollution Control Equipment and Runoff Control Measures

The ISFSI will not have any pollution discharges to water during operation and therefore will not require any water pollution control equipment. Since the site expansion will not add any wastes to storm water, it is expected that the quality of the runoff will be similar to the existing runoff quality. The expansion will

add a little more than an acre of impervious surfaces, which will not absorb runoff. Therefore, the quantity of runoff will slightly increase. This runoff will be directed toward natural flow routes around the facility. Energy absorbing controls such as riprap and sediment controls will be used to minimize erosion into these natural flow routes.

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

The proposed expansion of the pads at the Prairie Island ISFSI is not expected to disturb any additional undisturbed land area; therefore no additional storm water permitting is expected at this time.

7.4.6 Spill and Leak Prevention Measures

The storage system is designed with a double metallic seal bolted lid so that there are no leaks of any radioactive materials. The facility will also contain no restroom facilities or any other wastewater generating processes that could involve a spill or leak. Therefore, no spill or leak prevention measures are required.

7.4.7 Heat Rejection Reduction Methods

The TN-40 casks are designed and licensed to reject up to 27 kw (0.675 kW per assembly) of heat generated by the spent fuel. The TN-40HT casks are designed and will be licensed to reject up to 32 kW (0.80 kW per assembly) of heat generated by the spent fuel. Magnitudes of 27 kW for the TN-40 and 32 kW for the TN-40HT of heat rejection to the atmosphere per cask will not adversely affect the surrounding environment and no heat rejection reduction methods will be applied to the facility.

7.4.8 Other Equipment or Measures to Reduce Effects of Facility on the Environment

The facility will have negligible effect on the environment, therefore no additional equipment or measures are required.

7.4.9 Environmental Monitoring

7.4.9.1 Radiation Monitoring System

According to 10 CFR 72.126(b), radiological alarm systems must be provided in accessible work areas as appropriate to warn operating personnel of radiation and airborne radioactive material concentrations above a given set point and of concentrations of radioactive material in effluents above control limits. However, significant airborne radioactivity releases are precluded by the cask design in which the closures are sealed by double metallic seals and confirmed by the storage system testing criteria that conforms in ANSI N14.5. Therefore, airborne radioactivity monitoring is not required for the ISFSI.

According to 10 CFR 72.126(c)(2), areas containing radioactive materials must be provided with systems for measuring the direct radiation levels in and around these areas. Adequate radiological monitoring will be provided by portable survey instruments during cask handling and for other activities. Thermo-luminescent Dosimeters (TLDs) are located on the outer (nuisance) fence that surrounds the ISFSI, to monitor cumulative direct radiation levels over predetermined time intervals as part of the environmental monitoring program. Personnel entering the ISFSI radiation restricted area will be provided with dosimetry to accurately measure, record, and report exposure on an individual basis.

In addition to the radiation monitoring required by the NRC, the Minnesota Department of Health continuously monitors radiation levels.

7.5 Estimates of Induced Development

In this section, we provide information regarding induced development as required by Minnesota Rule 7855.0670.

7.5.1 Vehicular Traffic During Construction and Operation

7.5.1.1 Traffic from Construction

Construction of the two new pads will consist of earthwork, structural fill and concrete materials being brought to the site, delivery of equipment and supplies, and daily construction workers commuting to the sites in the morning and afternoon on work days during an assumed shift length of 8 hours, at least five days per week for a duration of a few weeks. The traffic estimates represent a reasonable approximation of the construction traffic that can be anticipated as a result of this project.

The initial construction will include excavation and structural fill for the storage pads. These activities will take a maximum of 1-week duration (5 working days) to complete. The storage pads must be supported by structural fill. The area of the pads is 216 ft x 18 ft. The typical depth required for fill is around 3 ft. The volume of fill is 216 x 18 x 3 = 11,664 cu ft per pad or 864 CY total. The smallest truck (end dump) has a volume of 10 CY versus a larger truck (belly dump) of 20 CY. Assuming the smallest truck is used since it is a small site, the total number of truck trips will be 864 / 10 = 87 total trips. At least 3 trucks are assumed per hour depending on whether the location of the gravel pit can accommodate the site (this is not a strenuous level - more trucks could be used to increase the trips per hour). This will require 87 trips / 3 trucks per hour / 8 hours per day = 4 workdays to provide the fill. The total daily traffic will be 24 trips plus commuting traffic.

Following excavation of the in-situ soil and placement of the structural fill, each pad will require formwork in preparation of concrete pouring during week 2. The total rebar tonnage will be approximately 150 tons. Assuming a typical flatbed payload of 25 tons, an estimated 6 truck trips will be required to deliver the rebar. The total daily traffic will be 6 trips that will occur over 1 to 2 days plus commuting traffic for the workers.

Each storage pad is 216 ft x 18 ft x 3 ft, which has a volume of 432 CY. Therefore, the total required concrete would be 432 x 2 = 864 CY. Concrete is also used for the duct bank that must be run from the pads to the alarm monitor building. Assuming the duct bank is 2 ft high x 3 ft wide and is 260 ft long to the east pad and 540 ft to the west pad, then the volume of concrete is [2 x 3 x 260 + 2 x 3 x 540]/27 = 178 CY. A typical cement truck can hold 8 to 10 CY. Assuming it can hold only 8 CY, the number of total cement truck trips required is (864 + 178) / 8 = 131 trips. If it is assumed that only 3 trucks

deliver per hour during a workday of 8 hours, then it will require 131 / 3 trips per hour / 8 hours per day = 6 workdays to pour all the concrete. The total daily traffic will be 24 trips plus commuting traffic. This activity would occur during the last part of week 2 and primarily during week 3.

Following concrete placement there will be fill replacement of the structural fill that was removed around the pads and pulling of the monitoring wiring between the alarm monitoring building and pads. It is estimated that fill replacement, performed by up to 2 heavy equipment operators, will take no more than 2 days. Wire placement could take up to one week and will require 1 to 2 light truck trips per day. These activities will be performed during week 4. During this period the total daily traffic will primarily be only commuter traffic.

In addition to material and equipment deliveries, an average construction labor force of 4 workers per day is projected. There will also be 2 project management personnel who currently work at the Plant and will not add to the impact of the traffic due to the construction work. The peak number of construction labor workers, occurring during concrete placement, will be 5 workers. The average number of construction labor workers per day will be approximately 6.

It is anticipated that workers will commute to and from the construction site on a daily basis utilizing individual passenger vehicles and light trucks. The number of workers will add up to an additional 6 trips/day average on the Prairie Island access roads.

7.5.1.2 Traffic from Operation

During operation, there will be no increase in traffic since there are no additional full time workers at the ISFSI. (Table 7-13). When a cask campaign is engaged (typically a week long) the only vehicles added to the facility will be the cask transport vehicle. This vehicle operates solely on the Plant property. No other significant traffic increases are expected during operation.

Table 7-13 Summary of Additional Traffic

	Added Daily Traffic Construction Vehicles Max. (vehicles/day)	Commute 1-hour morn 1-hour evening (vehicles/day)
Construction	24	6
Operation	None	None

7.5.2 Work Force During Construction and Operation

7.5.2.1 Work Force During Construction

Construction of two new Prairie Island ISFSI pads will involve earthwork to excavate the pad area, placement of structural fill under the pad area before pouring and around the pads after pouring, form and pour the storage pads and ductbank, and installation of electrical wiring. Equipment could typically include bulldozers, scrapers, dump trucks, graders, water trucks, cement trucks, and light vehicles (pickup trucks). The work will be performed over a 1-month period, during daytime hours and is estimated to require approximately 13 workers (Table 7-14) including equipment operators, laborers, electricians, iron-workers, concrete finishers, and construction supervision staff.

**Table 7-14 Estimated Construction Labor Force
1-Month Project Duration**

SPECIALTY	NO. OF WORKERS	CONSTRUCTION PERIOD
Project Engineer	1	Weeks 1 – 4
Construction Manager	1	Weeks 1 – 4
General Superintendent	1	Weeks 1 – 4
Earthwork Equip Operators	2	Weeks 1 and 4
Iron Workers (rebar)	2	Week 2
Cement Truck Operators	2	Weeks 2-3
Concrete Finishers	2	Weeks 2-3
Electricians	2	Week 4
Total	13	

7.5.2.2 Work Force During Operation

The proposed expansion of the ISFSI will not require the addition of any workers. Transfer of the spent fuel will involve placing the storage cask loaded with spent fuel in the cask transport vehicle in the Auxiliary Building, moving it to the ISFSI site, placing the cask in the storage pad, and connecting the overpressure monitoring system. This process requires an 8-man crew. These activities are conducted during daytime hours and only occasionally every other year. The ISFSI is not normally manned and has no workers other than security personnel.

7.5.3 Impacts to Utilities and Public Services

The ISFSI is a low use type of facility. The only electrical demand is for operation of the facility lighting, security systems, and state owned radiation monitors. The additional pads and storage casks will not increase the electrical demands of the site. No new utilities will be required.

Since the proposal calls for increasing the storage within the footprint of the existing ISFSI, there is no need to alter the access road. Therefore, no additional public access roads will be required for the facility.

7.5.4 Water Usage During Construction and Operation

Water may be used to provide dust control during excavation of in situ soil and placement of fill for the pads. A typical water truck holds approximately 7500 gallons of water. The dust control activities are estimated to use less than 1 truck load per day over a total of 7 days of the 1 month project during earthwork activities. Assuming the truck makes 1 trip per day then 7,500 gallons could be used per day. Over a 7-day period a total of up to 52,500 gallons could be used. This is a gross over estimation however, since the total volume of water is expected to be much less.

The water is expected to be from the closest source, the Mississippi River, which is located a few feet away.

The ISFSI contains no restroom or any other type of system that uses water. Therefore, during operation, no water is used by the facility.

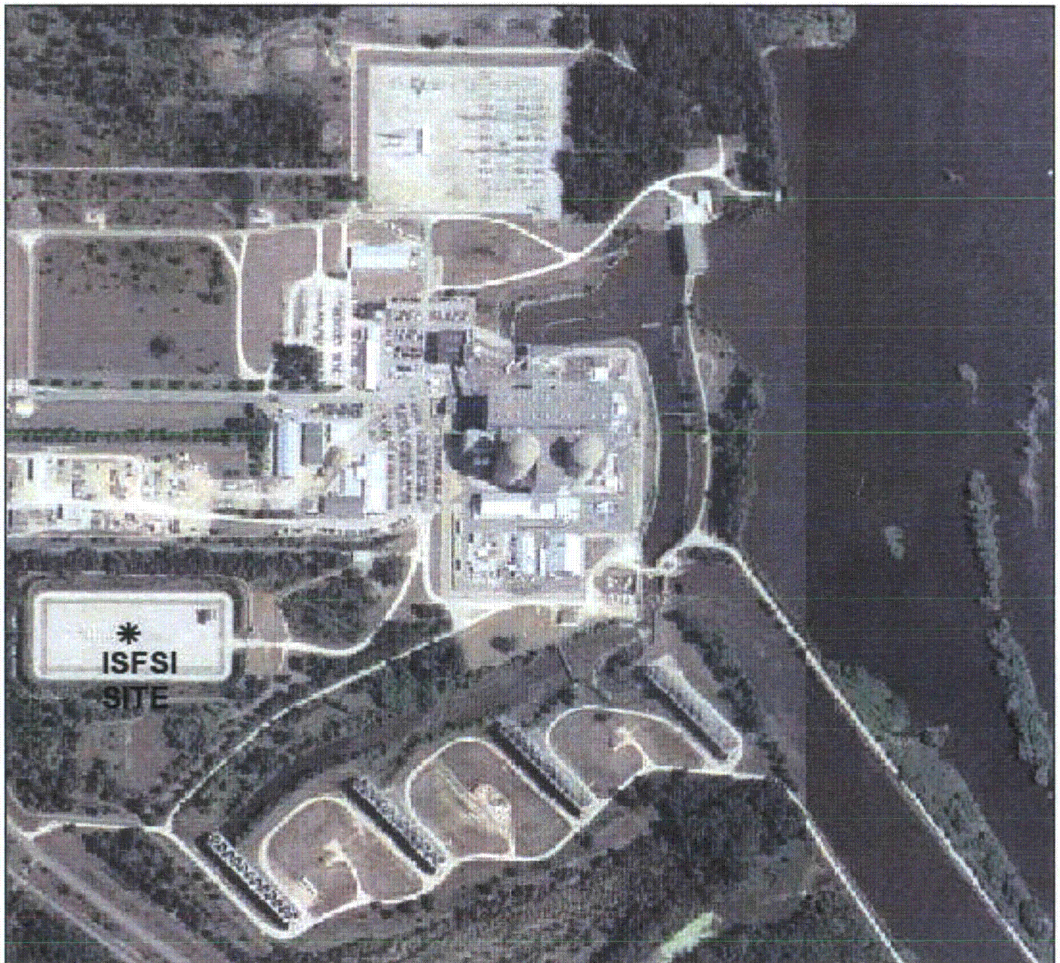
7.5.5 Impacts on Agricultural Lands

Since the proposal calls for increasing the storage within the footprint of the existing ISFSI, no agricultural land will be lost due to the construction of the additional storage pads.

7.5.6 Impacts on the Local Population

Since the proposal calls for increasing the storage within the footprint of the existing ISFSI, no relocation of people is required.

Figure 7-1
Site
PRAIRIE ISLAND NUCLEAR PLANT



0 125 250 500 750 1,000
Feet
1 inch equals 500 feet

Shaw · Shaw Environmental Inc.

Prairie Island Spent Fuel Storage
Certificate of Need

Figure 7-2
Topography

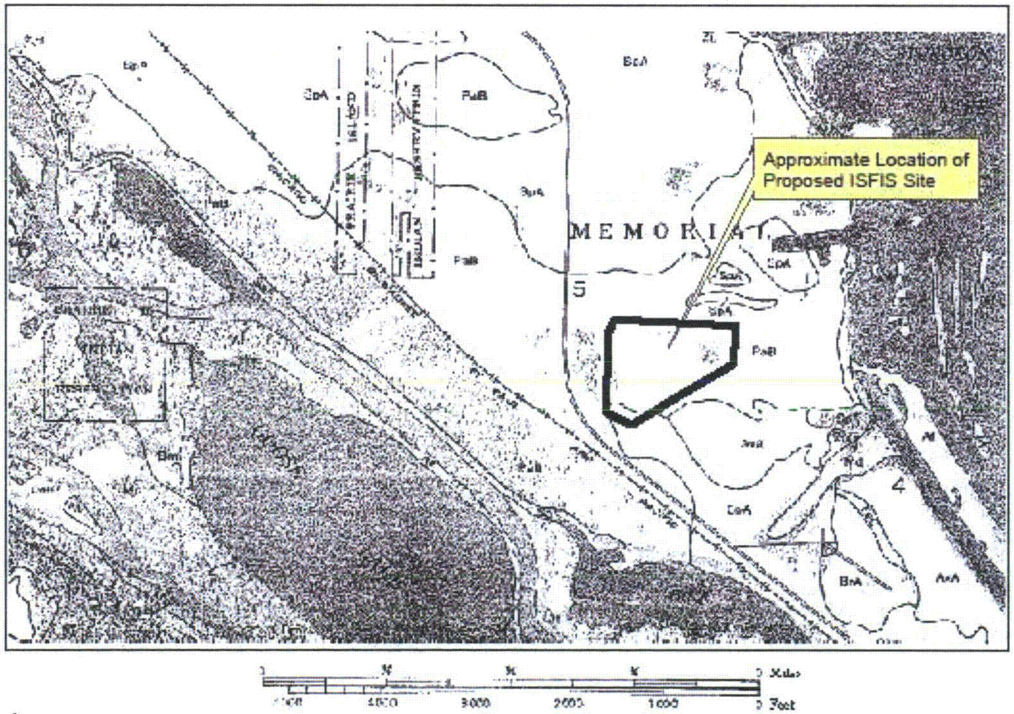
PRAIRIE ISLAND NUCLEAR PLANT

Prairie Island Spen Fuel Storage
Certificate of Need

Figure 7-3

Soils

PRAIRIE ISLAND NUCLEAR PLANT



Legend

Af	Alluvial land, frequently flooded
AvA	Alvin fine sandy loam, 0 to 3 percent slopes
AxA	Ankeny sandy loam, 0 to 3 percent slopes
BrA	Burkhardt loam, 0 to 3 percent slopes
EsC	Estherville soils, 6 to 18 percent slopes
LlA	Lilah sandy loam, 0 to 6 percent slopes
Md	Marsh
Mp	McPaul silt loam
PaB	Plainfield loamy sand, 0 to 6 percent slopes
PaD	Plainfield loamy sand, 6 to 25 percent slopes
SaE	Salida gravelly coarse sand, 12 to 45 percent slopes
SpA	Sparta loamy sand, 0 to 3 percent slopes
Zu	Zumbro loamy sand

Source: Sheet Number 8, *Soil Survey of Goodhue County, Minnesota* (Poch 1976)

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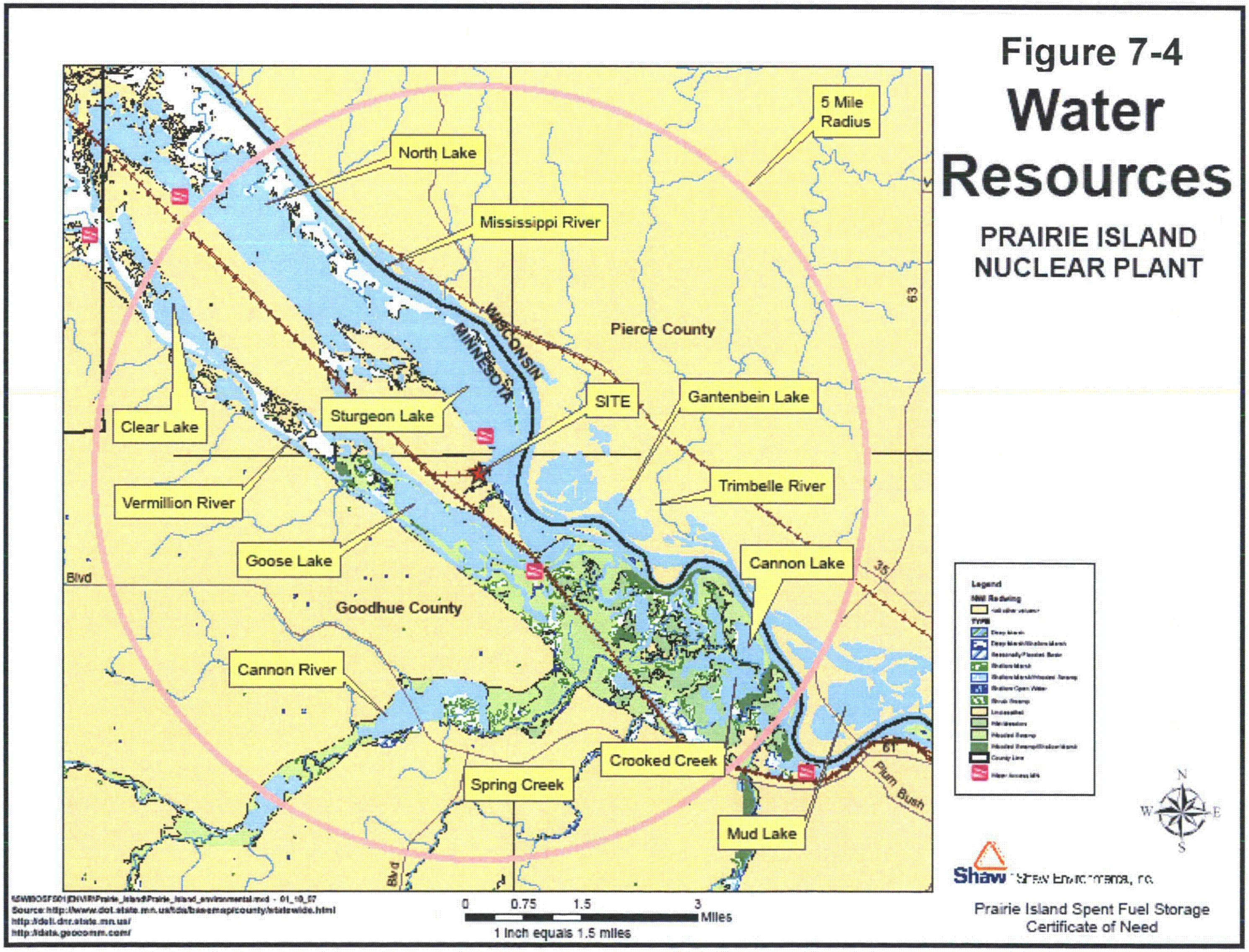
Figure 7-4
Water Resources
PRAIRIE ISLAND NUCLEAR PLANT
5 Mile Radius
North Lake
Mississippi River
Pierce County
WISCONSIN
MINNESOTA
SITE
Gantenbein Lake
Clear Lake
Sturgeon Lake
Trimbelle River
Vermillion River
Goose Lake
Cannon Lake
Goodhue County
Cannon River
Crooked Creek
Spring Creek
Mud Lake
Plum Bush
0 0.75 1.5 3 Miles
1 inch equals 1.5 miles
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Xcel Energy

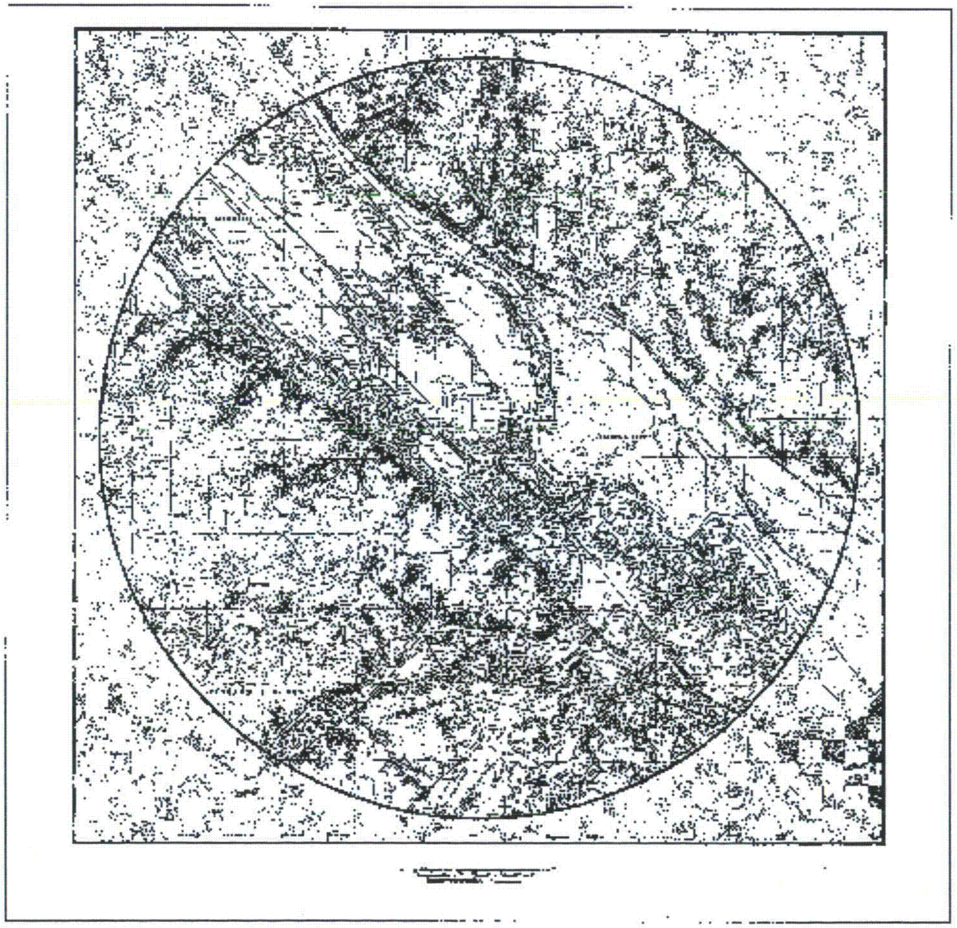

Figure 7-5

Wetland Resources

PRAIRIE ISLAND NUCLEAR PLANT

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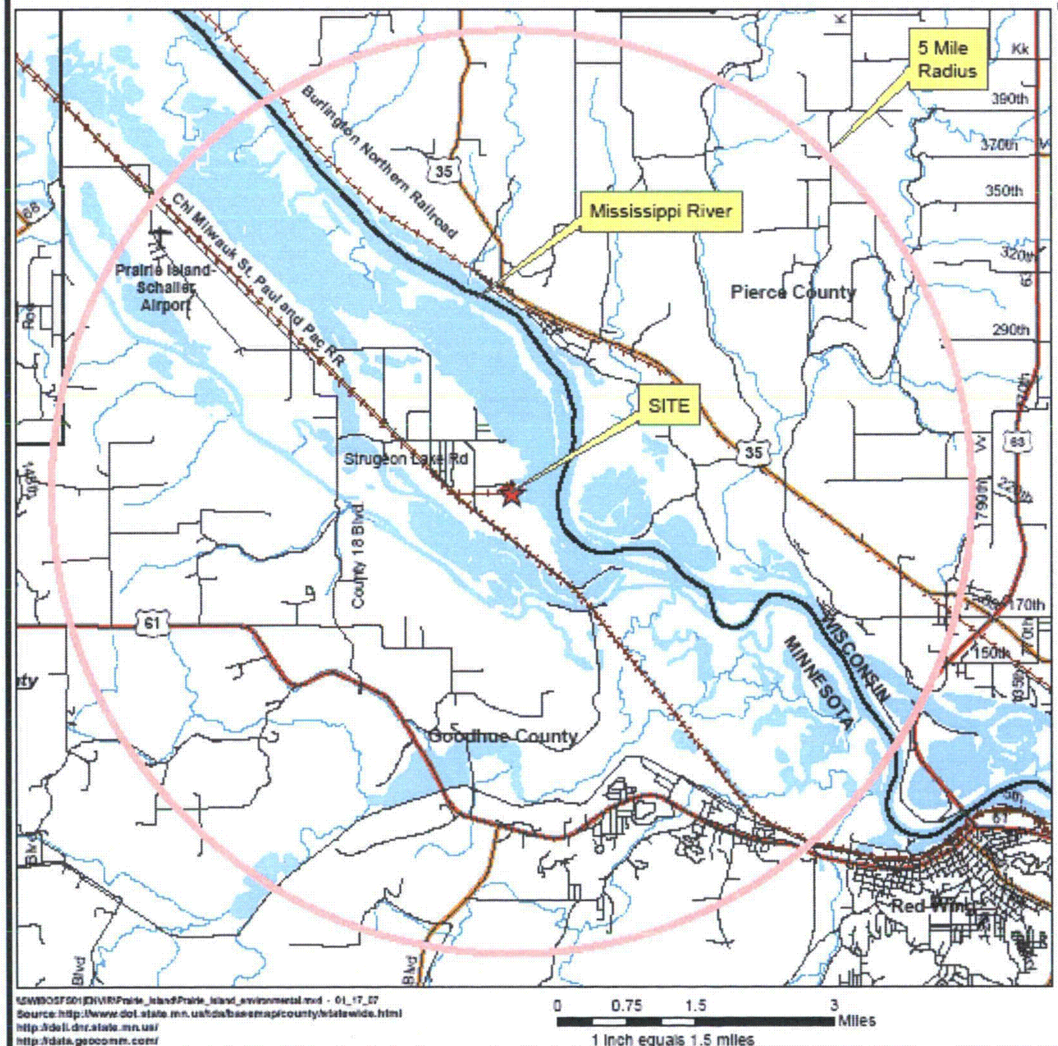
Figure 7-6
Transportation

PRAIRIE ISLAND NUCLEAR PLANT



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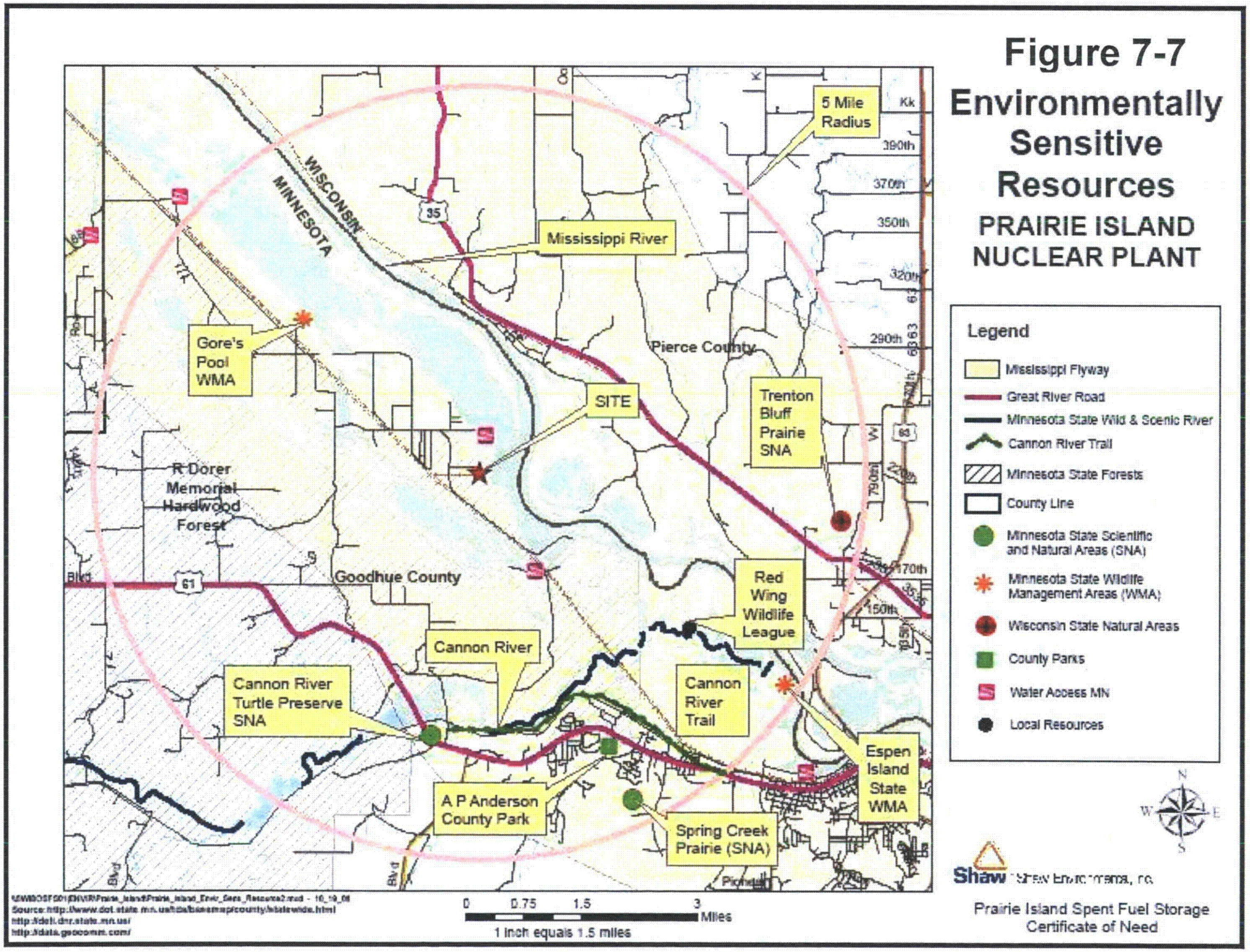
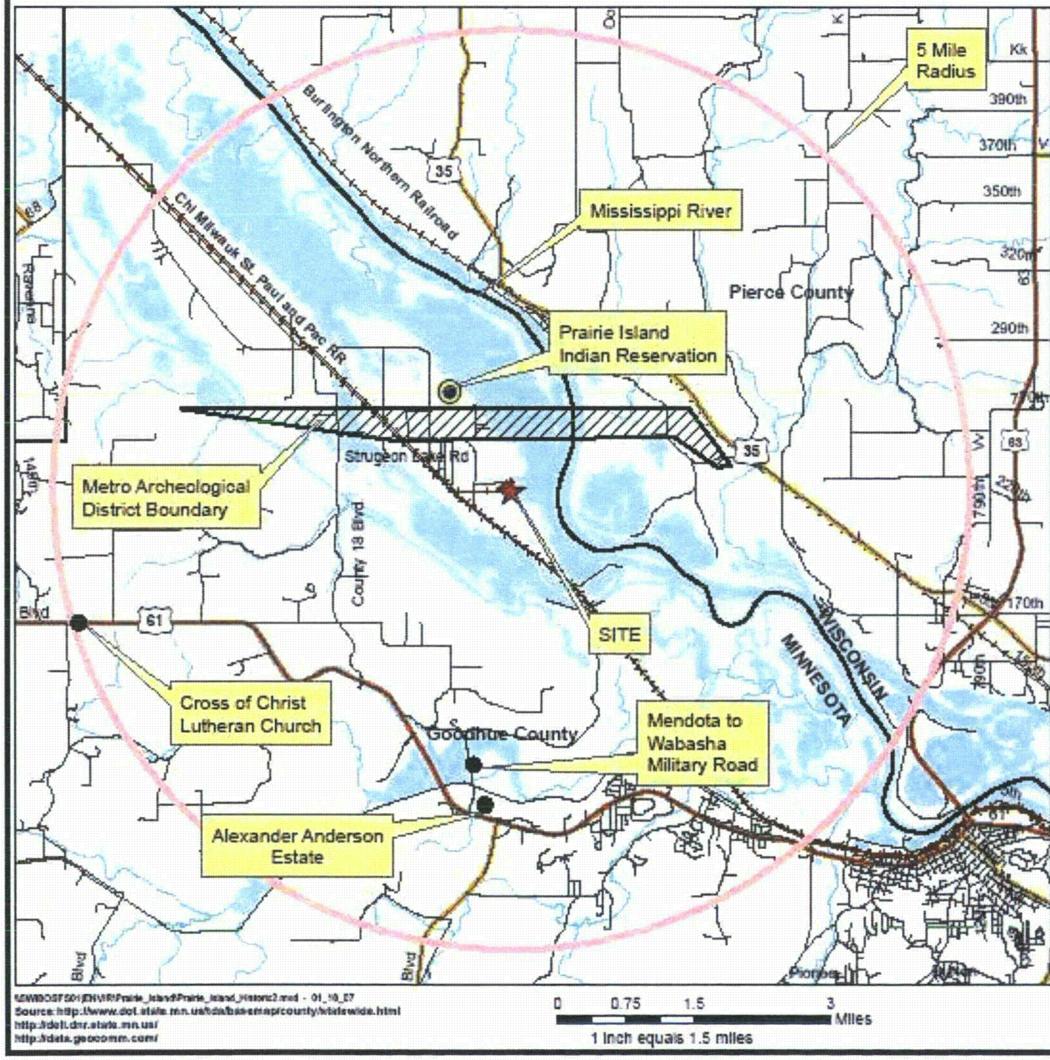


Figure 7-7
Environmentally Sensitive Resources
PRAIRIE ISLAND NUCLEAR PLANT

Figure 7-8
Historic and Cultural Resources

PRAIRIE ISLAND NUCLEAR PLANT



Legend

- Ferdeal Historic Area
- National Register of Historic Places Site
- Indian reservation

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Prairie Island Spent Fuel Storage
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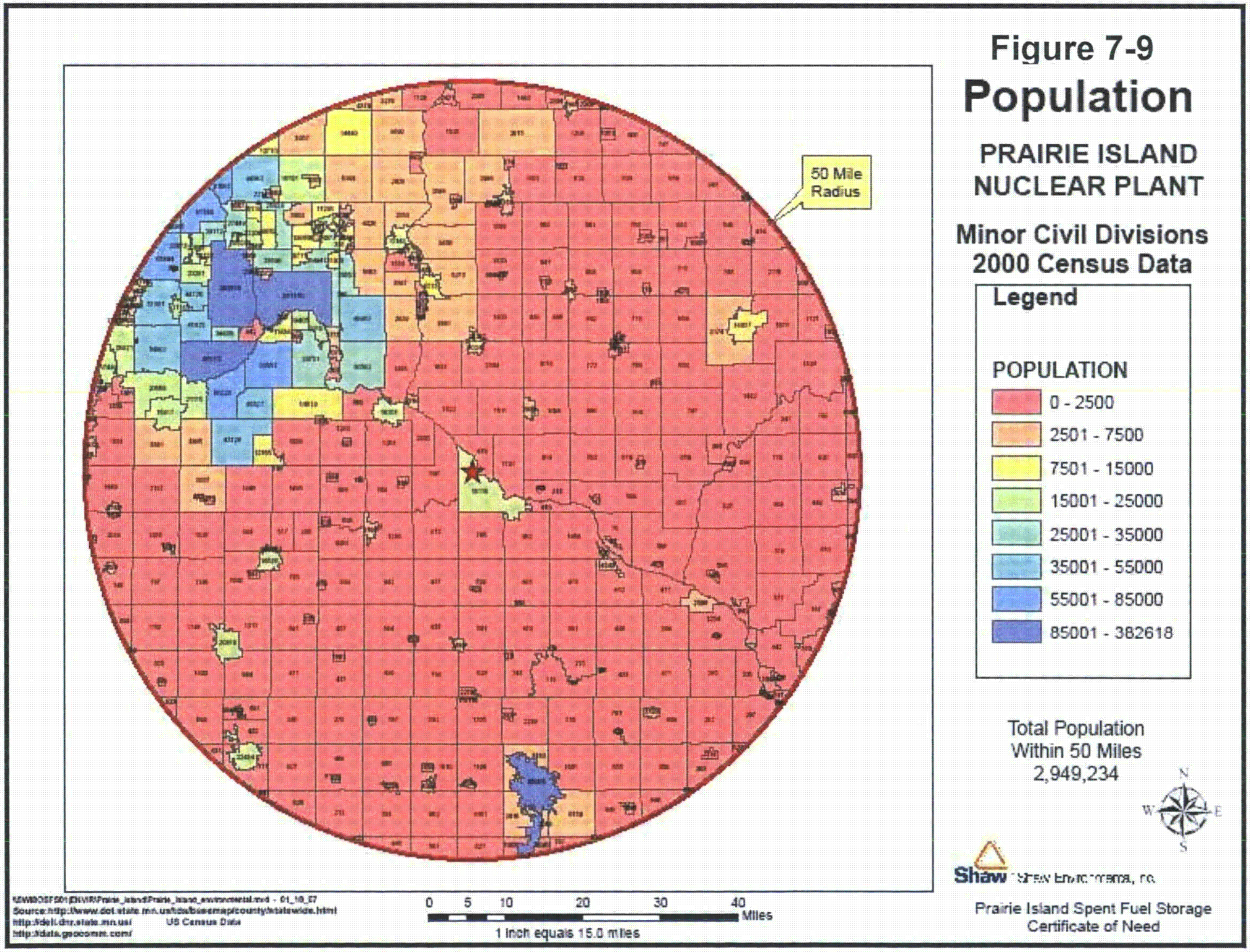


Figure 7-9
Population
PRAIRIE ISLAND
NUCLEAR PLANT
Minor Civil Divisions
2000 Census Data
Legend
POPULATION
0 - 2500
2501 - 7500
7501 - 15000
15001 - 25000
25001 - 35000
35001 - 55000
55001 - 85000
85001 - 382618
Total Population
Within 50 Miles
2,949,234
N
W
E
S
50 Mile
Radius
US Census Data
http://data.geocomm.com/
0 5 10 20 30 40
Miles
1 inch equals 15.0 miles
Prairie Island Spent Fuel Storage
Certificate of Need

Figure 7-10 Prairie Island ISFSI Site Boundaries

(Boundary Shown in Red)

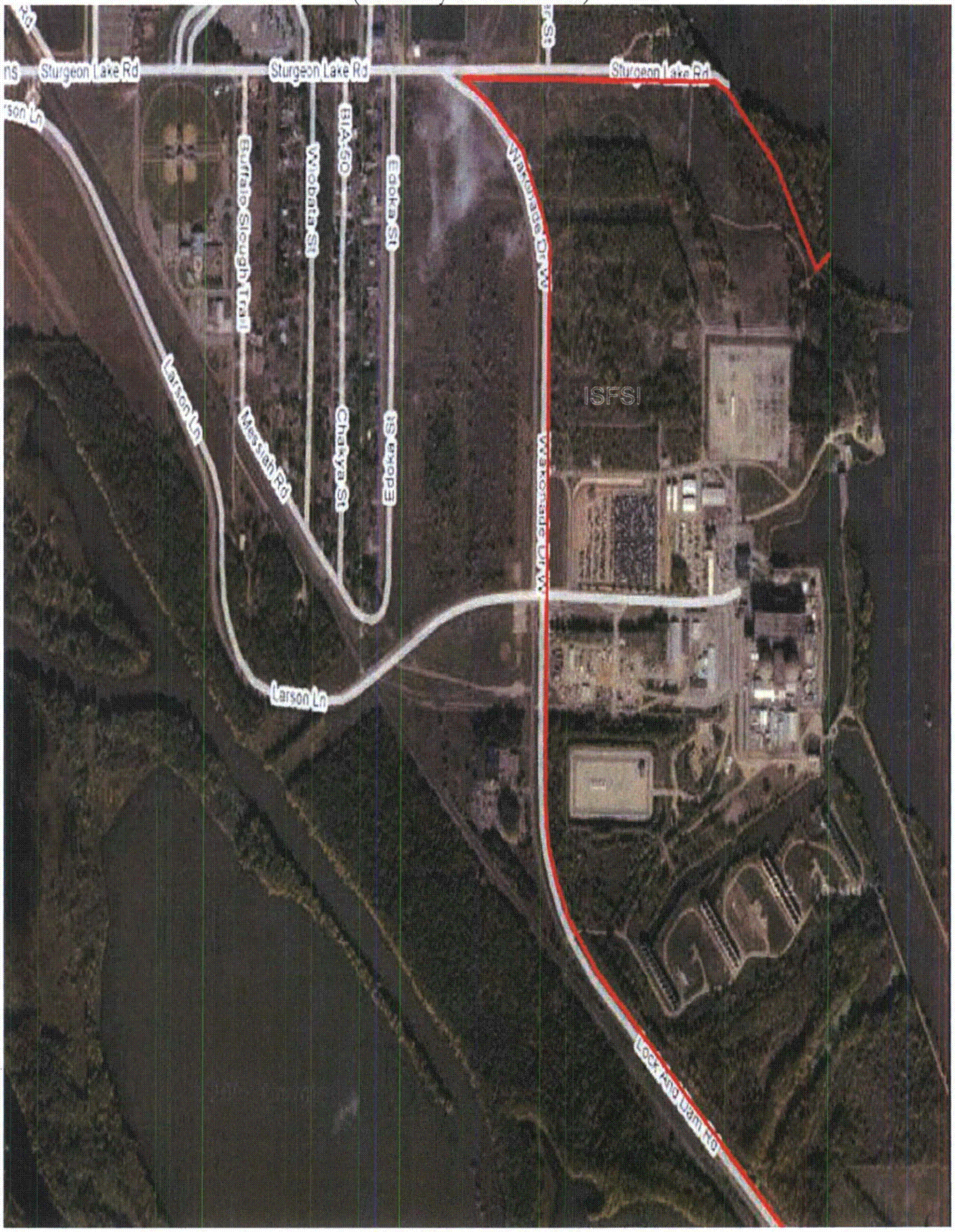


Figure 7-11 Noise Measurement Locations

8 Power Uprate Environmental Information

8.1 Section Summary

This section discusses the environmental impacts of the proposed uprate project and provides the environmental data required under Minn. R. Parts 7849.0310, 7849.0320 and 7849.0340. The environmental impacts of the power uprate project and the alternatives are listed in Tables 8-12 and 8-13 at the end of this section.

The proposed power uprate project will not have any significant negative environmental impacts. Environmental impacts of the power uprate will include:[25]

- a significant reduction carbon emissions, as compared to the alternatives;
- an increase in water use by up to approximately 10 percent, but not above the currently permitted level;
- a slight increase in circulating water outfall temperature, but not above the limits currently set by the MPCA; and
- a slight increase in radioactive releases, but by no more than 10 percent and well below current limits.

[25] Xcel Energy has provided conservative estimates of the extent of the adverse impacts of the proposed power uprate project. As the Company completes detailed design and engineering activities, it will confirm that the conservative estimates presented bound the actual impacts.

8.2 Power Uprate Project Environmental Information

8.2.1 Land Requirements (Minn. R. 7849.0320(A))

The Prairie Island uprate project will not increase the land requirements for the generating plant and does not result in any activity that will change or otherwise modify the present requirements for land use at the site. The project does not involve the construction of any new facilities, access roads, parking areas; lay down areas, or onsite transmission/distribution equipment to support power uprate activities at Prairie Island. Except for transportation of equipment and routine disposal of waste, power uprate maintenance activities will be confined to the inner-plant security fenced area. The power uprate will not affect the storage requirements for above- or below-ground tanks. 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.

It is our intent to salvage the old turbine components and other equipment that are being replaced. No radioactive contaminated equipment is expected.

8.2.2 Traffic

Plant modifications to accomplish power uprate will be completed primarily 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 nonpower 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.

8.2.3 Water Use for Alternate Cooling Systems

8.2.3.1 Ground Water

The power uprate will not involve significant increases in groundwater consumption and thus will not affect groundwater resource permit limits.

Groundwater use is governed by water appropriation limits of the Minnesota Department of Natural Resources (MDNR). 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. 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 equals approximately 850 gpm, ground water appropriation permit numbers 69-171-G, 78-5153, 86-5114, and 96402, limit the usage to a total of 354.7 million gallons per year for the five wells. Over a recent period of five years (2003 through 2007), the maximum usage was 61.6 million gallons in 2005 (See Table 8-1). Assuming a 10 percent increase in groundwater use applied to the maximum annual usage over the past five years of 61.6 million gallons in 2005, the projected maximum use would be approximately 68 million gallons or 129.4 gpm.

Any increases in makeup to plant systems from these sources are expected to be minor, and operation within the allowable permit limits will continue. The maximum 68 million gallons is still significantly less than the 355 million gallons per year permit limit. Thus, the power uprate project will not affect compliance with the permit limits. A more realistic calculation based on the average usage the past four years of 52.3 million gallons per year would indicate a reasonably expected usage of 57.5 million gallons per year.

Table 8-1: Reported Pumping Permit Appropriation (MGY)

Year	2003	2004	2005	2006	2007
Reported	41.9 MGY 128.63 acre ft 79.72 gpm	54.6 MGY 167.62 acre ft 103.60 gpm	61.6 MGY 189.11 acre ft 117.20 gpm	58.6 MGY 179.90 acre ft 111.49 gpm	44.8 MGY 137.53 acre ft 85.24 gpm

8.2.3.2 Surface Water Appropriation

Based on a range of assumptions, the power uprate will increase surface water appropriations by approximately 1300-acre ft/year. This increase is within the limits of the current surface water permit.

Surface water use at Prairie Island is in accordance with the water appropriation limits of the MDNR. Under surface water appropriation permit number 69-0172, amended in June 1995, Prairie Island draws water from the Mississippi River for plant condenser cooling and auxiliary water systems, such as service water cooling, intake screen wash, and fire protection. Prairie Island may withdraw up to 235,000 million gallons of water per year from the Mississippi River. Over a period of five recent years (2001 through 2005), a maximum of 207,650 million gallons of water was withdrawn, occurring during the year 2005.

The circulating water system removes heat for the generating plant. Excess heat from the steam leaving the turbine is transferred to circulating water flowing through the condenser tubes. Based on seasonal limitations heat is transferred to the environment either by the use of the cooling towers, discharge to the river or a combination of cooling towers and river discharge. Operating restrictions are governed by the National Pollutant Discharge Elimination System (NPDES).

The average annual river water withdrawal for years 2000-2005 was 849 cfs (614,880 acre-ft/yr). The estimated average annual water loss due to evaporation and drift is approximately 39 cfs (28,245 acre-ft/yr) with 810 cfs being returned to the river.

Assuming that evaporative rate is proportional to the proposed power increase of about 10 percent, the power uprate could potentially cause an increase in evaporation rate to about 43 cfs. The water loss of 43 cfs by evaporation is about 0.23 percent of the 18,380 cfs average Mississippi River flow and is approximately 1 % of the lowest annual mean of 4,367 cfs. Based on this comparison, it is concluded that any impacts caused by higher evaporative losses of 43 cfs from the Mississippi river is very small and has insignificant impact on the Mississippi River flow.

8.2.4 Water Discharges (Minn. R. 7849.0320(F))

8.2.4.1 Water Discharge Flow Rates

The power uprate will not result in any increase in wastewater discharges beyond those allowed under the current applicable permits.

Wastewater discharges are regulated by the State of Minnesota through the NPDES permit. The NPDES permit is periodically reviewed and re-issued by the Minnesota Pollution Control Agency (MPCA). The NPDES permit for Prairie Island, permit number MN0004006, was issued on June 30, 2006 and expires on August 31, 2010. The NPDES permit authorizes discharges and intakes and imposes limits and/or monitoring/reporting requirements for the discharges listed in Tables 8-2. No changes to the discharge permit requirements, other than administrative and descriptive changes, are necessary to implement the power uprate.

Table 8-2: Surface Water Discharge Streams

Stream	Description	Maximum Flow	Average Flow
SD 001	Condenser/circulating water and Cooling Water	864	503
SD 002	Steam Generator blowdown	0.576	0.012
SD 003	Radioactive waste Effluent	0.230	0.002
SD 004	Reverse Osmosis Effluent (Monitoring and Reporting requirements only)	0.244	0.051
SD 005	U 1 Turbine Building sump	0.360	0.030
SD 006	U 2 Turbine Building sump	0.360	0.030
SD 010	Misc Plant Floor Drains	0.015	0.001
SD 012	Intake Screen wash (Monitoring and Reporting Requirements Only)	3.2	2.0
WS 001 & SW 002	Combined U 1/U 2 Cooling water	69	25

Specific limits for each discharge as imposed by the NPDES permit are summarized below. None of these limits described below will require modification to implement the power uprate.

(SD 001) Condenser/Circulating Water and Cooling Water

The total discharge flow limits are summarized below in Table 8-3.

Table 8-3: NPDES Discharge Flow Limits Permit Limits (millions gallons per day)

Dates	Limiting Flow (mgd)	Notes
April 15 to30	97**	River Flow < 15,000 cfs
April 15 to 30	194**	River flow > 15,000 cfs
May 1 to 31	194**	
June 1 to 15	259**	
June 16 to 30	517.5**	
Balance of year	N/A	

Million Gallons Day (mgd); Gallons Per Minute (gpm); Cubic Feet Second (cfs)

** This flow limit may be exceeded if required to maintain condenser inlet temperature to less than 85 F, provided (a) the additional flow to achieve the necessary inlet temperature is minimized, and (b) cooling towers are operating to the maximum extent possible.

There are no anticipated changes to the river intake flow limits for operation after power uprate implementation. The river intake flow limits given in the current NPDES permit will allow for sustained operation after power uprate.

8.2.4.2 Water Discharge Temperature

The power uprate project will result in slight increases in circulating water outlet temperature, but will be managed by cooling towers that can operate in various modes or derating the plant to meet permit requirements for water appropriations and thermal discharge. These increases will not result in any significant impacts to the environment.

Thermal limits in the current permit (issued on June 30, 2006) are keyed to temperatures in the Mississippi River up-and downstream of the plant, which are referred to the permit as spring and fall "trigger points." From April 1 through the fall "trigger point" (when daily average upstream river temperature falls below 43° F for five consecutive days) Prairie Island is required to operate cooling towers in such a way that:

> Discharge temperature requirements are such that the river downstream of the plant shall not exceed a daily average of 86° F

Additionally, the water temperature below Lock and Dam 3 (Outfall SD 001) shall not be raised by more than 5 degrees above ambient (upstream) temperature.

Also, if ambient (upstream) temperature reaches or exceed 78° F for two days, Prairie Island is required to operate cooling towers "to the maximum extent practicable" (NPDES Permit No. MN0004006, Chapter 6, Section 2.3), meaning two cooling tower per operating unit.

In addition, Plant operating procedure has administrative targets for canal discharge temperature of 95° F in summer and 85° F in winter.

Water for condenser cooling is withdrawn from the Mississippi River. Water used for service water-cooling, screen wash, irrigation, and domestic water supply is groundwater withdrawn from on-site wells. Station surface water and groundwater withdrawals are governed by water appropriation limits set by the Minnesota Department of Natural Resources (MN DNR). Water Appropriations Permit Number 690172 limits withdrawal of surface water from the Mississippi River for condenser cooling to 630,000 gpm.

The FES related to the Prairie Island Nuclear Generating Plant describes the original configuration of the plant's cooling water systems, which were extensively modified in the early 1980s. As designed and initially operated, the plant withdrew cooling water from the Mississippi River (Sturgeon Lake) via a 750-foot-long intake canal that extended from the river shoreline to the screen house, where a trash rack removed large debris and four (3/8-inch mesh) traveling screens (per unit) removed fish and smaller debris. A skimmer wall (barrier) at the mouth of the intake canal prevented large floating objects from entering the intake canal. The plant's heated discharge flowed into a discharge basin, from which it was (depending on plant operating mode) either pumped to the cooling towers or discharged to the river via an 800-foot-long canal. The plant could 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).

The plant's cooling system was heavily modified in the early 1980s to reduce impacts of plant operation on aquatic communities. A new intake screenhouse with improved traveling screens was constructed across the mouth of intake canal. A fish return line was installed to convey organisms washed from the traveling screens back to the Mississippi River. A new, half-mile-long discharge

canal with a north-south orientation was created by building a 2,350-foot-long dike that paralleled the river shoreline. A new discharge structure was built at the southern terminus of the canal, and connected to the river's edge by four underground discharge pipes. The new submerged jet discharge was intended to promote rapid mixing of the heated effluent, keep fish out of the discharge canal, and prevent recycling of warm discharge water. The intake and discharge modifications were completed in 1983.

8.2.4.3 Circulating Water System

As previously discussed, Prairie Island withdraws water from the Mississippi River for its circulating water (condenser cooling) system. Key components of the circulating water system and closely related cooling tower system are the intake screenhouse, plant screenhouse, circulating water pumps, condensers, discharge structure, mechanical draft cooling towers, discharge canal, and discharge structure.

The cooling water intake system is designed to minimize impacts to fish populations. Aquatic organisms on the traveling screens and in the attached buckets are lifted to the level of the fish sprays and washed off into a fish collection trough within four minutes. Removal of the fish and organisms is accomplished on the upward travel side with a low pressure [10 pounds per square inch (psi)] inside spray when fine mesh screen is used and with a low pressure (20 psi) outside spray when coarse mesh screen is used. Debris is removed by a backside interior high-pressure (50 psi for fine mesh and 100 psi for coarse mesh) spray system. In spring and summer (April 1 – August 31), traveling screens are equipped with fine mesh (0.5 millimeter) panels. For the remainder of the year, conventional screens with coarse mesh (3/8 inch) panels are employed. Traveling screens can be operated over a range of speeds, depending on panel mesh size and debris loading. The pump supplying the 50 psi fine mesh spray is run at a higher speed to provide a 125 psi spray to supplement the 100 psi coarse mesh spray during periods of high trash loading. The separate fish and debris troughs combine to form a common trough. The fish and debris are then returned to the river through a buried pipe. The pipe discharges at a point approximately 1,500 feet south of the intake screenhouse. Transferring the fish downriver, outside of the influence of the cooling water intake, serves to prevent re-impingement of weakened or disoriented fish. The pipe is designed for velocities between 3 and 5 feet per second with higher velocities encountered for short durations. All internal surfaces of the pipe are

smooth to preclude abrasion damage. The pipe discharges below the mean water elevation at a depth, which ensures submergence below any ice cover.

River water flows into the intake screenhouse through eight (18.5 foot by 11.2 foot) intake bays, each equipped with a trash rack, a 10-foot-wide traveling screen, and high/low pressure wash systems. Bypass gates permit a continuous flow in the event that traveling screens become clogged with debris. After moving through the traveling screens, circulating water flows down the intake canal to the plant screenhouse, where the circulating water pumps are housed. Four circulating water pumps (two per nuclear unit) supply water to the condensers for cooling. Each pump has a design capacity of 147,000 gpm, meaning the circulating water flow is approximately 294,000 gpm per unit and the total circulating water flow is approximately 588,000 gpm. Smaller volumes of water are also withdrawn for its cooling water (i.e., service water) system, which supplies cooling water to a variety of feedwater pumps, air compressors, and small heat exchangers in the plant.

8.2.4.4 Circulating Water System Operating Modes

After passing through the condensers, cooling water is piped to a discharge basin from which it may be (a) pumped to the cooling towers (closed-cycle or helper cycle) or (b) allowed to flow to the discharge canal (open cycle) via the distribution basin. If it is pumped to the cooling towers, the cooling tower outfall may be routed back to the intake canal (closed cycle) or flow to the discharge canal (helper cycle). The distribution basin receives circulating water flow from the discharge basin during open-cycle operation and from the cooling tower return canal during closed-cycle operation. During transition periods (from closed cycle to open cycle), the distribution basin receives flow from both sources.

The cooling tower system is comprised of four towers, fans, water distribution headers and basins. Each tower has one cooling tower pump and is made up of 12 cells grouped together (a bank).

The cooling tower pumps intake water from the discharge basin and discharge into individual distribution pipes to the top of the cooling towers. The pumps are vertical, dry pit pumps mounted so that the casing will be flooded with the water in the discharge basin at normal level. The pump motors are mounted on, and supported by, the pump. The intakes to the pumps are submerged to prevent the intake of air from any cause. Spray nozzles at the top of the

cooling towers break-up the water stream into small streams, which drop by gravity through a maze of "fill" to a basin at the base of the towers. Fans draw air up through the streams of water and the heat of the water is carried into the atmosphere by the airstream. From the cold-water basin at the bottom of the towers, the water flows through the cooling tower return canal to the distribution basin. The towers are designed to accommodate the full circulating water flow of the plant and are capable of removing up to 96 percent of the waste heat generated by plant operation.

Operation of Prairie Island's circulating water system is governed by spring and fall "trigger points." The spring trigger point is defined as 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. From the spring trigger point through 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 can not 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 shall 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 43° F 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).

Prairie Island is equipped with a deicing system to prevent the formation of ice on trash racks, traveling screens, and bypass gates. Warm water is pumped from the discharge canal to the intake screen house via a 30-inch-diameter pipe buried below the frost line. The warm water is discharged at the bottom of the approach canal, directly in front of the intake screen house.

After project implementation, the heat rejected by the condenser will increase. This will result in a corresponding increase in the circulating water outlet temperature for a given system flow rate. The steam cycle heat dissipation is

provided by the circulating water system and the cooling tower system and is the source of thermal discharges from the Plant. No physical modifications or operational changes are required for these systems to implement the power uprate.

The temperature increase across the intake and plant discharge is highest in fall and winter, when once-through cooling is employed. (During the winter, the plant is on partial recirculation to maintain condenser inlet temps >45° F and discharge temps at Lock & Dam #3 from exceeding 43° F.) The temperature increase is lowest in summer and during periods of low river flow, when NPDES permit limits necessitate cooling tower use.

During open cycle operation (late summer and fall) at rated circulating water system flow, it is conservatively estimated that the uprate will result in an increase in temperature of water entering the discharge canal by less than 3° F. During closed cycle and modified helper cycle operation, mathematical modeling shows the water temperature increase will be less than 0.5° F due to increased heat removal in the cooling towers The resultant increase in downstream river temperature in the modified helper cycle mode of operation due to EPU is therefore expected to be less than approximately 0.2° F, even under low river flow conditions. The calculated maximum temperature increase of 3° F at the discharge canal inlet would be experienced during months when cooling tower operation is not required to meet NPDES permit temperature requirements. This resultant discharge canal temperature increase is well bounded by seasonal variations.

To determine the ambient river water temperature, assess the plant's thermal output, and assure compliance with NPDES thermal discharge requirements, river water is monitored by Prairie Island at multiple locations. Temperatures are monitored in the main river channel (upstream), Sturgeon Lake (upstream), the plant intake structure, the discharge canal, and immediately downstream of Lock and Dam Number 3. The highest temperatures at the station upstream of the plant intake structure were 81.0°F in 2000 (July 9), 86.0°F in 2001 (August 8), 82.1°F in 2002 (July 8), 79.8°F in 2003 (August 22), 78.4°F in 2004 (July 22), and 82.7°F in 2005 (July 16). The highest temperature measured over the same period downstream of the plant at the Lock and Dam Number 3 monitoring station was 86.4°F in 2001 (August 9). The highest daily maximum temperature measured at the plant's discharge canal from January 2003 through December 2004 was 99.0°F, recorded on July 28, 2003. The entire length of the discharge canal and adjoining portions of the Mississippi River are within

the plant's exclusion zone, however, and there is no public access to these areas.

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.

Given the information presented, the slight increases in circulating water outlet temperature due to power uprate will not involve any changes in compliance with the present discharge temperature limits established by the MPCA and will not result in any significant impacts to the environment.

8.2.4.5 Water Quality Monitoring

Water quality monitoring programs are detailed in the Prairie Island Monitoring Plan in accordance with the NPDES permit. Effluent limitations and monitoring requirements for the discharges are an integral part of the NPDES permit. Each outfall identified in the permit requires continuous flow monitoring when discharging along with monitoring of the contaminants and pollutants.

The power uprate will not introduce any new contaminants or pollutants and will not significantly increase the amount of any one of the potential contaminants presently allowed for release.

Each outflow is discussed in detail below:

<u>SD 001 Biocide Treatments</u>

Chlorine and bromine may be used for biocide treatment of the circulation water flow through the plant. The NPDES permit regulates residual bromine and chlorine for release to the river. Increased discharge temperatures after the uprate could potentially increase biological growth and need for biocide treatment, but the change in outlet temperatures are small (less than 3° F), and not expected to result in a significant change.

In any case, for operation after the uprate, conditions, residual oxidant levels will be controlled using existing procedures and equipment, and no changes to the permit are required.

<u>SD 002 Steam Generator Blowdown Discharges</u>

The NPDES permit has established Steam Generator Blowdown compliance limits for Total Suspended Solids (TSS). Steam generator blowdown is targeted to a nominal flow as a percentage of feedwater flow. After the uprate, feedwater flow may increase by about 10 percent, in proportion to the power level increase. This increase is not expected to have any significant impact on TSS for this stream, as the feedwater flowing to the steam generators is demineralized water. As shown in Table 8-4, a significant margin exists between the actual TSS values for current operation and the TSS limits.

Table 8-4: Measure steam Generator Blowdowns TSS vs. TSS limits

Measurement date	Calendar quarter Average (kg/day)	Calendar quarter Average (mg/l)	Daily Maximum (kg/day)	Daily Maximum (mg/l)
Limit	26.0	30	217	100
September 2006	0.001	2.8	0.001	4.6
December 2006	<0.001	<1.0	<0.001	<1.0

Even with an increase of about 10 percent by volume in blowdown discharges for operation after the uprate, the Plant will remain in compliance with TSS limits.

SD003 Radwaste Treatment Effluent

The NPDES permit has established radwaste treatment effluent compliance limits for TSS. Radwaste treatment is an offline process and is independent of the operating power level. Radwaste treatment relates to general plant design and material of construction, operating experience with leaking fuel, outage practices and site ALARA practices. Operation after power uprate implementation is therefore expected to have an insignificant impact on the amount of TSS in the liquid radwaste effluent.

As shown in Table 8-5, a significant margin exists between the actual TSS values for current operation and the TSS limits.

Table 8-5: Measured Radwaste Treatment Effluent TSS vs. TSS limits

Measurement date	Calendar Quarter Average (kg/day)	Calendar Quarter Average (mg/l)	Daily Maximum (kg/day)	Daily Maximum (mg/l)
Limit	20	30	86.9	100
September 2006	<0.001	<1.0	<0.001	<1.0
December 2006	0.001	1.6	0.001	1.8

The power uprate project is not expected to have any significant impact on TSS for the radwaste treatment effluent stream, and compliance with the TSS limits will continue.

<u>SD 004 Reverse Osmosis ("RO") Effluent</u>

RO Effluent is currently monitored for flow, and does not have established compliance limits. Typically, demineralized makeup flows at Prairie Island are limiting during startup, shutdown, and outages (i.e., for flushing and filling operations). Therefore, RO effluent is not expected to significantly change following the uprate, and monitoring will continue as required by the NPDES permit.

<u>SD 005 and SD 006 Unit 1 & Unit 2 Turbine Building Sump</u>

The NPDES permit has established turbine building sump discharge compliance limits for total recoverable oil and grease and TSS.

Turbine building sump flows and TSS relate to house-keeping practices, leaking equipment, and effectiveness of oil separators. None of these activities relate to the operating power level in the reactor. Thus, the uprate is not expected to have any significant impact on compliance with the requirements of the NPDES permit.

<u>SD 010 Miscellaneous Floor Drains Discharge</u>

The NPDES permit has established miscellaneous floor drains discharge compliance limits for total recoverable oil and grease and TSS.

Miscellaneous floor drain discharge flow rates and TSS relate to house-keeping practices, leaking equipment, and effectiveness of oil separators. None of these activities relate to the operating power level in the reactor. Thus, the power uprate is not expected to have any significant impact on compliance with the requirements of the NPDES permit.

<u>SD012 Intake Screen Backwash and Fish Return</u>

Intake screen backwash is currently monitored for flow only and does not have any established compliance limits. Since NPDES intake flow limits and operating intake flow limits are not affected by the uprate; screen backwash and fish return are not expected to change significantly.

Other- Storm Water, Dredging, and Land Treatment

The NPDES permit also regulates other site feature activities such as storm water, dredging, and land treatment. The uprate will not require any change in storm water discharge, dredging frequencies and land treatment.

8.2.4.6 Mississippi River Thermal Plume

The thermal plume is normally formed by the cooling tower blowdown during spring, summer, and fall. During the winter season, 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.

The uprate will not 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 cause neither appreciable harm nor adverse levels of impact to aquatic biota.

8.2.4.7 Cold Shock

Cold shock is caused by an unplanned shutdown, and the probability of an unplanned shutdown is independent of power uprate. The projected increase in discharge canal inlet temperature of less than 3° F during open cycle operation at uprate conditions does not result in a significant increase in the overall discharge canal temperature, and 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.

8.2.4.8 Impingement and Entrainment

Section 316(b) of the Clean Water Act (CWA) requires any standard established pursuant to 301 or 306 to require 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 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 entrainment and impingement 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".

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.

The impacts of impingement and entrainment for operation at current power level are small and implementation of the power uprate will not effect impingement and entrainment significantly. Therefore, there is not expected to be any significant increases in the mortality of drift organisms above present levels due to the power uprate.

8.2.5 Radioactive Releases (Minn. R. 7849.0320(G))

The uprate project will not result in any significant increase in radioactive releases.

The uprate will not introduce any new or different radiological release pathways and the uprate will not result in radiological levels above the safe thresholds established by the NRC and in the Technical Specifications for the Plant.
The radioactive waste systems at Prairie Island are designed to collect, process, and dispose of radioactive wastes in a controlled and safe manner. The design bases for these systems during normal operation is to limit discharges in accordance with 10 CFR 20 and to satisfy the design objectives of Appendix I to 10 CFR 50. These limits and objectives will continue to be adhered to after the power uprate.

8.2.5.1 Gaseous Wastes

Gaseous radioactive wastes principally include activation gases and fission product radioactive noble gases resulting from process operations, gases used for tank cover gases, gases collected during venting, and gases generated in the radiochemistry laboratory.

During normal operation, the gaseous effluent treatment systems process and control the release of gaseous radioactive effluents to the environment, and there is almost no discharge of radioactive gaseous waste. However, during refueling and maintenance operation, 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 very small fraction of 10 CFR Part 20 limits.

Implementation of the proposed power uprate does not significantly increase the total inventory of gas normally processed in the gaseous waste management system since the plant system functions are not changing and the volume inputs remain the same.

Prairie Island expects that the concentration of radionuclides in the gaseous radioactive effluents streams would, at most, linearly increase with power as a result of the proposed uprate, by approximately 10 percent. Even with a 10 percent increase, the radioactivity associated with the discharge would still remain well below the estimates provided in Prairie Island's Updated Safety Analysis Report ("USAR") and Final Environmental Statement ("FES"), issued by U. S. Atomic Energy Commission (predecessor agency to NRC) in May of 1973.

Table 8-6: Annual Gaseous Releases

	Noble Gases Curie (Ci)	Particulate & Iodines Curie (Ci)
Actual releases Average over 5 years (2001 -2005)	11.15	163.8 E-06
USAR	3400	0.528
FES	7200	0.330

8.2.5.2 Radiation Levels and Offsite Dose

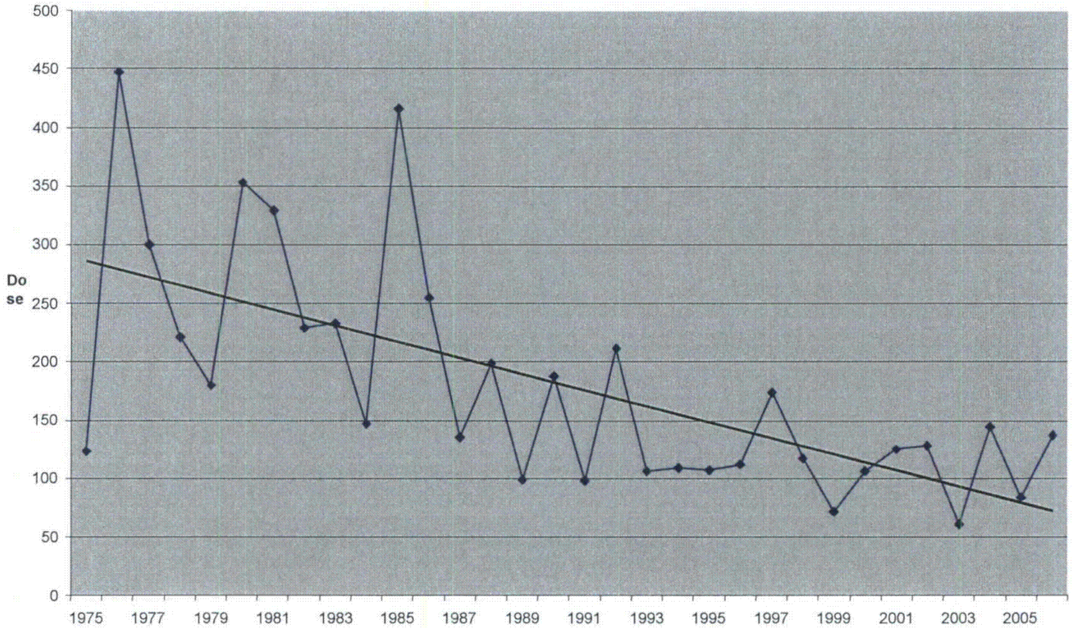
8.2.5.2.1 Operating and Shutdown In-Plant Radiation

The proposed uprate is being expected to increase in-plant radiation dose rates linearly with the increase in core power level by approximately 10%. These higher dose rates should not increase the annual average collective occupational doses more than 10 percent. Figure 8-1 below shows the annual collective dose rate for Prairie Island from 1975 through 2006. The trend line shows that the collective annual dose at the plant has been steadily decreasing. 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 rate from 2002 through 2006 was 110.8 rem. A 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 dose rate of 175 rem.

Plant programs and administrative controls, such as conservatism used in the original design basis reactor coolant system source terms, conservatism used in designing plant shielding, and the PINGP Station Radiation Protection Program will ensure that occupational doses will remain within the regulatory limits of 10 CFR Part 20, with the expected 10 percent increase.

Prairie Island dose reduction programs will also compensate for possible increases in individual doses due to the uprate. The plant radiation protection program will be used to maintain individual doses As Low As Reasonably Achievable ("ALARA"). Routine plant radiation surveys required by the radiation protection program will identify increased radiation levels in accessible areas of the plant and radiation zone postings will be adjusted if necessary. Time within radiation areas is controlled under the radiation protection program. Administrative dose control limits are established well below regulatory criteria and provide significant margin to that allowed by regulatory dose limits.

Figure 8-1 Collective On-Site Dose



8.2.5.2.2 Offsite Doses

8.2.5.2.2.1 Radiological Effluent Doses

The uprate is expected to increase the production and activity of liquid and gaseous effluents by approximately 10 percent. The increase in activity levels is generally proportional to the percentage increase in core thermal power. This slight increase does not affect the large margin to the offsite dose limits established by 10 CFR 20.

Over a recent five-year period (2001 through 2005), the average "Total Body" and "Organ" doses to the off site members of the general public, as reported in the "Annual Radiological Environmental Monitoring Program Report", are bounded by FES and original plant Environmental Report estimates, as well as the dose limits of 10 CFR 50. See Table 8-7 below.

Table 8-7: Radiological Effluent Doses

	Gaseous Effluent		Liquid effluent	
	Total Body Mrem/year mrem/year	Organ	Total Body Mrem/year mrem/year	Organ
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

For the five-year period (2001 through 2005), the average, "Total Body" and "Organ" dose to the off site member of general public from the gaseous and liquid effluents, is only a small fraction of the estimates provided in the FES and Environmental Report, as well as 10 CFR Part 50 Appendix I limits.

The Prairie Island Technical Specifications, part of the Plant's operating license, implement the guidelines of the 10 CFR 50 Appendix I which are well within the 10 CFR 20 limits.

Additionally, Prairie Island's Technical Specification 5.5.4, "Radioactive Effluent Control Program", requires a program that conforms to 10 CFR 50.36a for the control of radioactive effluents and for maintaining the doses to members of the public from radioactive effluents as low as reasonably achievable.

The uprate does not create any new or different sources of offsite dose from Prairie Island operation and does not involve a significant increase in present radiation levels. Therefore, it is concluded that under uprate conditions, offsite doses will remain well within regulatory criteria with insignificant environmental impact.

8.2.5.2.2.2 Postulated Accident Doses

Prairie Island will be required to reanalyze the Postulated Accident Doses to members of the public under power uprate conditions as part of its NRC license amendment request. These calculations will be reviewed by the NRC and the staff's evaluation and acceptance will be presented in the Safety Evaluation Report ("SER").

The NRC's acceptance criteria for radiological consequences analysis using the Alternative Source Term are based on 10 CFR 50.67. The newly calculated doses for postulated accidents following the uprate, using the Alternative Source Term are expected to be well blow the NRC regulatory limits of 10 CFR 50 and Reg. Guide 1.183. Therefore, the effect of the uprate calculated for postulated accident doses is expected to be insignificant.

8.2.6 Radioactive Wastes

8.2.6.1 Radioactive Solid Wastes

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. See Table 8-8 below.

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 linearly increase with power level (i.e. by approximately 10 percent). Even with increases in the activity level of about 10 percent, it is predicted that the results will remain bounded by the associated activity assumed in the FES.

Table 8-8: Annual Low Level Radioactive Solid Waste

	Volume Cubic Feet	Activity Curie (Ci)
Actual Annual Releases Average over 5 years 2001 to 2005	15,597	343
FES	14,925	16,450

In recent years (2004 and 2005), the solid waste volume generated at Prairie Island has been above the quantity considered in the FES. This increase in 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 value 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.

8.2.6.2 Radioactive Liquid Waste

The liquid radioactive waste systems 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, such 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 uprate will not significantly increase the inventory of liquid normally processed by the liquid waste management system. This conclusion is based on the fact that 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 uprate. Even

with this increase of about 10 percent, the maximum liquid effluent radioactivity level will remain bounded by the quantities originally considered in the FES. See Table 8-9 below.

Table 8-9: Annual Liquid Effluent Releases

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

8.2.6.3 Reactor System Wastes

It is not anticipated that the reactor system wastes will increase proportionally to the power increase as the solid or liquid wastes might. Unlike at a boiling water reactor, a pressure water reactor like Prairie Island does not contain the consumable items such as control rods and local range power monitor components that would constitute the reactor system wastes.

Thus, the environmental impact due to generation of radioactive waste from the power uprate project is insignificant.

8.2.7 Non-Radioactive Solid Wastes (Minn. R. 7849.0320(H))

Construction activities associated with the power uprate will generate non-radioactive solid wastes. The volume will be comparable to the waste generated during a typical refueling/maintenance outage. No ongoing solid waste generation will be generated due to the power uprate after construction activities have been completed.

8.2.8 Noise (Minn. R. 7849.0320(I))

The power uprate project will not result in any significant changes to the character, sources, or energy of noise generated at Prairie Island. The new equipment necessary to implement the uprate project will be installed within existing plant buildings. No significant increases in ambient noise levels are

expected within the plant. This includes the upgraded high-pressure turbine, which will operate at the same speed as the original equipment. The effect of the additional period of cooling tower operation on ambient noise levels is not significant. No new significant noise-generating equipment will be installed outside the plant.

8.2.9 Workforce (Minn. R. 7849.0320(J))

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.[26] There is no impact from power uprate on the size of the Plant's workforce during periods of normal operation.

8.2.10 Transmission Facilities (Minn. R. 7849.0320(K))

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. 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. Dynamic stability studies have not been completed to date.

8.3 Power Uprate Project and Alternatives Environmental Information Comparison

Tables 8-10 and 8-11 contain the environmental information required by Minn. R. 7849.

[25] Power uprate may result in a few dozen additional employees on-site during refueling; however, this is an insignificant amount in relation to the approximately 500 additional personnel who will be on-site for the refueling. This extra workforce is not unusual and has been seen in the past during large outages such as the Steam Generator Replacement overhauls in 2004.

Table 8-10: Power Uprate Environmental Information Summary

Rule Reference	Description	Prairie Island Power Uprate
7849.0320 A	Land Requirements	No increased land usage
7849.0320 B	Traffic	No increased levels during construction or normal operation
7849.0320 E (1)	Water Use Maximum	Within permitted levels. Maximum estimated increase of 10 percent
7849.0320 E (1)	Max. Pumping Rate	6 existing ground water wells • 2 - 100 gpm pumps • 2 - 45 gpm pumps • 1 - 10 gpm pump • 1 - 22 gpm pump No new wells or increase from existing wells required
7849.0320 E (1)	Annual Appropriation	Increase surface water appropriations by approximately 1300 acre ft/yr (346.6 acre-ft/year). The increased use is within the limits of the current surface water permit
7849.0320 E (1)	Annual Consumption	Assuming an increase in open cycle consumption of 20% is required for the proposed power uprate, an increase in days of cooling tower operation to 150 days/year, and nominal values of cooling tower flow, the estimated consumption would be 7,700 acre-ft/year.
7849.00320G	Radioactive Releases	• Maximum estimated increases of 10 percent. • Solid increase of 34 curies • Liquid increase of 63 curies • Gaseous increase of o 1.115 curies noble gases o 1.638 E-07 curies particulates and iodines

Table 8-10: Power Uprate Environmental Information Summary

Rule Reference	Description	Prairie Island Power Uprate
7849.0320 H	Non-Radioactive Solid Wastes Produced	• Construction activities associated with the power uprate will generate non-radioactive waste. • The volume will be comparable to the waste generated during a typical refueling/maintenance outage. • No ongoing non-radioactive solid wastes will be generated due to power uprate.
7849.0320 I	Noise	• Power uprate does not result in any significant changes to the character, sources, or energy of noise generated at Prairie Island.
7849.0320 J	Work Force	• No significant change to the size of workforce normally utilized at Prairie Island during construction or normal operation.
7849.0320 K	Transmission Requirements	• No know impact on the environment due to transmission at this time. Working within MISO process.

Table 8-11: Power Uprate Alternatives Environmental Information

Rule Reference	Description	Coal PPA Alternative	Biomass Alternative	Unconstrained Optimization (Gas CT + System Energy)
7849.320 A	Land Requirements	150Acres	150Acres	100Acres
7849.320 B	Traffic	Rail traffic for coal delivery and auto traffic for staffing	Rail or truck traffic for fuel delivery and auto traffic for staffing	Minimal increased traffic to staff one CT.
7849.320 E (1)	Water Use Maximum	133,000gal/hr	133,000gal/hr	109,000gal/hr
7849.320 E (1)	Max. Pumping Rate	Unknown if the unit would utilize ground or surface water. During operation the unit would consume approximately 133,000gal/hr	Unknown if the unit would utilize ground or surface water. During operation the unit would consume approximately 133,000gal/hr	Unknown if the unit would utilize ground or surface water. During operation the unit would consume approximately 109,000gal/hr
7849.320 E (1)	Annual Appropriation	Unknown if the unit would utilize ground or surface water. During operation the unit would consume approximately 133,000gal/hr	Unknown if the unit would utilize ground or surface water. During operation the unit would consume approximately 133,000gal/hr	Unknown if the unit would utilize ground or surface water. During operation the unit would consume approximately 109,000gal/hr
7849.320 E (1)	Annual Consumption	1,100million gal / yr	1,100million gal / yr	44million gal / yr
7849.320 H	Non-Radioactive Solid Wastes Produced	Unit would produce approximately 5 tons of ash per hour.	Unit would produce approximately 10 tons of ash per hour.	None
7849.320 I	Noise	Boiler and steam turbines create significant noise	Boiler and steam turbines create significant noise	Combustion turbines create significant noise.
7849.320 J	Work Force	10-15 full time employees	10-15 full time employees	2 full time employees
7849.320 K	Transmission Requirements	Transmission requirements would be site specific.	Transmission requirements would be site specific.	Transmission requirements would be site specific.

9 Denial Would Adversely Affect Adequacy, Reliability, and Efficiency of Energy Supply System

9.1 Section Summary

The Commission must determine that four principal criteria are met when granting a Certificate of Need (Minn. R. 7855.0120) for additional dry cask storage and Certificate of Need (Minn. R. 7849.0120) for a power uprate. The four criteria are similar for both Certificates of Need.

Our Application for approval of the Prairie Island dry cask storage and power uprate projects meets all four principal criteria. This section addresses the first criterion (Subpart A) that:

Minn. R. 7855.0120, subd. (A).
"the probable result of denial would be an adverse effect upon the future adequacy, reliability, or efficiency of energy supply to the applicant, to the applicant's customers, or to the people of Minnesota and neighboring states."

Minn. R. 7849.0120, subd. (A).
"the probable direct or indirect result of denial would be an adverse effect upon the future adequacy, reliability, safety, or efficiency of energy supply to the applicant, to the applicant's customers, or to the people of Minnesota and neighboring states, considering"

Xcel Energy is one of the primary electrical systems serving Minnesota and neighboring states. Prairie Island plays a critical role in meeting our customers' needs in a cost-effective manner with carbon-free emissions. Prairie Island represents approximately 10 percent of the production capacity used to meet electrical demand and provides nearly 18 percent of the energy delivered to our customers.

In our 2004 Resource Plan, we identified a 1,125 MW deficit in 2015. During the Resource Plan review process, we discussed that the implementation of the Prairie Island and Monticello power uprate projects were contingent upon the successful approval of operating license extensions and additional dry cask storage.[26] The Commission subsequently approved our resource plan and instructed us to seek the necessary government approvals to obtain additional

[26] We filed a Application for license extension for Monticello in March 2005 and the NRC approved it on November 8, 2006. The number of additional casks necessary to support Monticello's power uprate project were not known at the time we filed for Monticello's dry cast storage facility.

MWs from the Monticello, Prairie Island and Sherco generating plants to reduce that deficit.[27] The deficit was further reduced as a result of increased demand-side management ("DSM").

To allow for the continued operation of Prairie Island after the end of its current operating licenses in 2013 and 2014, we must obtain both the renewal of operating licenses from the NRC and approval for additional storage capacity from the Commission. We filed an application with the NRC on April 15, 2008 to renew Prairie Island operating licenses for an additional 20 years.[28] However, in addition to the renewed operating licenses from the NRC, approval for additional storage capacity from the Commission is necessary to continue to operate the plant during the license extension.

The shutdown of Prairie Island in 2013-2014 would adversely affect the future adequacy, reliability, safety and efficiency of the energy supply to our customers. In 2007 Prairie Island produced almost 9 million megawatt-hours of base load electric power. This represents approximately 18 percent of the energy consumed by our customers across the five-state area. If additional storage casks are not obtained, Prairie Island would need to be replaced and decommissioned.

The analysis in this Application is consistent with the analysis in our 2007 Resource Plan. The analysis concludes that the best replacement for Prairie Island, taking into account environmental impacts and cost-effectiveness, would be two 600 MW nature gas combined cycle units. The replacement of Prairie Island with these units would result in a significant increase in emission of air contaminants and overall electricity costs.

As noted in our 2007 Resource Plan and discussed in Section 1 of this Application, we have a deficit starting in 2010 that steadily grows to over 2,800 MW by 2022. The proposed continued operation of Prairie Island and the implementation of the power uprate helps us fill the deficit by providing highly reliable capacity, low-cost, carbon-free energy for many years. Even with the continued operation of Prairie Island, our 2007 Resource Plan also identifies a need for 3,800 MW of natural gas intermediate and peaking resources over the planning horizon.[29] All of these needs were identified after assuming we would add 2,600 MW of wind resources by 2020 to comply with the RES statute and in

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[27] Ordering paragraph 11, Docket No. E002/RP-04-1752, Order dated July 28, 2006.

[28] A copy of the entire Application is available on the NRC and Xcel Energy websites.

[29] The expansion plan resulting from the reference case. It does not consider identified uprates/upgrades or life extension of Manitoba Hydro contract.

addition to an increase from our current level of DSM savings of 0.8 percent to 1.1 percent of retail sales due to the passage of the Next Generation Energy Act of 2007.

Approval of the additional dry cask storage at Prairie Island, and implementation of the power uprate will contribute to our efforts to insure an adequate, reliable and efficient energy supply for our customers, the people of Minnesota and those in neighboring states. Even with the increased commitment to DSM and wind energy, our system is growing and we need additional resources. By gaining additional MW from an existing carbon-free generation source, we can meet our customers' growing energy needs at a reasonable cost while keeping us on the path to achieve the 30 percent carbon reduction goal by 2025.

Denial of our Certificates of Need will have an adverse effect on the adequacy, reliability and efficiency of our energy supply to the region. Denying this CON would increase the probability of inadequate regional generation capability, reduce the reliability of our system, and negatively affect the Company's ability to comply with statutory and regulatory requirements of the Next Generation Energy Act of 2007.

9.2 Forecasting and System Planning

Xcel Energy operates our five-state system in our northern service territory on a system-wide basis. The forecast used to determine the system's resource needs takes into consideration our customers' needs in Michigan, Minnesota, North Dakota, South Dakota and Wisconsin. In determining those needs, we forecast the number of customers and MWh sales by customer class for each of the five-state jurisdictions separately and then aggregate them. The use of a five-state system forecast is appropriate for planning purposes and is consistent with the forecast approved in the 2004 Resource Plan and previous Certificates of Need.

Minn. R. 7849.0270, subp. 2(A) requires data on the annual electric consumption of *Minnesota* customers (emphasis added). A forecast of only Minnesota customers' needs is of little value for system planning purposes. Therefore, the growth of our system depicted in this chapter is the five-state system forecast.[30]

[30] Minn. R. 7849.0270, subp. 2 (A) and subp. 3 and Minn. R. 7849.0270, subp. 3(D) require the submittal of the statistical tests used to prepare the forecast. Since Xcel Energy forecasts peak demand and energy for the five-state system by customer class for each state jurisdiction, the data is voluminous (>1,000 pages). Therefore, we have not included the information required by Minn. R. 7849.0270, subp. 3(D) with this Application, but will provide it on CD upon receiving an information request from the Office of Energy Security.

9.3 Demand and Energy Forecasts are Increasing

9.3.1 Current Peak Demand and Energy Forecast

Our most recent forecast of peak demand for electrical power from customers in our five-state upper Midwest system is shown in Figure 9-1. Consistent with the previous forecast approved in the 2004 Resource Plan, we anticipate that the demand for electrical power will continue to grow in the future. The base demand forecast in Figure 9-1 has not been adjusted for our very successful load management programs. The net forecast reflects our anticipated peak after adjusting for the load management programs.

We currently project energy growth of 1.1 percent or 556 GWH per year and demand growth of 1.2 percent or approximately 133 MW per year[31]. The energy and demand forecasts incorporate a methodology change involving our accounting for DSM savings versus previous forecasts filed. Prior to our 2007 Resource Plan submittal, embedded DSM from past programs was included in the forecast, but the forecasts did not incorporate estimated saving from future DSM programs. Starting with the 2007 Resource Plan our forecasts include an estimate of future DSM savings. The effect of this methodology change is discussed in detail in our 2007 Resource Plan. The methodology used to develop the forecast demand and energy and other forecast details required by Minnesota Rule 7849.0270 are provided in Appendix B: System Demand and Capability Data.

The projected demand growth after complying with the DSM and RES requirements will result in a deficit of 126 MW in 2010 that grows to 2,886 MW by 2022 (Table 9-1). The Prairie Island dry cask storage and power uprate projects provide the needed capacity in the most economic manner and also provide significant benefits towards carbon reduction by displacing energy from existing fossil fuel sources with carbon-free energy going forward.

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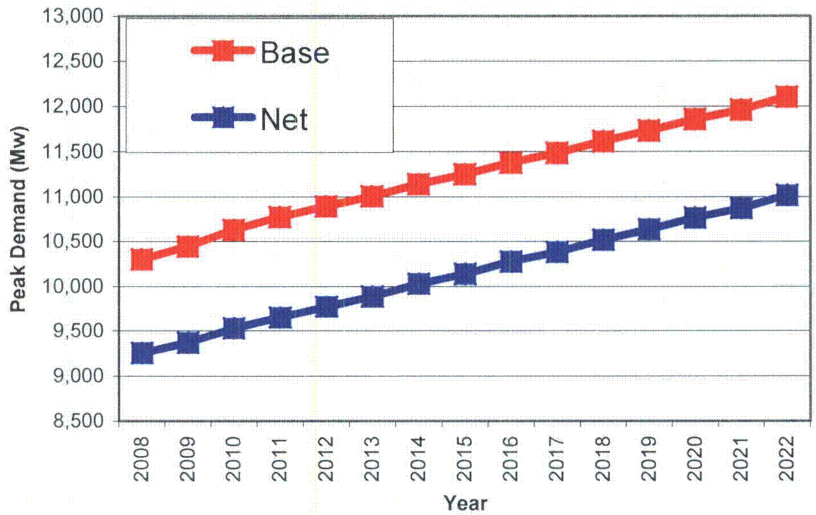
[31] Base energy growth is based on the 50 percent forecast and base demand growth is based on the 90 percent forecast. The data depicted in Figure 8-1 is the 90th percentile Base (uninterrupted) and Net (interrupted) Peak Demand forecast.

Table 9-1: Surplus/(Deficit) Projections

Year	MW
2008	102
2009	83
2010	(126)
2011	(75)
2012	(228)
2013	(395)
2014	(597)
2015	(1,195)
2016	(1,779)
2017	(1,877)
2018	(2,038)
2019	(2,220)
2020	(2,353)
2021	(2,503)
2022	(2,886)

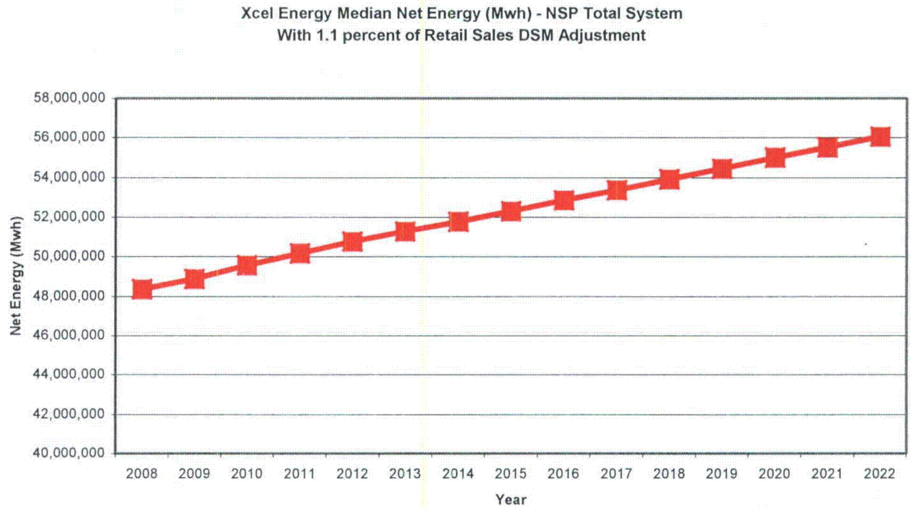
Figure 9-1:
Xcel Energy 90th Percentile Base and Net Summer Peak Demand (MW) NSP Total System - With 1.1% of Retail Sales DSM Adjustment



As seen in Figure 9-2, like the increasing demand forecast, the energy forecast is also growing. After accounting for DSM, the energy forecast grows at an

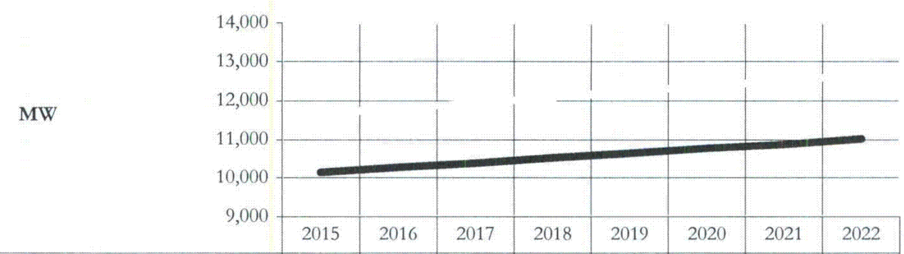
average rate of 1.1 percent. This 1.1 percent annual growth rate equates to an average annual growth of 556 GWh per year on our five-state system.

Figure 9-2: Native Energy Requirements Forecast



In order to determine the generation needed to serve our load determined in Figure 9-1 and meet the MAPP reserve capacity obligations, a 15 percent reserve margin must be added. (Figure 9-3.)

Figure 9-3: Net Peak Demand and Load Obligation



	2015	2016	2017	2018	2019	2020	2021	2022
90% Peak Demand Forecast	10,142	10,277	10,385	10,521	10,638	10,768	10,874	11,021
90% Load Obligation	11,663	11,819	11,943	12,099	12,234	12,383	12,505	12,674

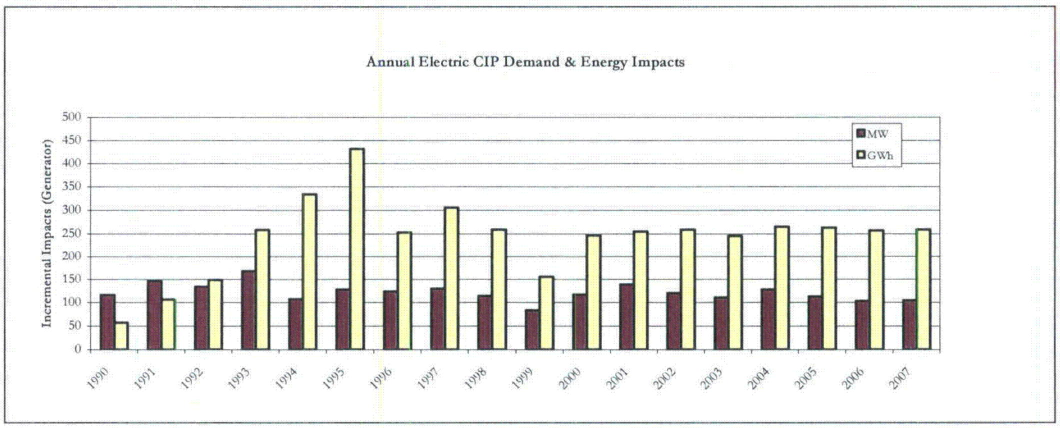
The solid black line in Figure 9-3 illustrates the peak demand level that is likely to be exceeded 10 percent of the time. The black line includes embedded DSM from past programs and future savings estimates from conservation and load management programs. The dashed line is the amount of generation that will be necessary to meet the forecasted demand plus a 15 percent reserve margin.

9.3.2 Forecasts Rely on Continued Aggressive DSM

Our forecasted demand is not growing as a result of promotional activities to sell electricity. We do not have programs promoting the sale of electricity: we have programs that promote the conservation of electricity. The forecast information presented in this section already takes into account the aggressive peak demand and energy savings goals set in our 2007/2008/2009 CIP Triennial Plan for 2008 and 2009. The forecast also assumes we achieve a 1.1 percent reduction in sales from DSM in 2010 and beyond, consistent with the Next Generation Energy Act of 2007.

To meet our demand-side management goals, we have devoted significant resources to our DSM programs, resulting in some of the most significant DSM achievements in the United States. Between 1990 and 2006 in Minnesota, we have achieved nearly 4,100 GWh of energy savings and 2,100 MW of peak demand savings due to our DSM programs, as reflected in Figure 9-4. Of the 2,100 MW of peak demand savings, approximately 875 MW have been controlled through our load management programs. The net peak demand line in Figure 9-3 reflects those load management capabilities.

Figure 9-4: CIP Demand and Energy Impacts[32]



[32] All years have been approved except 2007.

Our current demand and energy-savings goals were approved as part of our 2007-2009 Triennial Plan. Specifically, we are committed to achieving 762 GWh and 271 MW of savings between 2007 and 2009. In our Triennial Plan, we developed two new Business programs, Industrial Efficiency and Segment Efficiency (focused on Commercial Real Estate), as well as one new Residential program, the Home Performance Pilot. Including these three new programs, the Company proposed the goals found in Table 9-2 for our 2007-2009 CIP Triennial Plan. We will continue to evaluate our existing programs and look for ways to better serve customer markets in order to meet the aggressive requirements of the Next Generation Energy Act of 2007.

Table 9-2: DSM Goals as Approved in 2007/2008/2009 CIP Triennial Plan*

	2007	2008	2009	Total
Budget	$45,504,799	$47,002,224	$48,350,183	$140,857,206
Generator kW	87,300	90,980	92,809	271,089
Generator kWh	238,213,749	259,635,189	264,114,597	761,963,535

*Please note that these goals were proposed in the Company's CIP Triennial Plan Errata, filed September 13, 2006 in Docket No. E,G002/CIP-06-80 and approved by the OES on November 29, 2006.

Figures 9-5 and 9-6 indicate our historical commitment to achieving and exceeding its DSM goals. The Company fully expects to meet its CIP energy and demand savings goals in future years.

Figure 9-5: CIP Electric Energy Savings, 2000-2009[33]

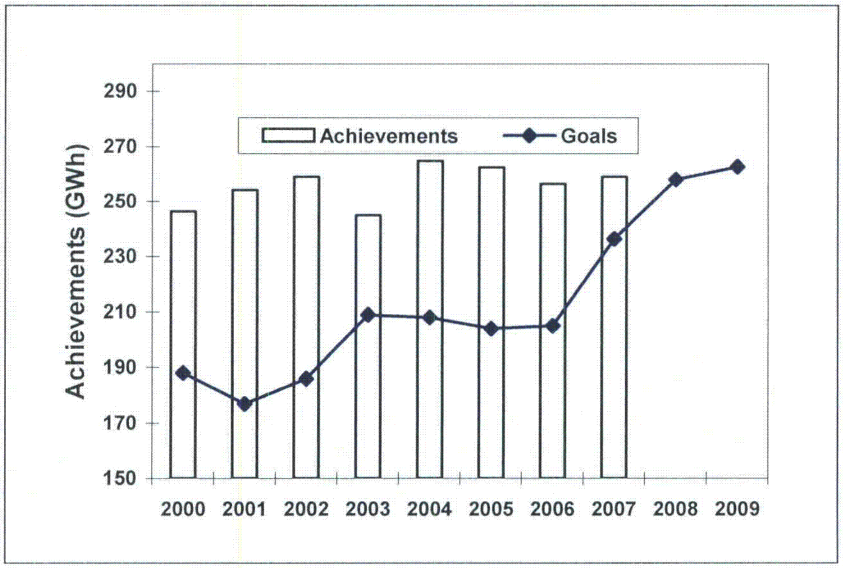
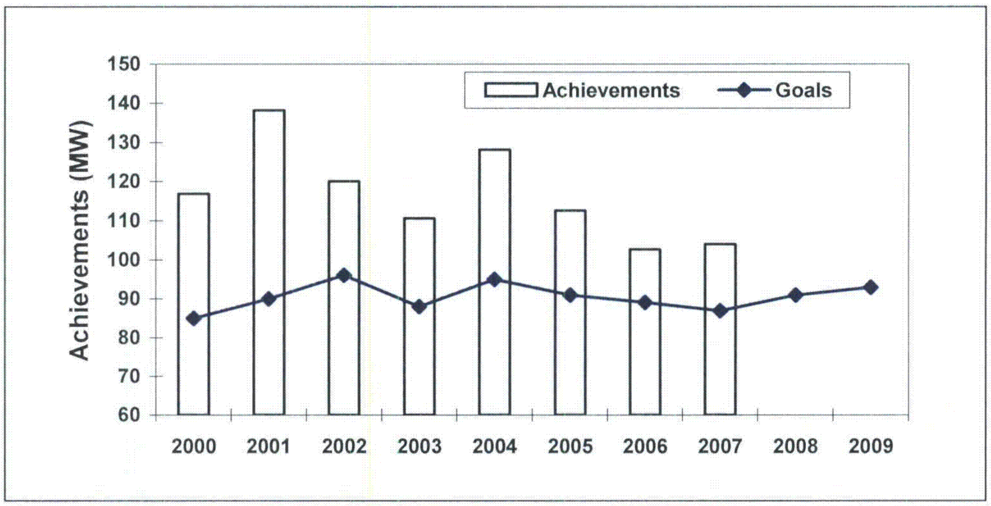


Figure 9-6: CIP Electric Demand Savings, 2000-2009[34]



Additional detail on our conservation and load management programs is presented in Appendix C.

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[33] *Ibid.*

[34] *Ibid.*

9.3.3 Demand and Energy Obligations Include MAPP Reserve Capacity Obligation

The Company is obligated as a member of the MAPP to provide a 15 percent reserve margin, so that adequate backup resources are available to all MAPP members in the event of critical equipment failures on the regional system. In this way, upper midwest power suppliers pool together to ensure the reliability of service to their customers. By pooling resources, total production capacity reserve can actually be reduced. Without the 15 percent reserve commitment from all power suppliers, each company would have to provide a higher level of backup resources to ensure the equivalent reliability of its own system. The solid line on Figure 9-7 reflects the 15 percent reserve capacity obligation, calculated after conservation and load management forecasts are applied to the peak demand forecast.

9.3.4 Meeting Customers' Energy Needs

We meet our customers' needs for electricity with a combination of Company-owned-and-operated generating facilities, and long- and short-term power purchases. To ensure that the actual demand and associated MAPP capacity reserve requirements can be met, we plan our generation supply to meet the 90 percent forecast probability level. Notwithstanding MAPP requirements to maintain a 15 percent reserve margin, we are required under Minn. Stat. § 216B.04 to supply safe, adequate, efficient and reasonable electric service to all customers in our exclusive service territory. The assumption to plan capacity to the 90 percent probability was based on the decreasing availability of capacity reserves in the region and the increasing constraints on the transmission system seen in recent years.[35]

Our most recent forecast of available resources is illustrated in Figure 9-7.

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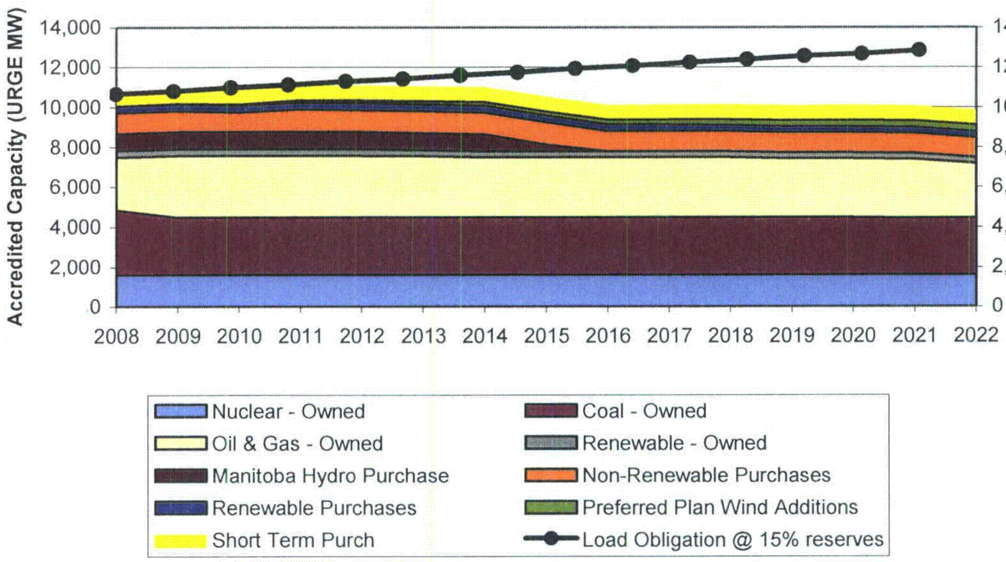
[35] The change to using the 90 percent probability for capacity planning is further explained in Appendix J of this Application.

Figure 9-7: Requirements and Resources



9.3.5 Compliance

Our obligation is to provide sufficient resources to meet our customers' growing energy needs while complying with the requirements of the Next Generation Energy Act of 2007 and the Commission's Order to pursue the uprates from our 2004 Resource Plan. As we determine how best to meet the increased generation needs of our customers, we must do so in a manner that also furthers our compliance with the legislature's 30 percent carbon reduction goal by 2025. The Prairie Island dry cask storage and power uprate projects provide unique opportunities to continue utilizing and expand operation of a carbon-free resource with low-cost capacity and energy.

9.4 Consequences of Project Delay

The Prairie Island nuclear generating plant cannot operate without a license form the NRC. The existing operating licenses will expire in 2013 and 2014. The replacement of 1,100 MW of energy and capacity with similar characteristics will take years to build and permit. Due to the size and importance of Prairie Island as resource, a delay in determination of additional dry storage to support continued operation of Prairie Island is not feasible. We must either decide to

continue to operate the plant an additional 20 years or begin the process of securing the necessary energy and capacity to replace it.

We plan to implement the power uprate at the Prairie Island Plant only if the NRC extends the Plant's operating licenses until 2033 and 2034 and the Commission approves our proposal for addition dry casks at the existing ISFSI. Due to the nature of nuclear power production and the importance of Prairie Island to the system, the only time the construction for the power uprate can take place is during a refueling outage. Refueling outages are scheduled approximately every 18 to 20 months at the Prairie Island plant. The most significant power uprate work will be performed during the 2012 and 2015 refueling outages. Detailed outage construction and refueling schedules are determined years in advance of an outage to minimize plant down time: minimizing plant down time minimizes the cost of replacement power. Delaying this schedule would significantly affect the maintenance, construction and refueling analyses performed. Project delay would also decrease the number of years the power uprate project could provide benefits to customers. During the delay period, customers would not benefit from the availability of the lower cost energy and the environment would not benefit from the increased operation of a carbon-free base load facility.

Denial or delay of the Prairie Island dry cask storage and power uprate projects will have an adverse effect upon the future adequacy, reliability, or efficiency of energy supply to our customers and the region. Additional capacity is required on our system starting in 2010 and the deficit grows steadily. The additional capacity of a highly reliable base load facility complements the significant amount of wind to be added to the system. The low-cost carbon free energy from Prairie Island replaces energy from existing natural gas-fired generation, freeing them up to dispatch as necessary to complement the wind.

10 Projects Benefits Society

10.1 Section Summary

The Prairie Island dry cask storage and power uprate projects benefit society by meeting the overall state energy needs in an economically and environmentally responsible manner, thereby supporting future development in Minnesota and the region.

A Certificate of Need must be granted to an applicant upon determining that four principal criteria are met (Minn. R. 7855.0120 and 7849.0120). This section addresses the third criterion (Subpart C) that:

Minn. R. 7855.0120, subd. (C).
"by a preponderance of the evidence on the record, the proposed facility, or a suitable modification of the facility, will provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments, including human health."

Minn. R. 7849.0120, subd. (C).
"it has been demonstrated by a preponderance of the evidence on the record that the consequences of granting the certificate of need for the proposed facility, or a suitable modification thereof, are more favorable to society than the consequences of denying the certificate, considering."

10.2 Society Benefits from Reliable, Low Cost, and Environmentally Benign Electricity Sources

Minnesota law establishes parameters to ensure that utilities select and implement resources that provide reliable energy at reasonable prices and with minimal impact on the environment. Our peak demand and energy requirements are growing at an average 1.2 percent and 1.1 percent, respectively per year.[36] We have a statutory obligation under Minn. Stat. § 216B.04 to plan our system to reliably serve our customers.

We have added base load generation in smaller increments over the years in the form of conservation and purchased power from renewable energy projects. We will be adding significant amounts of additional wind resources to our system due to the RES legislation. As the 2007 Resource Plan indicates, we will need to add a significant amount of natural gas resources to complement the additional wind energy. Additional base load nuclear energy helps diversify our generation mix,

[36] These estimates are based on 50 percentile energy forecast and 90 percentile net demand forecast.

which helps mitigate risk. The proposed projects will benefit society by enhancing our ability to provide our customers with reliable, low-cost, carbon free energy.

The proposed projects will also contribute significantly towards our carbon reduction goals and our corporate goal to be leading environmental utility. The additional casks will allow us to operate Prairie Island an additional 20 years: the power uprate will provide an additional 164 MW of low-cost, reliable, and carbon-free energy. A low-cost supply is an economic driver to our customers as well as state and regional economies. The proposed projects also provide benefits in a manner compatible with protecting the natural and socioeconomic environments.

10.3 Provides Value to Ratepayers

Continued and expanded operation of Prairie Island is the most cost-effective alternative for providing the additional capacity and energy our customers need. The projects provide reliable and relatively low-cost electricity with minimal air quality impacts and further diversify our generation portfolio. Continuing and increasing the output from an existing generation facility provides efficiencies and more fully utilizes the existing transmission infrastructure. The Prairie Island projects provide our customers with low-cost, carbon-free energy and capacity round-the-clock. The high availability of Prairie Island helps offset the intermittency of the significant amount of new wind resource that will be added to our system by replacing the use of some existing natural gas fired generation. This frees up the natural gas generation to be used in conjunction with the intermittency of the wind. The projects also provide a hedge against additional exposure to natural gas fuel costs and future environmental regulations. Considered together, the low-cost carbon free resource provides great value – economic and environmental – to ratepayers.

10.4 Use of Existing Infrastructure

Prairie Island is an existing generating facility and the changes necessary to achieve the additional 164 MW of output will take place within the confines of the existing buildings. Similarly the additional casks will be located completely within the boundary of the existing ISFSI site. The plant and ISFSI site footprints will not be expanded and no greenfields will be affected by the projects. Although additional storage involves the construction of two concrete storage pads within the ISFSI site, we will not need to construct or modify any building footprint, access roads, parking areas, or lay down areas to support the projects.

The projects will utilize the existing transmission facilities to transport electricity from the plant to the electrical grid. It is not known at this time if any transmission enhancement will be necessary and if so, what they are. Final determination of the necessary transmission system changes to support the increased generation at Prairie Island will be addressed in the appropriate MISO studies.

10.5 Lower Emissions

Prairie Island does not emit significant levels of any of the criteria pollutants or green house gases that are emitted from coal or other fossil fuel burning plants. If additional storage capacity for spent nuclear fuel is not obtained, however, we will be forced to shut down the Plant starting in 2013. Replacement of Prairie Island with the "best" replacement of two 600 MW combined cycle units would result in a substantial increase in emission of air contaminants, in particular, the emission of an additional 88 million tons of carbon.

Similarly, the Prairie Island uprate project will result in over 16 million less tons of carbon being emitted to the atmosphere as compared to the next "best" alternative - a natural gas combustion turbine.

10.6 Health and Safety

The increased spent fuel storage and power uprate will not result in on-site or off-site radiological dose levels above the safe thresholds established by the NRC and in the Technical Specifications for Prairie Island. The increased spent fuel storage and power uprate projects will not introduce any new or different radiological release pathways. The uprate will not increase the number of fuel assemblies to be handled at each refueling. Larger diameter fuel rods do not increase the probability of an operator error or equipment malfunction that would result in an uncontrolled radioactive release.

Traffic safety will not be degraded because the projects will not result in a long-term change to the routes, number of trips, types of vehicles, or speed compared to current conditions. Any changes affecting traffic will be temporary in nature to accommodate delivery of equipment for the projects.

10.7 Jobs

Continued operation of Prairie Island will ensure the continued employment of the highly skilled and dedicated work force at the Plant. The 600 plus permanent work

force at Prairie Island benefits the entire community as active, involved, tax paying citizens participate and contribute to the greater social fabric of the community. The Prairie Island projects will also employ a number of construction workers over the projects' construction periods. These high-skilled, high-paying positions add significant limited-time economic benefit to the local economy.

10.8 Supports Future Economic Development

Historically, Xcel Energy has maintained low electric rates relative to utilities in other regions of the United States. As a result, Minnesota and the region have been able to attract industrial concerns and maintain steady economic growth. Our Prairie Island projects will allow us to continue to reliably serve our customers' energy needs while maintaining favorable rates to support future economic development in Minnesota and the surrounding states. The Prairie Island projects were the lowest-cost alternatives – even under a wide variety of sensitivities were considered. Investing in additional assets at the Prairie Island plant will increase the asset value of Prairie Island and will also provide additional property tax revenues.

10.9 Provides Tax Benefits

It is anticipated that the Prairie Island spent fuel storage and power uprate projects will provide significant tax benefits - local, state and federal. The continued operation of Prairie Island will result in increased state and federal income taxes being paid by the Company of an estimated $380 million over the 20-year continued operation of the plant. In addition, there will be a significant increase in the local property tax payments due to the significant investment that will occur at the plant due to the continued operation and the power uprate project.

11 Project Compliance

11.1 Section Summary

The Prairie Island additional dry cask and power uprate projects serve the overall state energy needs, foster state energy policy and comply with all applicable rules and regulations.

A Certificate of Need must be granted to an applicant upon determining that four principal criteria are met as defined in Minn. R. 7855.0120 and 7849.0120. This section addresses the fourth criterion (Subpart D) in that:

Minn. R. 7855.0120, subd. (D).
"that it has not been demonstrated on the record that the design, construction, operation, or retirement of the proposed facility will fail to comply with those relevant policies, rules, and regulations of other state and federal agencies and local governments."

Minn. R. 7849.0120, subd. (D)
"the record does not demonstrate that the design, construction, or operation of the proposed facility, or a suitable modification of the facility, will fail to comply with relevant policies, rules, and regulations of other state and federal agencies and local governments."

11.2 Projects are Consistent with Minnesota Energy Policy

11.2.1 Legislative Preference

The Minnesota legislature has determined that:

"The following energy sources for generating electric power distributed in the state, listed in their descending order of preference, based on minimizing long-term negative environmental, social, and economic burdens imposed by the specific energy sources are:

1. *wind and solar;*
2. *biomass and low-head or refurbished hydropower,*
3. *decomposition gases produced by solid waste management facilities, natural gas-fired cogeneration, and waste materials or byproducts combined with natural gas;*
4. *natural gas, hydropower that is not low-head or refurbished hydropower, and solid waste as a direct fuel or refuse-derived fuel; and*

5. *coal and nuclear power.*"[37]

Xcel Energy supports an energy policy that balances the impact of energy use and production on the environment, with the costs and reliability of various resource options. We believe a diverse portfolio that includes reliance on renewable resources and demand-side management best meets this objective. The selection of the Prairie Island projects over the alternatives considered is consistent with the State's Energy Policy priorities.

First, we reduced our forecast 1.1 percent starting in 2010 to reflect our commitment to the DSM requirements of the Next Generation Energy Act of 2007. Then, compliance with the nation's most aggressive renewable energy standard was assumed. This amounted to adding 200 MW of wind to our system per year. The projects were then compared to hypothetical biomass, natural gas, and coal generation. The additional dry cask storage scenario to support life extension and the power uprate project prove to be the most economical alternatives produce the greatest amount of carbon reduction, and have the least land and environmental impacts. The additional dry cask storage and power uprate projects, which modify and use an existing site to generate emission-free energy, minimizes "*negative environmental, social and economic burdens...*" when compared to the fossil-fueled alternatives considered.

The 2007 Legislature also declared the state's goal to reduce statewide greenhouse gas emissions across all sectors producing those emissions to a level at least 15 percent below 2005 levels by 2015, to a level at least 30 percent below 2005 levels by 2025, and to a level at least 80 percent below 2005 levels by 2050. (Minn. Stat. § 216H.02, subd. 1.) The modeling supporting this Application and our 2007 Resource Plan, which includes the continued operation of and uprate to the Prairie Island plant, suggests that the continued operation of Prairie Island and the implementation of the power uprate project will ensure our compliance with the state's carbon-reduction milestones.

11.2.2 Department of Commerce Policy

The Prairie Island additional dry cask storage and power uprate projects serve the State Energy Policy goals as stated in the Minnesota Department of Commerce publication *Energy Policy & Conservation Report 2004*. The four guiding principles of Minnesota energy policy are to ensure that:

1. *Minnesota has a reliable energy-provision system into the future;*

[37] Minn. Stat. §216C.051, subd. 7(c) and (d).

2. *The State's energy system meets Minnesota's economic needs;*
3. *Minnesota's energy cost remains low, compared to the rest of the nation; and*
4. *The environmental impacts of energy produced and consumed in the state are reduced.*

The goal of these guiding principles is to maintain Minnesota's current reliable, low-cost energy in order to promote job growth and economic development, while lowering the environmental impacts of the production, delivery and use of that energy."

The *Energy Policy & Conservation Report 2004* lays out seven energy policy strategies to achieve those guiding principles:

1. Continue the operation of facilities that provide safe, reliable power, low-cost power, and do not emit air pollution.
2. Encourage coal-fired power generation facilities to convert to less polluting fuels or to install state-of-the-art emissions control technologies.
3. Encourage the generation of reasonably priced, environmentally superior electricity from low-polluting or renewable fuels.
4. Enhance the state's energy delivery infrastructure to assure reliability and provide access for electricity from low cost and/or environmentally superior resources.
5. Support research, development and deployment of new, environmentally superior energy technologies.
6. Support the state's conservation programs.
7. Reduce regulatory and government barriers.

The continued and expanded operation of Prairie Island clearly addresses all four of the guiding principles by offering a low-cost, environmentally benign generation options to meet our customers' needs. Our proposals also directly addresses Strategy #1 – which is to "continue the operation of facilities that provide safe, reliable power, low-cost power and do not emit air pollution." The projects directly address #4 by adding a highly reliable, low-cost and environmentally superior resource. The passage of the 2007 DSM and RES legislation are also incorporated into our analysis through the explicit assumption that the DSM goals will be achieved and the RES will be met – which directly supports Strategies # 3 and #6.

11.2.3 Non-Proliferation Policy

The Prairie Island additional dry cask storage and power uprate projects will take full advantage of existing infrastructure. The additional casks will be added to an existing spent fuel storage facility. After completion, the additional dry cask storage will be unnoticeable. The power uprate will take place at an existing generation facility within existing buildings and it will use existing high-voltage electric transmission facilities to transport the energy generated.

The use of existing transmission facilities is consistent with the State of Minnesota's commitment to non-proliferation of transmission corridors.[38] Generation interconnection and transmission service request filings will be made at the MISO for the additional MW expected in 2012 and 2015. Any transmission upgrade identified for the additional 164 MW should be minimal and will be addressed after the completion of the appropriate MISO studies.

11.3 The Projects Comply with Federal and State Environmental Regulations

The Prairie Island additional dry cask storage and power uprate projects meet or exceed the requirements of all applicable federal and state environmental laws and regulations. The approval of seven regulatory permits are necessary to implement the additional dry cask storage and power uprate: the Certificates of Need (2) and Site Permit from the Minnesota PUC; and the Plant Operating License Amendment, the License Amendment for the TN-40HT cask, License Renewal request to renew the Prairie Island ISFSI license, and a License Amendment to increase the allowed storage beyond the current NRC approved 48 cask limit. The operation of Prairie Island after the power uprate will be within the operating limits of all other existing state and federal permits.

11.4 Carbon Risk Analysis Compliance

Order Point 16 of the Commission's Order dated July 28, 2006 from our 2004 Resource Plan (Docket No. E002/RP-04-1752), states:

> *Xcel shall discuss carbon risk analysis strategies in the November 1, 2006 base load certificate of need filing required in paragraph 10, in its next resource plan, <u>in future certificate</u>*

[38] *People for Environmental Enlightenment and Responsibility (PEER) v. Minnesota Environmental Quality Council*, 266 N.W. 2d 858 (Minn. 1978)

of need filings, and in other proceedings involving the acquisition of generation resources. (underline added)

There is significant concern over climate change policy - internationally, nationally, and at the state level. The contribution of carbon released during the combustion of fossil fuels for electric generation is often at the forefront of that discussion. There is also a significant amount of discussion surrounding the development of a market for trading carbon credits. This creates a potential regulatory risk and a cost risk when proposing to construct a fossil fuel burning power plant that emits carbon. Prairie Island does not produce carbon. The power uprate is carbon neutral on its own. Integrated into our resource mix, the addition of the Prairie Island projects will reduce carbon by eliminating the need to build new natural gas-fired generation and by reducing the use from existing fossil fuel plants. Nonetheless, we are providing a carbon risk analysis in compliance with Order Point 16 of our 2004 Resource Plan.

11.4.1 CO_2 Analysis

The issue of global climate change is in the forefront of public policy debates in the United States. Today, Congress, state legislatures, and policy makers across the country and around the world, are gradually identifying and adopting policies to address greenhouse gas ("GHG") emissions. In Minnesota, Governor Pawlenty and the Legislature have made global climate change a top priority, most notably through the Next Generation Energy Act of 2007, the Minnesota Climate Change Advisory Group, and the Midwest Regional Greenhouse Gas Reduction Accord.

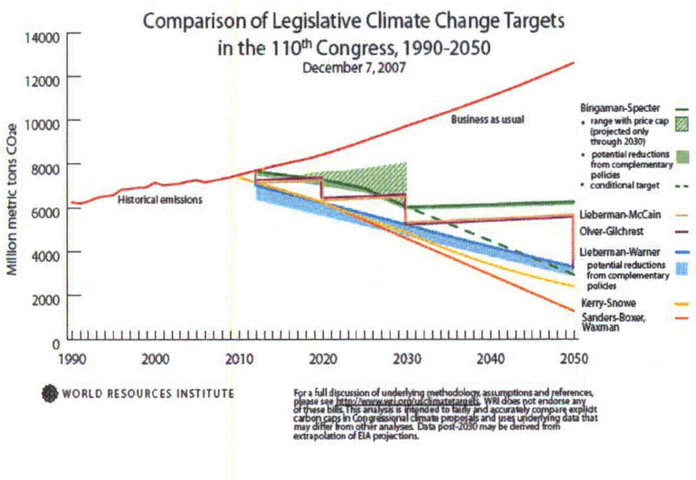
Global climate change and the likelihood of future GHG regulation underlie the approach proposed in our 2007 Resource Plan and in this Application. We believe the nation will be subject to regulations designed to reduce GHG emissions, and that those regulations will have a significant impact on the Company's operations.

Global climate change is a complex issue that affects the Company in many ways. The CO_2 analysis and discussion in this section touches on the major aspects of global climate change as a resource planning factor, beginning with federal, state and regional policy initiatives, continuing with the impacts of climate policy on our business landscape including the pricing of CO_2, and concluding with the implications on this Application.

11.4.1.1 Federal Legislative Proposals

The current Congress is considering a number of bills that address global climate change. These bills include legislation sponsored by Senator Bingaman, Senator Lieberman, Senator Boxer, and Senator Kerry, among others. The bills usually have some bi-partisan support. Although these bills vary in structure and format, most of them share several common traits. On December 5, 2007, the Senate Environment and Public Works Committee passed the American Climate Security Act sponsored by Senator Lieberman and Senator Warner. Like the other climate policy bills under consideration, the Lieberman-Warner bill would impose CO_2 emission limits on the entire economy and target some level of emission reductions by 2020. The main bills under consideration all target much more aggressive reductions by 2050. They would use a "cap and trade" policy structure – placing an overall limit on GHG emissions across the economy and allowing sources to trade emission allowances with each other to meet their emission targets. However similar, the bills vary dramatically in their particulars, including whether they incorporate "safety valves" (i.e. maximum carbon prices) and how they allocate emissions.[39] A comparison of the reductions proposed by the bills is shown in Figure 11-1.

Figure 11-1: GHG Emission Trajectories Under Proposed Federal Legislation



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[39] Xcel Energy supports a national Clean Energy Portfolio Standard, which would use a mechanism similar to a renewable portfolio standard to promote the use of clean technology and limit GHG emissions from the utility industry.

Many of these programs are generally designed to reduce CO_2 emissions to levels that, according to many computer models, would put the U.S. share of global emissions on a trajectory to help stabilize atmospheric CO_2 concentrations at 450 to 550 parts per million, or roughly twice pre-industrial levels.

Most recently, on December 19, 2007, the President signed legislation that, in addition to increasing fuel economy standards for cars and light trucks sold in the United States, requires a renewable fuels standard to be established for transportation. Proposals for a national renewable portfolio standard for electric utilities were not passed in this Congress. Separately, the US Environmental Protection Agency ("EPA") was required to commence a rulemaking on mandatory reporting of GHGs through appropriations language.

Finally, in Massachusetts v. EPA, the US Supreme Court found that GHGs are pollutants under the Federal Clean Air Act, a ruling that will begin a process of regulatory determinations at the EPA that could lead to GHG regulation even if the Congress does not pass legislation.

11.4.1.2 State and Local Climate Policies

The states are not waiting for Congress to act. States throughout the country are proposing CO_2 emission reduction programs and using other policy mechanisms to address GHG emissions. In Minnesota, the Legislature and Governor Tim Pawlenty have already passed the most stringent renewable energy standard in the nation and both aggressive energy efficiency requirements and statewide GHG emission reduction goals through the Next Generation Energy Act of 2007. This also requires a plan for regulatory action and established a formal stakeholder process (the Minnesota Climate Change Advisory Group) to make recommendations on future policies related to climate change. Establishment of the RES further reinforces the regulatory process that requires CO_2 valuation in selecting generation resources in resource planning processes. Prospective state and federal climate policies have profound implications on our selection of future generation resources.

11.4.1.3 Impacts of Climate Policy on the Energy Industry

To meet the challenge of global climate change and prospective regulation while continuing to provide reasonably priced, reliable energy service to our customers, Xcel Energy and the entire industry will need to undertake significant changes.

First, because of the long planning periods that must be employed in the utility industry, we need to act early and make decisions about our resources despite the fact that climate change regulation has not yet been implemented.

Second, there is today no single "solution" that will allow us to achieve significant GHG reductions while meeting our obligation to serve our customers. We must rely on a diverse portfolio of clean resources available today to bridge the gap to a clean energy future tomorrow. Integrated transmission planning will be a critical component of this strategy because it can link utility customers to the clean energy supplies (e.g. renewable energy resources and areas with good geologic sequestration opportunities).

Third, as technologies evolve, we must have the flexibility to adjust our strategies. It is highly likely that investment in research, development and deployment will need to be reconsidered in order to meet the challenges of the new energy landscape. Today's programs may be supplanted by new approaches to innovative technology in the regulated utility context.

11.4.1.4 Carbon Dioxide Pricing

There are many GHGs, but CO_2 is the most important for policy and planning purposes. CO_2 pricing provides a suitable representation of regulatory risk and climate policy direction. The two main types of GHG emission reduction policy proposals are "cap and trade" programs that require reduced levels of emissions in conjunction with tradable emissions allowances, and "carbon tax" programs that levy a fee on GHG emissions. Both impose a price for CO_2 emissions to fossil generators in the electric power sector. A CO_2 price could come from the market for emissions reduction under a cap and trade program, or could come directly from a carbon tax. In either case, the CO_2 price imposes a new operating cost to existing and new fossil power plants.

To develop our CO_2 emissions price scenarios, we have researched publicly available analyses of mandatory greenhouse gas policies. Numerous analyses of U.S. GHG emission reduction policies have been performed and we have selected a set of analyses that we believe represent the range of current public thought about U.S. CO_2 pricing. In addition to these analytic results, we have also reviewed CO_2 price curves based on the statutory price ceiling or "safety valve" prices from three proposed federal bills. We have also included the carbon proxy cost of $9/ton used in other dockets. On December 21, 2007, in Docket No. E-999/CI-07-1199, the Commission adopted new values for CO_2 to be used in resource planning and "...all proceedings to acquire electricity generation resources to serve needs in

Minnesota." The cost range established was from $4 to $30 per ton emitted in 2012 and thereafter.

Table 11-1
Levelized Carbon Dioxide Prices From Various Sources

Scenario Name	Note	Levelized 2010-2030 $/metric ton CO2e
Bingaman '06 (EIA)	EIA analysis from January 2007 of Bingaman 2006 cap proposal, "Phased Auction" or main case. Bingaman's policy has since been updated	$9.16
Bingaman '06 (Safety Valve)	Carbon price set at statutory price ceiling (not a modeled result) from Bingaman 2006 cap proposal	$10.15
Bingaman '05 (Safety Valve)	Carbon price set at statutory price ceiling (not a modeled result) from Bingaman/NCEP 2005 cap proposal	$10.42
2003 PSCo Resource Plan Proxy Cost	2004 Settlement Agreement between stakeholders related to Comanche 3 coal plant	$12.01
Bingaman '07 (NCEP)	NCEP analysis from July 2007 of Bingaman 2007 cap proposal. Based on EIA "High Technology" case	$13.19
Lieberman '06 (EIA - Low Price)	EIA analysis from July 2007 of Lieberman-McCain S. 280 cap proposal, "Fixed 30 Percent" or high offsets case	$16.10
Lieberman '06 (US EPA - Low Price)	US EPA analysis from July 2007 of Lieberman-McCain S. 280 cap proposal, "Senate Scenario," ADAGE model	$16.24
Bingaman '07 (Safety Valve)	Carbon price set at statutory price ceiling (not a modeled result) from Bingaman 2007 cap proposal	$17.40
Lieberman '06 (US EPA - High Price)	US EPA analysis from July 2007 of Lieberman-McCain S. 280 cap proposal, "Senate Scenario," IGEM model	$22.99
MIT (Low Price)	MIT Analysis from April 2007 of a policy that includes a safety valve, titled "Core scenario: 287 bmt"	$23.72
Lieberman '06 (EIA - Medium Price)	EIA analysis from July 2007 of Lieberman-McCain S. 280 cap proposal, "S.280 Core" or medium offsets case	$25.19
Lieberman '06 (EIA - High Price)	EIA analysis from July 2007 of Lieberman-McCain S. 280 cap proposal, "No International" or low (domestic only) offsets case	$32.97
MIT (Medium Price)	MIT Analysis from April 2007 of a 1995 by 2020, 50% below 1990 by 2050 policy, titled "Core scenario: 203 bmt"	$54.79
MIT (High Price)	MIT Analysis from April 2007 of a 1990 by 2020, 80% below 1990 by 2050 policy, titled "Core scenario: 167 bmt"	$71.18

As demonstrated by the table above, there is a significant range of possible CO_2 values. Based on our research, we believe that the range of CO_2 price scenarios in the analyses shown above will encompass most likely GHG emission reduction policies. To better compare the CO_2 price curves from the analyses considered, we performed a simple levelization analysis. Levelization allows us to compare price curves from analyses and statutory "safety valve" prices with different starting years and escalation rates. To levelize the price curves, we calculated the net present value of each CO_2 price curve from 2010-2030 and then created a levelized series of annual prices from 2010 to 2030 with an equivalent net present value. We note that while these levelized values are useful for comparison purposes, we used CO_2

price curves rather than levelized values in the actual modeling for the Resource Plan and this Application. Table 11-1 above presents the levelized CO_2 price results. In light of the significant ongoing changes in the political climate regarding GHG emission regulation, we believe that the "Medium" scenario set forth below is the appropriate base case for modeling and analysis, and that the "Low" and "High" represent appropriate sensitivities.

Table 11-2: 2007 CO_2 Price Scenarios

Scenario	2008 Price ($/short ton CO_2)	2030 Price ($/short ton CO_2)	2010 Price ($/metric ton CO_2)	2010-2030 Levelized Price (nominal $/metric ton CO_2)
Low	$9.00	$16.39	$11.02	$13.34
Medium	$20.00	$32.77	$22.05	$26.69
High	$40.00	$65.54	$44.09	$53.38

By including the prices above in our various scenarios as noted in Table 11-2 above, we have evaluated the costs of different climate change scenarios. Both the additional dry cask storage necessary to support Prairie Island life extension and the power uprate projects reduce our carbon footprint in excess of 20 percent over the next 20 years. By extending the life of Prairie Island and increasing the capacity at the plant, we will reduce our exposure to the costs of future carbon regulation. We believe this analysis is a reasonable approach to incorporate the CO_2 risk analysis required by the 2004 Resource Plan Order. We believe the range of CO_2 values used in our analyses for Prairie Island are consistent with the range set by the Commission.

11.5 Compliance and Policy Summary

The expansion of an existing low-cost generation facility benefits all. The design, construction and operation of Prairie Island will comply with all policies, rules and regulations of the State of Minnesota and the NRC. The Prairie Island additional dry cask storage and power uprate projects will:

- Improve the reliability of the state's energy infrastructure;
- Contribute towards the legislature's 30 percent carbon reduction goal by 2025;
- Play an integral role in meeting Xcel Energy's resource needs;
- Operate within all existing water appropriation, water discharge, air and other operating permits;

- Utilize an existing dry storage site to store additional casks and will utilize an existing generation site to produce additional electricity;
- Comply with the requirements of Minn. Stat. § 116C.83, subd. 4, which requires that the storage of spent nuclear fuel be managed to facilitate the shipment of spent fuel out of state to a permanent or interim storage facility as soon as feasible in a manner that allows the continued operation of the power plant; and
- Provide the generation capability to meet our customer's energy needs using the most environmentally friendly and cost-efficient generation resources available; resulting in minimal cost impact to ratepayers as compared to the alternatives.

A7.5 OFFSITE COLLECTIVE DOSE ASSESSMENT

Figure 1.2-1 illustrates the Prairie Island Nuclear Generating Plant site boundary, which is also the boundary of the exclusion area as defined in 10CFR100.3. This exclusion area corresponds to the controlled area for the ISFSI as defined in 10CFR72.3.

In calculating the offsite collective dose, the entire permanent population within a 2 mile radius of the plant was conservatively taken to be at the location of the residence subject to the highest exposure, i.e. 0.45 miles NW of the ISFSI. In addition to the permanent population, there is a large transient population of persons employed at or visitors to the Treasure Island Hotel and Casino that is located within a 2 mile radius of the plant. For these calculations it is assumed that this entire transient population is located 0.8 miles from the ISFSI. The estimates of the population (both permanent and transient) within the 2 mile radius were taken from the Prairie Island Nuclear Generating Plant's evacuation time study (Reference 6). A description of the off-site locations considered in this evaluation, the relevant population data, distances and occupancy times are shown in Table A7.5-1.

The dose rate resulting from cask storage at the ISFSI as a function of distance is given in Table A7A.7-2. For a distance of 0.45 mile (724 meters) in the corner direction, the total dose rate is 2.20 E-3 rem/year. This is the annual exposure at the nearest resident location.

Table A7.5-2 shows the total dose rates from the ISFSI at each of the assumed off-site locations. In addition, Table A7.5-2 also contains the information summarized in Table A7.5-1. For conservatism, the dose rates calculated at a distance of 1004 m from the "north-south" face of the ISFSI are utilized to determine the off-site exposures at distances greater than 0.8 miles (1280 m).

Table A7.5-2 summarizes the calculated total doses to the off-site population within a 2-mile radius due to the ISFSI operation. The total collective off-site dose is calculated to be 3.60 person-rem.

A7A.7 OFFSITE DOSE RATE CALCULATIONS

This Section evaluates off-site dose rates assuming the ISFSI consists of two (2) 2x12 array of TN-40HT casks, loaded in sets of four casks every two years, each loaded with design-basis fuel at the time of initial loading (i.e. total of 48 casks and credit for decay while the casks are on the ISFSI pads). This conservatively bounds the currently allowed storage of 48 casks and bounds operation with a mixture of TN-40 and TN-40HT casks. The ISFSI layout used in this evaluation is shown in Figure A7A.7-1.

This evaluation determines the neutron and gamma-ray off-site dose rates including skyshine in the vicinity of the ISFSI. It provides results for distances ranging from 10 to 1,000 meters from the front, side and corner of the arrays. A co-ordinate transformation of these results is performed so that they may be reported as a distance from a common point, i.e., the center of the ISFSI.

The Monte Carlo computer code MCNP (Reference 1) calculates the dose rates at the specified locations around the array of casks. An "MCNP Array" method is utilized to evaluate the dose rate as a function of distance from the ISFSI.

A7A.7.1 MCNP ARRAY METHOD – METHODOLOGY, MODEL AND ASSUMPTIONS

The ISFSI layout as illustrated in Figure A7A.7-1 is explicitly modeled in MCNP using advanced MCNP geometry. The gamma and neutron dose rates are determined as a function of distance from the ISFSI. All the doses are determined using F5 "detector" tallies.

The ISFSI array MCNP model consists of a two 2x12 arrays of TN40-HT casks. The cask array is modeled using advanced MCNP geometry to represent the ISFSI as shown in Figure A7A.7-1. Source specification is consistent with the loading "scheme" where four casks are loaded every two years. Due to the symmetry of the layout of the cask array and in the loading schedule, sources are only specified for the north-west row of casks (even-numbered casks 2 through 24 from Figure A7A.7-1). Even though, sources are not specified in the remaining 36 casks, the shielding configurations are identical and ensure that the resulting dose rate distribution around the ISFSI is symmetric. Tallies are constructed from small, spherical, F5 detectors providing for variance reduction capabilities. These detectors are positioned all around the ISFSI (all sides and corner locations) to determine the dose rates as a result of the source symmetry. These detector locations are shown in Table A7A.7-1.

Credit is taken for the ISFSI berm. The berm is modeled as an isosceles trapezoid with 14.02 and 2.44 meters bottom and top segments, respectively. The berm is assumed 6.25 meters height and made from soil. Based on the coordinate system depicted on Figure A7A.7-1 (the berm is not shown on the Figure), the planes of symmetry along the west and east sides of the berm are X=-114.30 and X=121.61 meters, respectively. Similarly, planes of symmetry along the north and south sides of the berm are at Y=-58.22 and Y=58.22 meters, respectively. -

Radiological sources from Bottom Nozzle, In-core, Plenum and Top Nozzle axial regions of the TN40 HT design basis fuel assembly are calculated for cooling times ranging from 18 to 40 years, with 2 years increments and shown in Table A7A.7-4. The SAS2H\ORIGEN-S models utilized in the design basis fuel source term calculations are also employed herein.

In order to simplify the source term specification in the MCNP models, the total gamma and neutron radiation source terms strength can be approximated with an exponential function as a function of decay time. The source strength at any cooling time is expressed as:

$$A_t = A_0 * e^{(-\lambda(t-18))}$$

where

A_t is the Source Strength at time t ($18 \leq t \leq 40$)
A_0 is the source strength at 18 years
λ is a decay constant

The decay constants are calculated based on the above equation using the source strengths obtained from the SAS2H calculations. Decay constants for calculating neutron, in-core gamma (active fuel region), and fittings (top and bottom nozzle and plenum regions) gamma radiation source terms strength are calculated to be equal to 0.0358 years^{-1} (corresponds to ~19.4 years half-life), 0.025 years^{-1} (corresponds to ~27.7 years half-life) and 0.1315 years^{-1} (corresponds to ~5.27 years half-life) respectively. These decay constants are calculated in such a way that exponential function produces source terms that match, within 1%, the source terms calculated using SAS2H\ORIGEN-S models.

For ease of input specification in the MCNP models, the total gamma source strength (4.8937e+18 gammas per second including contribution from BPRAs and TPDs.) is calculated utilizing the exponential functions. Spectrum due to the design basis fuel assembly is used to conservatively describe the spectral distribution of gamma radiation source terms in all the casks where source is specified.

For the neutron source specification, the total neutron source strength calculated directly (1.9253e+12 neutrons per second, including sub-critical multiplication and axial source profile) with the SAS2H\ORIGEN-S models are utilized. Spectral distribution of neutron radiation source terms is due to Cm-244. MCNP provides built-in parameters to describe this distribution in the calculational models.

The assumptions for the MCNP methodology are summarized below.

- Due to symmetry of the cask loading configurations, the source specification is simplified and considered only for 12 of the 48 casks while the detectors are positioned to obtain the results as a result of this simplified source specification.

- The "universe" is a sphere surrounding the ISFSI. The radius of this sphere (r=5.0 kilometers) is more than 20 mean free paths for neutrons and more than 20 mean free paths for gammas in energy groups that contribute the most to the gamma radiation dose rates. This ensures that the model is of a sufficient size to include all interactions affecting the dose rate at the detector locations.

- "Detectors" located at distances less than or equal to 45 meters are within the ISFSI berm perimeter. Dose rates points at larger distances are behind the berm. It is likely that the dose rates beyond the berm perimeter are almost entirely due to skyshine component.

- Dose rates include contribution due to primary gamma and neutron sources as well as due to the secondary gamma radiation from (n,g) interactions.

A7A.7.2 MCNP ARRAY METHOD – DOSE RATE AS A FUNCTION OF DISTANCE

The MCNP results provide the dose rate as a function of distance at all the locations (including sides and corner) around the ISFSI. The total and skyshine dose rate results for the N/S sides, E/W sides and the corners are shown in Table A7A.7-2. The skyshine doses are shown in Table A7A.7-3 only for comparison. Due to presence of the ISFSI berm, it is expected that the dose rates at distances greater than 100m are dominated by the skyshine component and these results serve to demonstrate this assertion. Co-ordinate transformation is performed such that the results reported in Table A7A.7-2 are based on the distance from the center of the ISFSI.

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XCEL ENERGY CORPORATION

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

ANNUAL REPORT
to the
UNITED STATES NUCLEAR REGULATORY COMMISSION

Radiological Environmental Monitoring Program

January 1 to December 31, 2012

Docket No.	50-282	License No.	DPR-42
	50-306		DPR-60
ISFSI			
Docket No.72-10			SNM-2506

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MIDWEST LABORATORY

Project No. 8010

Approved: ______________ 04/17/13

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PREFACE

The staff of Environmental, Inc., Midwest Laboratory was responsible for the acquisition of data presented in this report. Samples were collected by members of the staff of the Prairie Island Nuclear Generating Plant, operated by Northern States Power Co. –Minnesota, for XCEL Energy Corporation. The report was prepared by Environmental, Inc., Midwest Laboratory.

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1.0 INTRODUCTION

This report summarizes and interprets results of the Radiological Environmental Monitoring Program (REMP) conducted by Environmental, Inc., Midwest Laboratory at the Prairie Island Nuclear Generating Plant, Red Wing, Minnesota, during the period January - December, 2012. This program monitors the levels of radioactivity in the air, terrestrial, and aquatic environments in order to assess the impact of the plant on its surroundings.

Tabulations of the individual analyses made during the year are not included in this report. These data are included in a reference document (Environmental, Inc., Midwest Laboratory, 2013b) available at Prairie Island Nuclear Generating Plant.

Prairie Island Nuclear Generating Plant is located on the Mississippi River in Goodhue County, Minnesota, owned by Xcel Energy Corporation and operated by Northern States Power Co.-Minnesota. The plant has two 575 MWe pressurized water reactors. Unit 1 achieved initial criticality on 1 December 1973. Commercial operation at full power began on 16 December 1973. Unit 2 achieved initial criticality on 17 December 1974. Commercial operation at full power began on 21 December 1974.

2.0 SUMMARY

The Radiological Environmental Monitoring Program (REMP) required by the U.S. Nuclear Regulatory Commission (NRC) Offsite Dose Calculation Manual for the Prairie Island Nuclear Generating Plant and the Independent Spent Fuel Storage Installation (ISFSI) is described. Results for 2012 are summarized and discussed.

Program findings show background levels of radioactivity in the environmental samples collected in the vicinity of the Prairie Island Nuclear Generating Plant.

3.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

3.1 Program Design and Data Interpretation

The purpose of the Radiological Environmental Monitoring Program (REMP) at the Prairie Island Nuclear Generating Plant is to assess the impact of the plant on its environment. For this purpose, samples are collected from the air, terrestrial, and aquatic environments and analyzed for radioactive content. In addition, ambient gamma radiation levels are monitored by thermoluminescent dosimeters (TLDs).

Sources of environmental radiation include the following:

(1) Natural background radiation arising from cosmic rays and primordial radionuclides;

(2) Fallout from atmospheric nuclear detonations;

(3) Releases from nuclear power plants;

(4) Industrial and medical radioactive waste; and

(5) Fallout from nuclear accidents.

In interpreting the data, effects due to the plant must be distinguished from those due to other sources.

A major interpretive aid in assessment of these effects is the design of the monitoring program at the Prairie Island Plant which is based on the indicator-control concept. Most types of samples are collected both at indicator locations (nearby, downwind, or downstream) and at control locations (distant, upwind, or upstream). A plant effect would be indicated if the radiation level at an indicator location was significantly larger than that at the control location. The difference would have to be greater than could be accounted for by typical fluctuations in radiation levels arising from other sources.

An additional interpretive technique involves analyses for specific radionuclides present in the environmental samples collected from the plant site. The plant's monitoring program includes analyses for tritium and iodine-131. Most samples are analyzed for gamma-emitting isotopes with results for the following groups quantified: zirconium-95, cesium-137, cerium-144, beryllium-7, and potassium-40. The first three gamma-emitting isotopes were selected as radiological impact indicators because of the different characteristic proportions in which they appear in the fission product mix produced by a nuclear reactor and that produced by a nuclear detonation. Each of the three isotopes is produced in roughly equivalent amounts by a reactor: each constitutes about 10% of the total activity of fission products 10 days after reactor shutdown. On the other hand, 10 days after a nuclear explosion, the contributions of zirconium-95, cerium-144, and cesium-137 to the activity of the resulting debris are in the approximate ratio 4:1:0.03 (Eisenbud, 1963). Beryllium-7 is of cosmogenic origin and potassium-40 is a naturally-occurring isotope. They were chosen as calibration monitors and should not be considered radiological impact indicators.

The other group quantified consists of niobium-95, ruthenium-103 and -106, cesium-134, barium-lanthanum-140, and cerium-141. These isotopes are released in small quantities by nuclear power plants, but to date their major source of injection into the general environment has been atmospheric nuclear testing. Nuclides of the final group, manganese-54, iron-59, cobalt-58 and -60, and zinc-65, are activation products and arise from activation of corrosion products. They are typical components of a nuclear power plant's effluents, but are not produced in significant quantities by nuclear detonations.

3.1 Program Design and Data Interpretation (continued)

Other means of distinguishing sources of environmental radiation are employed in interpreting the data. Current radiation levels are compared with previous levels, including those measured before the Plant became operational. Results of the plant's monitoring program can be related to those obtained in other parts of the world. Finally, results can be related to events known to cause elevated levels of radiation in the environment, e.g., atmospheric nuclear detonations.

3.2 Program Description

The sampling and analysis schedule for the radiological environmental monitoring program at Prairie Island is summarized in Table 5.1 and briefly reviewed below. Table 5.2 defines the sampling location codes used in Table 5.1 and specifies for each location its type (indicator or control) and its distance, direction, and sector relative to the reactor site or ISFSI facility, as appropriate. To assure that sampling is carried out in a reproducible manner, detailed sampling procedures have been prescribed (Prairie Island Nuclear Generating Plant, 2012). Maps of fixed sampling locations are included in Appendix D.

To monitor the airborne environment, air is sampled by continuous pumping at five stations, three site boundary indicators (P-2, P-3, and P-4), located in the highest calculated D/Q sectors, one community indicator (P-6), and one control (P-1). The particulates are collected on membrane filters, airborne iodine is trapped by activated charcoal. Particulate filters are analyzed for gross beta activity and charcoal filters for iodine-131. Quarterly composites of particulate filters from each location are analyzed for gamma emitting isotopes.

Offsite ambient gamma radiation is monitored at thirty-four locations, using $CaSO_4$:Dy dosimeters with four sensitive areas at each location: ten in an inner ring in the general area of the site boundary, fifteen in the outer ring within a 4-5 mile radius, eight at special interest locations, and one control location, 11.1 miles distant from the plant. They are replaced and measured quarterly.

Ambient gamma radiation is monitored at the Independent Spent Fuel Storage Installation (ISFSI) Facility by twenty $CaSO_4$:Dy dosimeters. Twelve dosimeters are located inside of the earthen berm in direct line of sight from the storage casks and eight dosimeters are located outside of the earthen berm. They are replaced and measured quarterly.

Milk samples are collected monthly from three farms (two indicators and one control) and analyzed for iodine-131 and gamma-emitting isotopes. The milk is collected biweekly during the growing season (May - October), because the milk animals may be on pasture.

For additional monitoring of the terrestrial environment, green leafy vegetables (cabbage) are collected annually from the highest D/Q garden and a control location (P-38), and analyzed for gamma-emitting isotopes, including iodine-131. Corn is collected annually only if fields are irrigated with river water and analyzed for gamma-emitting isotopes. Well water and ground water are collected quarterly from four locations near the plant and analyzed for tritium and gamma-emitting isotopes.

River water is collected weekly at two locations, one upstream of the plant (P-5) and one downstream (P-6, Lock and Dam No.3). Monthly composites are analyzed for gamma-emitting isotopes. Quarterly composites are analyzed for tritium.

3.2 Program Description (continued)

Drinking water is collected weekly from the City of Red Wing well. Monthly composites are analyzed for gross beta, iodine-131, and gamma-emitting isotopes. Quarterly composites are analyzed for tritium.

The aquatic environment is also monitored by semi-annual upstream and downstream collections of fish, periphyton or invertebrates, and bottom sediments. Shoreline sediment is collected semi-annually from one location. All samples are analyzed for gamma-emitting isotopes.

3.3 Program Execution

The Program was executed as described in the preceding section with the following exceptions:

(1) Airborne Particulates / Airborne Iodine:

No air particulate / air iodine sample was available from location P-01 for the week ending May 16, 2012. There was no power to the sampler, due to an open fuse. The sampler pump was replaced.

A partial sample was collected from location P-04 for the week ending 8/22/12. Sampler run-time was reduced by approximately 20 hours due to a tripped breaker.

Air samples were not collected from the site boundary location of the highest calculated annual average ground level D/Q during 2012. The annual average ground level D/Q values were updated during 2011 for the station and the west sector became the new highest D/Q location. The second and third highest sectors were sampled with the current REMP air sample stations.

(2) Thermoluminescent Dosimeters:

The TLD for location PI-08B was missing in the field for the third quarter, 2012.

Deviations from the program are summarized in Table 5.3.

3.4 Laboratory Procedures

The iodine-131 analyses in milk and drinking water were made using a sensitive radiochemical procedure which involves separation of the iodine using an ion-exchange method, solvent extraction and subsequent beta counting.

Gamma-spectroscopic analyses are performed using high-purity germanium (HPGe) detectors. Levels of iodine-131 in cabbage and natural vegetation and concentrations of airborne iodine-131 in charcoal samples were determined by gamma spectroscopy.

Tritium concentrations are determined by liquid scintillation.

Analytical Procedures used by Environmental, Inc. are on file and are available for inspection. Procedures are based on those prescribed by the Health and Safety Laboratory of the U.S. Dep't of Energy, Edition 28, 1997, U.S. Environmental Protection Agency for Measurement of Radioactivity in Drinking Water, 1980, and the U.S. Environmental Protection Agency, EERF, Radiochemical Procedures Manual, 1984.

Environmental, Inc., Midwest Laboratory has a comprehensive quality control/quality assurance program designed to assure the reliability of data obtained. Details of the QA Program are presented elsewhere (Environmental, Inc., Midwest Laboratory, 2012). The QA Program includes participation in Interlaboratory Comparison (crosscheck) Programs. Results obtained in the crosscheck programs are presented in Appendix A.

3.5 Program Modifications

There were no program modifications in 2012.

3.6 Land Use Census

In accordance with the Prairie Island Nuclear Generating Plant Offsite Dose Calculation Manual, H4, (ODCM) a land use census is conducted in order to identify the location of the nearest milk animal, the nearest residence, and the nearest garden of greater than 500 ft^2 producing fresh leafy vegetables in each of the 16 meteorological sectors within a distance of 5 miles. This census is conducted at least once per 12 months between the dates of May 1 and October 31. If new locations yield a calculated dose or dose equivalent (via the same exposure pathway) twenty percent greater than the required locations per the ODCM, then the new locations are added to the radiological environmental monitoring program within 30 days, and sampling locations having lower calculated doses or a lower dose commitment may be deleted from this monitoring program after October 31 of the year in which the land use census was conducted.

This land use census insures the updating of the radiological environmental monitoring program should sampling locations change within the 5 mile radius from the plant.

The Land Use Census was completed in October, 2012. There were no changes to any of the highest D/Q locations for nearest milk animal, garden sites, or nearest residence.

No downstream irrigation of corn was discovered within 5 miles of the Prairie Island Plant. Therefore, no corn samples were collected for analysis.

4.0 RESULTS AND DISCUSSION

All scheduled collections and analyses were made except those listed in Table 5.3.

The results are summarized in Table 5.4 in a format recommended by the Nuclear Regulatory Commission in Regulatory Guide 4.8. For each type of analysis of each sampled medium, this table lists the mean and range for all indicator locations and for all control locations. The locations with the highest mean and range are also shown.

4.1 Atmospheric Nuclear Detonations and Nuclear Accidents

There were no reported accidents involving significant release to the environment at nuclear reactor facilities in 2012. The Fukushima Daiichi nuclear accident occurred March 11, 2011.

There were no reported atmospheric nuclear tests in 2012. The last reported test was conducted on October 16, 1980 by the People's Republic of China.

4.2 Summary of Preoperational Data

The following constitutes a summary of preoperational studies conducted at the Prairie Island Nuclear Power Plant during the years 1970 to 1973, to determine background levels expected in the environment, and provided, where applicable, as a means for comparison with present day levels. Strict comparisons, however, are difficult, since background levels of radiation were much higher in these years due to radioactive fallout from the atmosphere. Gross beta measurements in fallout declined yearly from a level of 12,167 pCi/ m^3 to 1,020 pCi/ m^3, and these declining values are reflected throughout the various media tested.

In the air environment, ambient gamma radiation (TLDs) averaged 9.4 mR/4 weeks during pre-operational studies. Gross beta in air particulates declined from levels of 0.38 to 0.037 pCi/m^3. Average present day levels have stabilized at around 0.025 pCi/m^3. Airborne radioiodine remained below detection levels.

In the terrestrial environment of 1970 to 1973, milk, agricultural crops, and soil were monitored. In milk samples, low levels of Cs-137, I-131, and Sr-90 were detected. Cs-137 levels declined from 16.5 to 8.6 pCi/L. Present day measurements for both Cs-137 and I-131 are below detection levels. Agricultural crop measurements averaged 57.7 pCi/g for gross beta and 0.47 pCi/g for Cs-137. Gross beta measured in soil averaged 52 pCi/g.

The aqueous environment was monitored by testing of river, well and lake waters, bottom sediments, fish, aquatic vegetation and periphyton. Specific location comparison of drinking, river and well water concentrations for tritium and gross beta are not possible. However, tritium background levels, measured at eight separate locations, declined steadily from an average concentration of 1020 pCi/L to 490 pCi/L. Present day environmental levels of tritium measure below a detection limit of approximately 160 pCi/L. Values for gross beta, measured from 1970 to 1973, averaged 9.9 pCi/L in downstream Mississippi River water, 8.2 pCi/L for well water, and 11.0 pCi/L for lake water. Gamma emitters were below the lower limit of detection (LLD). In bottom sediments, gross beta background levels were determined at 51.0 pCi/g. Cs-137 activity during preoperational studies in 1973 measured 0.25 pCi/g upstream and 0.21 pCi/g downstream. The lower levels occasionally observed today can still be attributed to residual activity from atmospheric fallout. Gross beta in fish, measured in both flesh and skeletal samples, averaged 7.3 and 11.7 pCi/g, respectively. Gross beta background levels in aquatic vegetation, algae and periphyton samples measured 76.0 pCi/g , 46.0 pCi/g, and 13.6 pCi/g, respectively.

4.3 Program Findings

Results obtained show background levels of radioactivity in the environmental samples collected in the vicinity of the Prairie Island Nuclear Generating Plant.

Ambient Radiation (TLDs)

Ambient radiation was measured in the general area of the site boundary, at the outer ring 4 - 5 mi. distant from the Plant, at special interest areas and at one control location. The means ranged from 16.2 mR/91 days at inner ring locations to 16.7 mR/91 days at outer ring locations. The mean at special interest locations was 15.6 mR/91 days and 16.2 mR/91 days at the control location. Dose rates measured at the inner and outer ring and the control locations were similar to those observed from 1997 through 2011. The results are tabulated below. No plant effect on ambient gamma radiation measurements was indicated (Figure 5-1).

Year	Average (Inner and Outer Rings)	Control		Year	Average (Inner and Outer Rings)	Control
1997	15.1	16.0		2005	16.8	16.3
1998	16.7	17.3		2006	16.6	16.6
1999	16.6	17.5		2007	17.5	17.7
2000	17.0	17.1		2008	16.9	17.1
2001	16.8	17.2		2009	15.9	16.3
2002	17.4	16.9		2010	16.0	16.0
2003	16.2	16.0		2011	15.7	15.7
2004	17.6	17.6		2012	16.5	16.2

Ambient gamma radiation as measured by thermoluminescent dosimetry.
Average quarterly dose rates (mR/91 days).

ISFSI Facility Operations Monitoring

Ambient radiation was measured inside the ISFSI earth berm, outside the ISFSI earth berm and at two special locations between the plant ISFSI and the Prairie Island Indian Community. The mean dose rates averaged 100.7 mR/91 days inside the ISFSI earth berm and 19.9 mR/91 days outside the ISFSI earth berm. No additional casks were placed on the ISFSI pad in 2012, a total of twenty-nine loaded casks remain. The higher levels inside the earth berm are expected, due to the loaded spent fuel casks being in direct line-of-sight of the TLDs.

Ambient radiation levels measured outside the earth berm show a slight increase as compared to other offsite dose rates around the plant. The cumulative average of the two special Prairie Island Indian Community TLDs measured 14.9 and 14.3 mR/91 days. Although the skyshine neutron dose rates are not directly measured, the neutron levels measured next to the casks are below the levels predicted in the ISFSI SAR Report, Table 7A-4, "TN-40 Dose Rates at Short Distances". Therefore, the skyshine dose rates at farther distances from the casks should be at or below the calculated dose rates. No spent fuel storage effect on offsite ambient gamma radiation was indicated (Fig. 5-1).

Airborne Particulates

Typically, the highest averages for gross beta occur during the months of January and December, and the first and fourth quarters, as in 1996 through 2006, and also in 2008 through 2010. The elevated activity observed in 2007 was attributed to construction activity in the area, an increase in dust and consequent heavier particulate filter loading.

Average annual gross beta concentrations in airborne particulates were 0.031 pCi/m^3 at the indicators and 0.032 pCi/m^3 at the control location and similar to levels observed from 1997 through 2006 and 2008 to 2011. The results are tabulated below.

Year	Average of Indicators	Control
	Concentration (pCi/ m^3)	
1997	0.021	0.021
1998	0.022	0.018
1999	0.024	0.022
2000	0.025	0.025
2001	0.023	0.023
2002	0.028	0.023
2003	0.027	0.025
2004	0.025	0.026
2005	0.027	0.025
2006	0.026	0.025
2007	0.037	0.031
2008	0.028	0.027
2009	0.029	0.029
2010	0.025	0.025
2011	0.026	0.027
2012	0.031	0.032

Average annual gross beta concentrations in airborne particulates.

Gamma spectroscopic analysis of quarterly composites of air particulate filters yielded similar results for indicator and control locations. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation (Arnold and Al-Salih, 1955) was detected in all samples, with an average activity of 0.077 pCi/m^3 for all locations. All other isotopes were below the lower limit of detection.

There was no indication of a plant effect.

Airborne Iodine

Weekly levels of airborne iodine-131 were below the lower limit of detection (LLD) of 0.03 pCi/m^3 in all samples. There was no indication of a plant effect.

Milk

Iodine-131 results were below a detection limit of 0.5 pCi/L in all samples.

Cs-137 results were below 5 pCi/L in all samples. No other gamma-emitting isotopes, except naturally occurring potassium-40, were detected in any milk sample. In general, radiocontaminants from cattlefeed are not found in milk, due to the selective metabolism of the cow. The common exceptions are isotopes of potassium, cesium, strontium, barium, and iodine (National Center for Radiological Health, 1968).

In summary, the data for 2012 show no radiological effects of the plant operation.

Drinking Water

In drinking water from the City of Red Wing well, tritium activity measured below a detection limit of 152 pCi/L for all samples.

Gross beta concentrations averaged 11.8 pCi/L throughout the year, ranging from 7.6–14.3 pCi/L. These concentrations are consistent with levels observed from 1997 through 2011. The most likely contribution is the relatively high levels of naturally-occurring radium. Gamma spectroscopy indicates the presence of lead and bismuth isotopes, which are daughters of the radium decay chain. There is no indication from the 2012 data of any effect of plant operation.

Year		Gross Beta (pCi/L)
1997		5.1
1998		5.4
1999		5.3
2000		10.1
2001		8.3
2002		8.7
2003		9.9
2004		9.8
2005		11.5
2006		13.4
2007		11.6
2008		11.6
2009		11.4
2010		11.7
2011		12.4
2012		11.8

Average annual concentrations; Gross beta in drinking water.

River Water

Tritium in river water samples tested measured below an LLD level of 152 pCi/L in all samples. Gamma-emitting isotopes were below detection limits in all samples.

In summary, well water data for 2012 show no radiological effects of the plant operation.

Well Water

Water samples tested from the control well, P-43 (Peterson Farm) and from four indicator wells (P-8, Community Center, P-6, Lock and Dam No. 3, P-9, Plant Well No. 2 and P-24, Suter Farm) showed no tritium detected above a detection limit of 152 pCi/L. Gamma-emitting isotopes were below detection limits in all samples.

In summary, well water data for 2012 show no radiological effects of the plant operation.

Crops

Three samples of broadleaf vegetation, cabbage leaves, were collected in July and August, 2012 and analyzed for gamma-emitting isotopes, including iodine-131. The I-131 level was below 0.022 pCi/g wet weight in all samples. With exceptions for naturally-occurring beryllium-7 and potassium-40, all other gamma-emitting isotopes were below their respective detection limits. There was no indication of a plant effect.

Field sampling personnel conducted an annual land use survey and found no river water taken for irrigation into fields within 5 miles downstream from the Prairie Island Plant. The collection and analysis of corn samples was not required.

Fish

Fish were collected in May and September, 2012 and analyzed for gamma emitting isotopes. Only naturally-occurring potassium-40 was detected, and there was no significant difference between upstream and downstream results. There was no indication of a plant effect.

Aquatic Insects or Periphyton

Aquatic insects (invertebrates) or periphyton were collected in May and September, 2012 and analyzed for gamma-emitting isotopes. All gamma-emitting isotopes, with the exception of naturally-occurring potassium-40, were below detection limits. There was no indication of any plant effect.

Bottom and Shoreline Sediments

Upstream, downstream and downstream recreational area shoreline sediments were sampled in May and October, 2012 and analyzed for gamma-emitting isotopes. The only gamma-emitting isotope detected was naturally-occurring potassium-40.

There was no indication of a plant effect.

5.0 FIGURES AND TABLES

Figure 5-1. Offsite Ambient Radiation (TLDs); average of inner and outer ring indicator locations versus control location.

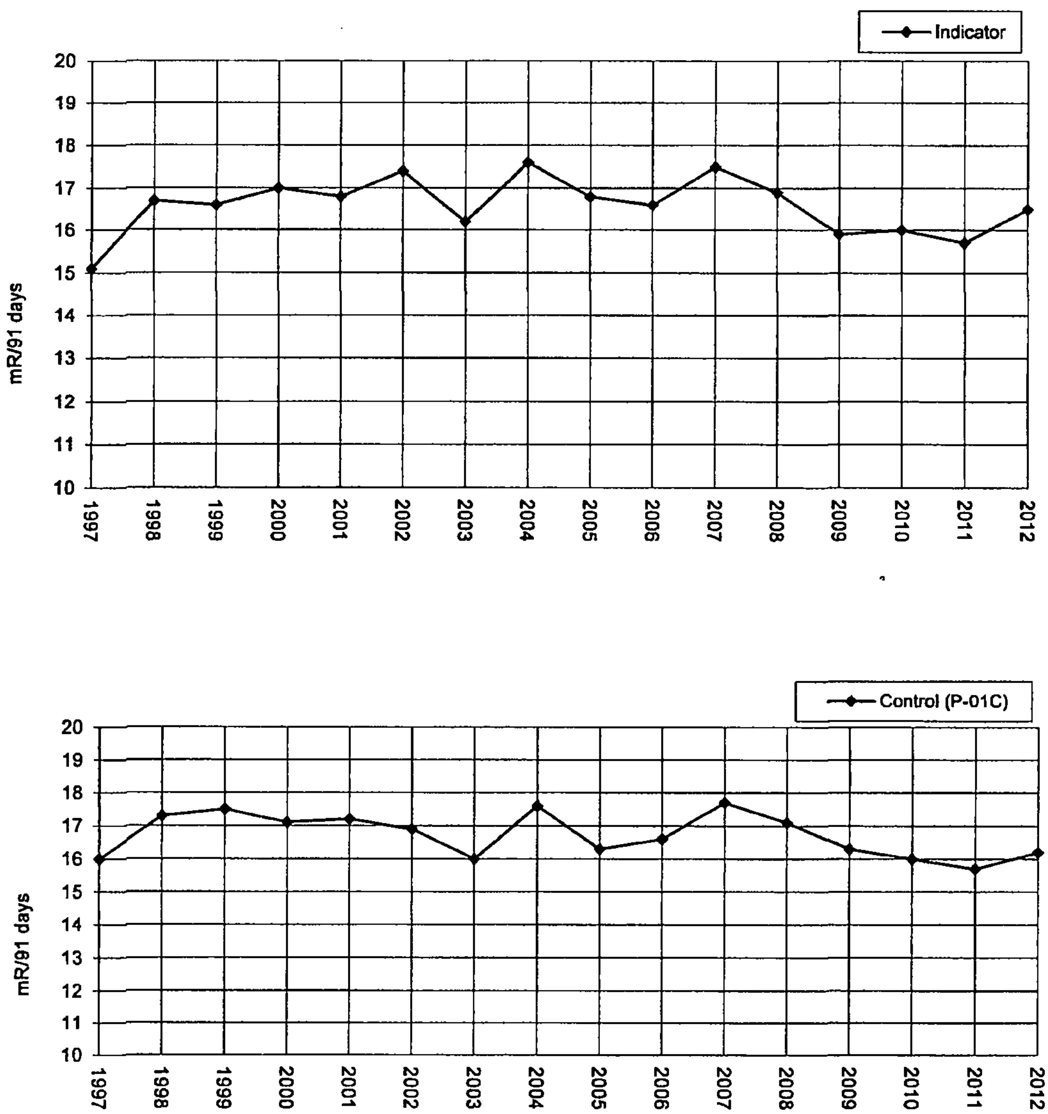
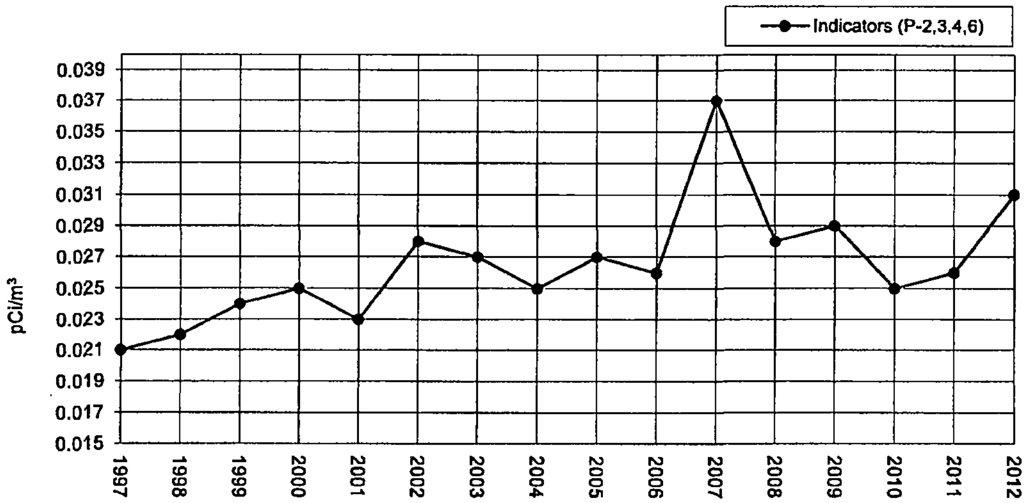
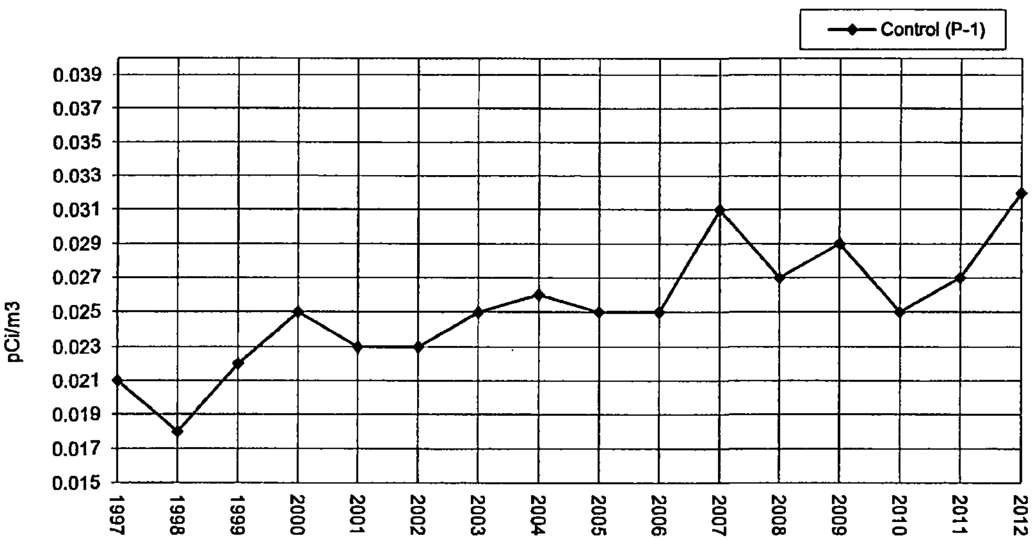


Figure 5-2. Airborne Particulates; analysis for gross beta, average mean of all indicator locations versus control location.





PRAIRIE ISLAND

Table 5.1. Sample collection and analysis program, Prairie Island Nuclear Generating Plant.

Medium	Location No.	Location Codes (and Type)[a]	Collection Type and Frequency[b]	Analysis Type and Frequency[c]
Ambient radiation (TLD's)	54	P-01A - P-10A P-01B - P-15B P-01S - P-08S P-01IA - P-08IA P-01IB - P-08IB P-01IX- P-04IX, P-01C	C/Q	Ambient gamma
Airborne Particulates	5	P-1(C), P-2, P-3, P-4, P-6	C/W	GB, GS (QC of each location)
Airborne Iodine	5	P-1(C), P-2, P-3, P-4, P-6	C/W	I-131
Milk	4	P-18, P-37, P-43 (C)	G/M[d]	I-131, GS
River water	2	P-5(C), P-6	G/W	GS(MC), H-3(QC)
Drinking water	1	P-11	G/W	GB(MC), I-131(MC) GS (MC), H-3 (QC)
Well water	5	P-6, P-8, P-9, P-24, P-43 (C)	G/Q	H-3, GS
Edible cultivated crops - leafy green vegetables	3	P-28, P-38(C), P-45	G/A	GS (I-131)
Fish (one species, edible portion)	2	P-19(C), P-13	G/SA	GS
Periphyton or invertebrates	2	P-40(C), P-6	G/SA	GS
Bottom sediment	2	P-20(C), P-6	G/SA	GS
Shoreline sediment	1	P-12	G/SA	GS

[a] Location codes are defined in Table D-2. Control stations are indicated by (C). All other stations are indicators.

[b] Collection type is coded as follows: C/ = continuous, G/ = grab. Collection frequency is coded as follows:
W= weekly, M = monthly, Q = quarterly, SA = semiannually, A = annually.

[c] Analysis type is coded as follows: GB = gross beta, GS = gamma spectroscopy, H-3 = tritium, I-131 = iodine-131.
Analysis frequency is coded as follows: MC = monthly composite, QC = quarterly composite.

[d] Milk is collected biweekly during the grazing season (May - October).

PRAIRIE ISLAND

Table 5.2. Sampling locations, Prairie Island Nuclear Generating Plant.

Code	Type[a]	Collection Site	Sample Type[b]	Distance and Direction from Reactor
P-1	C	Air Station P-1	AP, AI	11.8 mi @ 316°/NNW
P-2		Air Station P-2	AP, AI	0.5 mi @ 294°/WNW
P-3		Air Station P-3	AP, AI	0.8 mi @ 313°/NW
P-4		Air Station P-4	AP, AI	0.4 mi @ 359°/N
P-5	C	Upstream of Plant	RW	1.8 mi @ 11°/N
P-6		Lock and Dam #3 & Air Station P-6	AP, AI, RW WW, BS, BO[c]	1.6 mi @ 129°/SE
P-8		Community Center	WW	1.0 mi @ 321°/WNW
P-9		Plant Well #2	WW	0.3 mi @ 306°/NW
P-11		Red Wing Service Center	DW	3.3 mi @ 158°/SSE
P-12		Downstream of Plant	SS	3.0 mi @ 116°/ESE
P-13		Downstream of Plant	F[c]	3.5 mi @ 113°/ESE
P-18		Christiansen Farm	M	3.8 mi @ 88°/E
P-19	C	Upstream of Plant	F[c]	1.3 mi @ 0°/N
P-20	C	Upstream of Plant	BS	0.9 mi @ 45°/NE
P-24		Suter Residence	WW	0.6 mi @ 158°/SSE
P-28		Allyn Residence	VE	1.0 mi @ 152°/SSE
P-37		Welsch Farm	M	4.1 mi @ 87°/E
P-38	C	Cain Residence	VE	14.2 mi @ 359°/N
P-40	C	Upstream of Plant	BO[c]	0.4 mi @ 0°/N
P-43	C	Peterson Farm	M, WW	13.9 mi. @ 355°/N
P-45		Glazier Residence	VE	0.6 mi. @ 341°/NNW
<u>General Area of the Site Boundary</u>				
P-01A		Property Line	TLD	0.4 mi @ 359°/N
P-02A		Property Line	TLD	0.3 mi @ 10°/N
P-03A		Property Line	TLD	0.5 mi @ 183°/S
P-04A		Property Line	TLD	0.4 mi @ 204°/SWW
P-05A		Property Line	TLD	0.4 mi @ 225°/SW
P-06A		Property Line	TLD	0.4 mi @ 249°/WSW
P-07A		Property Line	TLD	0.4 mi @ 268°/W
P-08A		Property Line	TLD	0.4 mi @ 291°/WNW
P-09A		Property Line	TLD	0.7 mi @ 317°/NW
P-10A		Property Line	TLD	0.5 mi @ 333°/NNW

PRAIRIE ISLAND

Table 5.2. Sampling locations, Prairie Island Nuclear Generating Plant (continued).

Code	Type[a]	Collection Site	Sample Type[b]	Distance and Direction from Reactor
Approximately 4 to 5 miles Distant from the Plant				
P-01B		Thomas Killian Residence	TLD	4.7 mi @ 355°/N
P-02B		Roy Kinneman Residence	TLD	4.8 mi @ 17°/NNE
P-03B		Wayne Anderson Farm	TLD	4.9 mi @ 46°/NE
P-04B		Nelson Drive (Road)	TLD	4.2 mi @ 61°/ENE
P-05B		County Road E and Coulee	TLD	4.2 mi @ 102°/ESE
P-06B		William Hauschibit Residence	TLD	4.4 mi @ 112°/ESE
P-07B		Red Wing Public Works	TLD	4.7 mi @ 140°/SE
P-08B		David Wnuk Residence	TLD	4.1 mi @ 165°/SSE
P-09B		Highway 19 South	TLD	4.2 mi @ 187°/S
P-10B		Cannondale Farm	TLD	4.9 mi @ 200°/SSW
P-11B		Wallace Weberg Farm	TLD	4.5 mi @ 221°/SW
P-12B		Ray Gergen Farm	TLD	4.6 mi @ 251°/WSW
P-13B		Thomas O'Rourke Farm	TLD	4.4 mi @ 270°/W
P-14B		David J. Anderson Farm	TLD	4.9 mi @ 306°/NW
P-15B		Holst Farms	TLD	3.8 mi @ 345°/NNW
Special Interest Locations				
P-01S		Federal Lock & Dam #3	TLD	1.6 mi @ 129°/SE
P-02S		Charles Suter Residence	TLD	0.5 mi @ 155°/SSE
P-03S		Carl Gustafson Farm	TLD	2.2 mi @ 173°/S
P-04S		Richard Burt Residence	TLD	2.0 mi @ 202°/SSW
P-05S		Kinney Store	TLD	2.0 mi @ 270°/W
P-06S		Earl Flynn Farm	TLD	2.5 mi @ 299°/WNW
P-07S		Indian Community	TLD	0.7 mi @ 271°/W
P-08S		Indian Community	TLD	0.7 mi @ 287°/NWW
P-01C	C	Robert Kinneman Farm	TLD	11.1 mi @ 331°/NNW

PRAIRIE ISLAND

Table 5.2. Sampling locations, Prairie Island Nuclear Generating Plant (continued).

Code	Type[a]	Collection Site	Sample Type[b]	Distance and Direction from ISFSI Center.
ISFSI Area Inside Earth Berm				
P-01IA		ISFSI Nuisance Fence	TLD	190' @ 45°/NE
P-02IA		ISFSI Nuisance Fence	TLD	360' @ 82°/E
P-03IA		ISFSI Nuisance Fence	TLD	370' @ 100°/E
P-04IA		ISFSI Nuisance Fence	TLD	200' @ 134°/SE
P-05IA		ISFSI Nuisance Fence	TLD	180' @ 219°/SW
P-06IA		ISFSI Nuisance Fence	TLD	320' @ 258°/WSW
P-07IA		ISFSI Nuisance Fence	TLD	320' @ 281°/WNW
P-08IA		ISFSI Nuisance Fence	TLD	190' @ 318°/NW
P-01IX		ISFSI Nuisance Fence	TLD	140' @ 180°/S
P-02IX		ISFSI Nuisance Fence	TLD	310' @ 270°/W
P-03IX		ISFSI Nuisance Fence	TLD	140' @ 0°/N
P-04IX		ISFSI Nuisance Fence	TLD	360' @ 90°/E
ISFSI Area Outside Earth Berm				
P-01IB		ISFSI Berm Area	TLD	340' @ 3°/N
P-02IB		ISFSI Berm Area	TLD	380' @ 28°/NNE
P-03IB		ISFSI Berm Area	TLD	560' @ 85°/E
P-04IB		ISFSI Berm Area	TLD	590' @ 165°/SSE
P-05IB		ISFSI Berm Area	TLD	690' @ 186°/S
P-06IB		ISFSI Berm Area	TLD	720' @ 201°/SSW
P-07IB		ISFSI Berm Area	TLD	610' @ 271°/W
P-08IB		ISFSI Berm Area	TLD	360' @ 332°/NNW

[a] "C" denotes control location. All other locations are indicators.

[b] Sample Codes:

AP	Airborne particulates	F	Fish
AI	Airborne Iodine	M	Milk
BS	Bottom (river) sediments	SS	Shoreline Sediments
BO	Bottom organisms (periphyton or macroinvertebrates)	SW	Surface Water
		VE	Vegetation/vegetables
DW	Drinking water	WW	Well water

[c] Distance and direction data for fish and bottom organisms are approximate since availability of sample specimen may vary at any one location.

Table 5.3. Missed collections and analyses at the Prairie Island Nuclear Generating Plant.

All required samples were collected and analyzed as scheduled with the following exceptions:

Sample Type	Analysis	Location	Collection Date or Period	Reason for not conducting REMP as required	Plans for Preventing Recurrence
AP/AI	Beta, I-131	P-3	5/16/2012	No sample, due to power loss. Sampler pump failed, open fuse.	Replaced pump.
AP/AI	Beta, I-131	P-4	8/22/2012	Partial sample due to tripped breaker. Run-time reduced by approx. 20 hrs.	None required.
AP/AI	Beta, I-131	Highest D/Q sector	2012	March, 2011 meteorological data indicated that the highest D/Q site was located in the West sector.	Sampler to be installed in West sector for 2013.
TLD	Gamma	PI-8B	3rd Qtr. 2012	TLD missing in the field	TLD replaced.

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility	Prairie Island Nuclear Power Station	Docket No.	50-282, 50-306
Location of Facility	Goodhue, Minnesota (County, State)	Reporting Period	January-December, 2012

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean		Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
				Location[d]	Mean (F)[c] Range[c]		
Direct Radiation							
TLD (Inner Ring, Area at Site Boundary) mR/91 days)	Gamma 40	3.0	16.2 (40/40) (11.6-19.4)	P-06A 0.4 mi @ 249° /WSW	17.7 (4/4) (16.5-19.4)	(See Control below.)	0
TLD (Outer Ring, 4-5 mi. distant) mR/91 days)	Gamma 59	3.0	16.7 (59/59) (12.5-20.3)	P-12B, R. Gergen Farm., 4.6 mi @ 251° /WSW	18.4 (4/4) (17.6-20.3)	(See Control below.)	0
TLD (Special Interest Areas) mR/91 days)	Gamma 32	3.0	15.6 (32/32) (12.0-19.2)	P-03S, Gustafson Farm, 2.2 mi @ 173° /S	18.4 (4/4) (16.6-19.1)	(See Control below.)	0
TLD (Control) mR/91 days)	Gamma 4	3.0	None	P-01C, Robert Kinneman 11.1 mi @ 331° /NNW	16.2 (4/4) (15.4-17.0)	16.2 (4/4) (15.4-17.0)	0
Airborne Pathway							
Airborne Particulates (pCi/m³)	GB 259	0.005	0.031 (208/208) (0.010-0.090)	P-01, Air Station 11.8 mi @ 316° /NNW	0.032 (51 /51) (0.014-0.084)	0.032 (51/51) (0.014-0.084)	0
	GS 20						
	Be-7	0.015	0.076 (16/16) (0.045-0.106)	P-04, Air Station 0.4 mi @ 359° /N	0.079 (4/4) (0.045-0.106)	0.078 (4/4) (0.045-0.104)	0
	Mn-54	0.0006	< LLD	-	-	< LLD	0
	Co-58	0.0007	< LLD	-	-	< LLD	0
	Co-60	0.0009	< LLD	-	-	< LLD	0
	Zn-65	0.0013	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.0009	< LLD	-	-	< LLD	0
	Ru-103	0.0008	< LLD	-	-	< LLD	0
	Ru-106	0.0068	< LLD	-	-	< LLD	0
	Cs-134	0.0005	< LLD	-	-	< LLD	0
	Cs-137	0.0007	< LLD	-	-	< LLD	0
	Ba-La-140	0.0018	< LLD	-	-	< LLD	0
	Ce-141	0.0015	< LLD	-	-	< LLD	0
	Ce-144	0.0040	< LLD	-	-	< LLD	0
Airborne Iodine (pCi/m³)	I-131 259	0.030	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility: Prairie Island Nuclear Power Station — Docket No. 50-282, 50-306

Location of Facility: Goodhue, Minnesota (County, State) — Reporting Period January-December, 2012

Sample Type (Units)	Type and Number of Analyses[a]		LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Terrestrial Pathway								
Milk (pCi/L)	I-131	54	0.5	< LLD	-	-	< LLD	0
	GS	54						
	K-40		200	1413 (36/36) (1240-1536)	P-43 (C)Peterson Farm 13.9 mi @ 355° /N	1442 (18 /18) (1353-1527)	1442 (18/18) (1353-1527)	0
	Cs-134		5	< LLD	-	-	< LLD	0
	Cs-137		5	< LLD	-	-	< LLD	0
	Ba-La-140		5	< LLD	-	-	< LLD	0
Crops - Cabbage (pCi/gwet)	I-131	2	0.022	< LLD	-	-	< LLD	0
Well Water (pCi/L)	H-3	20	152	< LLD	-	-	< LLD	0
	GS	20						
	Mn-54		10	< LLD	-	-	< LLD	0
	Fe-59		30	< LLD	-	-	< LLD	0
	Co-58		10	< LLD	-	-	< LLD	0
	Co-60		10	< LLD	-	-	< LLD	0
	Zn-65		30	< LLD	-	-	< LLD	0
	Zr-Nb-95		15	< LLD	-	-	< LLD	0
	Cs-134		10	< LLD	-	-	< LLD	0
	Cs-137		10	< LLD	-	-	< LLD	0
	Ba-La-140		15	< LLD	-	-	< LLD	0
	Ce-144		43	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility: Prairie Island Nuclear Power Station — Docket No. 50-282, 50-306

Location of Facility: Goodhue, Minnesota (County, State) — Reporting Period January-December, 2012

Sample Type (Units)	Type and Number of Analyses[a]		LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Waterborne Pathway								
Drinking Water (pCi/L)	GB	12	1.0	11.8 (12/12) (7.6-14.3)	P-11, Red Wing S.C. 3.3 mi @ 158° /SSE	11.8 (12/12) (7.6-14.3)	None	0
	I-131	12	1.0	< LLD		-	None	0
	H-3	4	152	< LLD	-	-	None	0
	GS	12						
	Mn-54		10	< LLD	-	-	None	0
	Fe-59		30	< LLD	-	-	None	0
	Co-58		10	< LLD	-	-	None	0
	Co-60		10	< LLD	-	-	None	0
	Zn-65		30	< LLD	-	-	None	0
	Zr-Nb-95		15	< LLD	-	-	None	0
	Cs-134		10	< LLD	-	-	None	0
	Cs-137		10	< LLD	-	-	None	0
	Ba-La-140		15	< LLD	-	-	None	0
	Ce-144		39	< LLD	-	-	None	0
River Water (pCi/L)	H-3	8	152	< LLD	-	-	< LLD	0
	GS	24						
	Mn-54		10	< LLD	-	-	< LLD	0
	Fe-59		30	< LLD	-	-	< LLD	0
	Co-58		10	< LLD	-	-	< LLD	0
	Co-60		10	< LLD	-	-	< LLD	0
	Zn-65		30	< LLD	-	-	< LLD	0
	Zr-Nb-95		15	< LLD	-	-	< LLD	0
	Cs-134		10	< LLD	-	-	< LLD	0
	Cs-137		10	< LLD	-	-	< LLD	0
	Ba-La-140		15	< LLD	-	-	< LLD	0
	Ce-144		29	< LLD	-	-	< LLD	0
Fish (pCi/g wet)	GS	4						
	K-40		0.10	3.29 (2/2) (3.26-3.33)	P-13, Downstream 3.5 mi @ 113°/ESE	3.29 (2/2) (3.26-3.33)	3.07 (2/2) (2.73-3.41)	0
	Mn-54		0.021	< LLD	-	-	< LLD	0
	Fe-59		0.11	< LLD	-	-	< LLD	0
	Co-58		0.030	< LLD	-	-	< LLD	0
	Co-60		0.019	< LLD	-	-	< LLD	0
	Zn-65		0.052	< LLD	-	-	< LLD	0
	Zr-Nb-95		0.066	< LLD	-	-	< LLD	0
	Cs-134		0.016	< LLD	-	-	< LLD	0
	Cs-137		0.018	< LLD	-	-	< LLD	0
	Ba-La-140		0.25	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility: Prairie Island Nuclear Power Station
Location of Facility: Goodhue, Minnesota (County, State)
Docket No.: 50-282, 50-306
Reporting Period: January-December, 2012

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Waterborne Pathway							
Invertebrates (pCi/g wet)	GS 4						
	Be-7	0.74	< LLD	-	-	< LLD	0
	K-40	0.49	1.51 (1/2)	P-06, Lock & Dam #3, 1.6 mi. @ 129° /SE	1.51 (1/2)	1.33 (1/2) -	0
	Mn-54	0.055	< LLD	-	-	< LLD	0
	Co-58	0.096	< LLD	-	-	< LLD	0
	Co-60	0.069	< LLD	-	-	< LLD	0
	Zn-65	0.11	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.23	< LLD	-	-	< LLD	0
	Ru-103	0.15	< LLD	-	-	< LLD	0
	Ru-106	0.46	< LLD	-	-	< LLD	0
	Cs-134	0.049	< LLD	-	-	< LLD	0
	Cs-137	0.045	< LLD	-	-	< LLD	0
	Ba-La-140	1.06	< LLD	-	-	< LLD	0
	Ce-141	0.37	< LLD	-	-	< LLD	0
	Ce-144	0.22	< LLD	-	-	< LLD	0
Bottom and Shoreline Sediments (pCi/g dry)	GS 6						
	Be-7	0.17	< LLD	-	-	< LLD	0
	K-40	0.10	8.91 (4/4) (8.36-9.42)	P-20, Upstream 0.9 mi. @ 45° /NE	9.50 (2/2) (9.26-9.74)	9.50 (2/2) (9.26-9.74)	0
	Mn-54	0.017	< LLD	-	-	< LLD	0
	Co-58	0.017	< LLD	-	-	< LLD	0
	Co-60	0.016	< LLD	-	-	< LLD	0
	Zn-65	0.033	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.022	< LLD	-	-	< LLD	0
	Ru-103	0.020	< LLD	-	-	< LLD	0
	Ru-106	0.13	< LLD	-	-	< LLD	0
	Cs-134	0.013	< LLD	-	-	< LLD	0
	Cs-137	0.014	< LLD	-	-	< LLD	0
	Ba-La-140	0.050	< LLD	-	-	< LLD	0
	Ce-141	0.044	< LLD	-	-	< LLD	0
	Ce-144	0.078	< LLD	-	-	< LLD	0

[a] GB = gross beta, GS = gamma scan.

[b] LLD = nominal lower limit of detection based on a 4.66 sigma counting error for background sample.

[c] Mean and range are based on detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).

[d] Locations are specified: (1) by name, and/or station code and (2) by distance (miles) and direction relative to reactor site.

[e] Non-routine results are those which exceed ten times the control station value. If no control station value is available, the result is considered non-routine if it exceeds ten times the typical preoperational value for the medium or location.

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APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

NOTE: Environmental Inc., Midwest Laboratory participates in intercomparison studies administered by Environmental Resources Associates, and serves as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. Results are reported in Appendix A. TLD Intercomparison results, in-house spikes, blanks, duplicates and mixed analyte performance evaluation program results are also reported. Appendix A is updated four times a year; the complete Appendix is included in March, June, September and December monthly progress reports only.

January, 2012 through December, 2012

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of it's quality control program in December 1971. These programs are operated by agencies which supply environmental type samples containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

Results in Table A-1 were obtained through participation in the environmental sample crosscheck program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

Table A-2 lists results for thermoluminescent dosimeters (TLDs), via International Intercomparison of Environmental Dosimeters, when available, and internal laboratory testing.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Data for previous years available upon request.

Table A-4 lists results of the analyses on in-house "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 lists REMP specific analytical results from the in-house "duplicate" program for the past twelve months. Acceptance is based on the difference of the results being less than the sum of the errors. Complete analytical data for duplicate analyses is available upon request.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

Results in Table A-7 were obtained through participation in the environmental sample crosscheck program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurement Laboratory Quality Assessment Program (EML).

Attachment A lists the laboratory precision at the 1 sigma level for various analyses. The acceptance criteria in Table A-3 is set at ± 2 sigma.

Out-of-limit results are explained directly below the result.

Attachment A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES[a]

Analysis	Level	One standard deviation for single determination
Gamma Emitters	5 to 100 pCi/liter or kg	5.0 pCi/liter
	> 100 pCi/liter or kg	5% of known value
Strontium-89[b]	5 to 50 pCi/liter or kg	5.0 pCi/liter
	> 50 pCi/liter or kg	10% of known value
Strontium-90[b]	2 to 30 pCi/liter or kg	5.0 pCi/liter
	> 30 pCi/liter or kg	10% of known value
Potassium-40	≥ 0.1 g/liter or kg	5% of known value
Gross alpha	≤ 20 pCi/liter	5.0 pCi/liter
	> 20 pCi/liter	25% of known value
Gross beta	≤ 100 pCi/liter	5.0 pCi/liter
	> 100 pCi/liter	5% of known value
Tritium	≤ 4,000 pCi/liter	$\pm 1\sigma = 169.85 \times (\text{known})^{0.0933}$
	> 4,000 pCi/liter	10% of known value
Radium-226,-228	≥ 0.1 pCi/liter	15% of known value
Plutonium	≥ 0.1 pCi/liter, gram, or sample	10% of known value
Iodine-131, Iodine-129[b]	≤ 55 pCi/liter	6 pCi/liter
	> 55 pCi/liter	10% of known value
Uranium-238, Nickel-63[b] Technetium-99[b]	≤ 35 pCi/liter	6 pCi/liter
	> 35 pCi/liter	15% of known value
Iron-55[b]	50 to 100 pCi/liter	10 pCi/liter
	> 100 pCi/liter	10% of known value
Other Analyses [b]	—	20% of known value

[a] From EPA publication, "Environmental Radioactivity Laboratory Intercomparison Studies Program, Fiscal Year, 1981-1982, EPA-600/4-81-004.

[b] Laboratory limit.

TABLE A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA) [a].

Lab Code	Date	Concentration (pCi/L) Analysis	Laboratory Result [b]	ERA Result [c]	Control Limits	Acceptance
ERW-1783	04/09/12	Sr-89	62.2 ± 6.0	58.5	46.9 - 66.3	Pass
ERW-1783	04/09/12	Sr-90	33.7 ± 2.1	37.4	27.4 - 43.1	Pass
ERW-1786	04/09/12	Ba-133	75.7 ± 4.1	82.3	69.1 - 90.5	Pass
ERW-1786	04/09/12	Co-60	71.9 ± 4.0	72.9	65.6 - 82.6	Pass
ERW-1786	04/09/12	Cs-134	70.0 ± 4.3	74.2	60.6 - 81.6	Pass
ERW-1786	04/09/12	Cs-137	151.5 ± 6.1	155.0	140.0 - 172.0	Pass
ERW-1786	04/09/12	Zn-65	108.3 ± 89.0	105.0	94.5 - 125.0	Pass
ERW-1789	04/09/12	Gr. Alpha	55.0 ± 2.4	62.9	33.0 - 78.0	Pass
ERW-1789 [d]	04/09/12	Gr. Beta	76.2 ± 1.8	44.2	29.6 - 51.5	Fail
ERW-1795	04/09/12	Ra-226	6.4 ± 0.4	5.7	4.3 - 6.9	Pass
ERW-1795	04/09/12	Ra-228	5.4 ± 1.2	4.6	2.7 - 6.3	Pass
ERW-1795	04/09/12	Uranium	56.2 ± 2.6	61.5	50.0 - 68.2	Pass
ERW-1798	04/09/12	H-3	16023 ± 355	15800	13800 - 17400	Pass
ERW-6283	10/05/12	Sr-89	41.5 ± 4.1	39.1	29.7 - 46.1	Pass
ERW-6283	10/05/12	Sr-90	19.7 ± 1.6	20.1	14.4 - 23.8	Pass
ERW-6286	10/05/12	Ba-133	82.7 ± 4.4	84.8	71.3 - 93.3	Pass
ERW-6286	10/05/12	Co-60	77.2 ± 3.7	78.3	70.5 - 88.5	Pass
ERW-6286	10/05/12	Cs-134	74.4 ± 1.5	76.6	62.6 - 84.3	Pass
ERW-6286	10/05/12	Cs-137	183.0 ± 6.2	183.0	165.0 - 203.0	Pass
ERW-6286	10/05/12	Zn-65	211.0 ± 9.9	204.0	184.0 - 240.0	Pass
ERW-6288	10/05/12	Gr. Alpha	47.0 ± 2.3	58.6	30.6 - 72.9	Pass
ERW-6288	10/05/12	Gr. Beta	33.4 ± 1.2	39.2	26.0 - 46.7	Pass
ERW-6290	10/05/12	I-131	23.3 ± 1.0	24.8	20.6 - 29.4	Pass
ERW-6295 [e]	10/05/12	Ra-226	17.5 ± 0.7	15.0	11.2 - 17.2	Fail
ERW-6295 [e]	10/05/12	Ra-228	7.4 ± 1.5	4.6	2.7 - 6.2	Fail
ERW-6295	10/05/12	Uranium	61.2 ± 1.8	62.5	50.8 - 69.3	Pass

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing in drinking water conducted by Environmental Resources Associates (ERA).

[b] Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

[c] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA.

[d] Result of reanalysis: 38.3 ± 1.3 pCi/L. Sample dilution problem suspected. A new dilution was prepared.

[e] Results of reanalyses, original submission (pCi/L): Ra-226, 16.5 ± 0.7 Ra-228, 4.9 ± 1.1
A new test was ordered from Environmental Resources Associates, results will be updated for first quarter, 2013.

TABLE A-2. Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards).

Lab Code	Date	mR				
		Description	Known Value	Lab Result ± 2 sigma	Control Limits	Acceptance
Environmental, Inc.						
2012-1	2/7/2012	30 cm.	74.87	87.22 ± 2.86	52.41 - 97.33	Pass
2012-1	2/7/2012	40 cm.	42.12	53.70 ± 4.53	29.48 - 54.76	Pass
2012-1	2/7/2012	50 cm.	26.95	33.04 ± 1.96	18.87 - 35.04	Pass
2012-1	2/7/2012	70 cm.	13.75	13.26 ± 1.15	9.63 - 17.88	Pass
2012-1	2/7/2012	75 cm.	11.98	13.38 ± 1.68	8.39 - 15.57	Pass
2012-1	2/7/2012	80 cm.	10.53	11.27 ± 0.95	7.37 - 13.69	Pass
2012-1	2/7/2012	90 cm.	8.32	7.79 ± 0.83	5.82 - 10.82	Pass
2012-1	2/7/2012	100 cm.	6.74	5.91 ± 0.25	4.72 - 8.76	Pass
2012-1	2/7/2012	110 cm.	5.57	4.63 ± 0.83	3.90 - 7.24	Pass
2012-1	2/7/2012	120 cm.	4.68	3.96 ± 1.68	3.28 - 6.08	Pass
2012-1	2/7/2012	150 cm.	2.99	2.41 ± 0.08	2.09 - 3.89	Pass
2012-1	2/7/2012	180 cm.	2.08	2.02 ± 0.25	1.46 - 2.70	Pass
Environmental, Inc.						
2012-2	9/11/2012	40 cm.	33.75	43.74 ± 1.31	23.63 - 43.88	Pass
2012-2	9/11/2012	50 cm.	21.6	25.37 ± 0.82	15.12 - 28.08	Pass
2012-2	9/11/2012	60 cm.	15	16.63 ± 0.45	10.50 - 19.50	Pass
2012-2	9/11/2012	70 cm.	11.02	10.58 ± 0.20	7.71 - 14.33	Pass
2012-2	9/11/2012	80 cm.	8.44	8.55 ± 1.18	5.91 - 10.97	Pass
2012-2	9/11/2012	90 cm.	6.67	5.75 ± 0.33	4.67 - 8.67	Pass
2012-2	9/11/2012	100 cm.	5.4	4.44 ± 0.22	3.78 - 7.02	Pass
2012-2	9/11/2012	110 cm.	4.46	3.85 ± 0.05	3.12 - 5.80	Pass
2012-2	9/11/2012	120 cm.	3.75	3.03 ± 0.71	2.63 - 4.88	Pass
2012-2	9/11/2012	150 cm.	2.4	1.82 ± 0.10	1.68 - 3.12	Pass
2012-2	9/11/2012	180 cm.	1.67	1.19 ± 0.34	1.17 - 2.17	Pass

TABLE A-3. In-House "Spiked" Samples

		Concentration (pCi/L)[a]				
Lab Code [b]	Date	Analysis	Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
SPW-41824	2/15/2012	Ra-228	24.85 ± 2.14	28.75	20.13 - 37.38	Pass
W-22712	2/27/2012	Gr. Alpha	14.59 ± 0.34	20.00	10.00 - 30.00	Pass
W-22712	2/27/2012	Gr. Alpha	43.57 ± 0.40	41.70	20.85 - 62.55	Pass
SPAP-1032	3/5/2012	Cs-134	7.06 ± 1.71	5.26	0.00 - 15.26	Pass
SPAP-1032	3/5/2012	Cs-137	102.63 ± 3.13	104.24	93.82 - 114.66	Pass
SPAP-1034	3/5/2012	Gr. Beta	44.30 ± 0.11	46.88	28.13 - 65.63	Pass
SPW-1036	3/5/2012	Cs-134	43.23 ± 3.84	39.42	29.42 - 49.42	Pass
SPW-1036	3/5/2012	Cs-137	57.44 ± 4.60	52.12	42.12 - 62.12	Pass
SPW-1036	3/5/2012	Sr-90	60.51 ± 1.93	61.52	49.22 - 73.82	Pass
SPMI-1038	3/5/2012	Cs-134	37.79 ± 4.06	39.42	29.42 - 49.42	Pass
SPMI-1038	3/5/2012	Cs-137	54.75 ± 5.09	52.12	42.12 - 62.12	Pass
SPW-1045	3/5/2012	H-3	68022 ± 746	69048	55238 - 82858	Pass
SPW-1047	3/5/2012	Ni-63	217.10 ± 3.64	206.64	144.65 - 268.63	Pass
SPW-1049	3/5/2012	C-14	3858.90 ± 12.79	4738.80	2843.28 - 6634.32	Pass
W-31412	3/14/2012	Ra-226	13.13 ± 0.36	16.70	11.69 - 21.71	Pass
SPW-1520	3/23/2012	U-238	45.67 ± 2.02	41.70	29.19 - 54.21	Pass
SPW-41825	4/10/2012	Ra-228	28.48 ± 2.51	28.35	19.85 - 36.86	Pass
WW-1547	4/16/2012	Ba-133	18.99 ± 4.67	26.70	16.70 - 36.70	Pass
WW-1547	4/16/2012	Cs-134	9.28 ± 2.82	8.68	0.00 - 18.68	Pass
WW-1547	4/16/2012	Cs-137	27.77 ± 4.49	29.70	19.70 - 39.70	Pass
W-51712	5/17/2012	Ra-226	17.29 ± 0.43	16.70	11.69 - 21.71	Pass
W-61112	6/11/2012	Gr. Alpha	22.16 ± 0.45	20.00	10.00 - 30.00	Pass
W-61112	6/11/2012	Gr. Beta	43.57 ± 0.40	45.20	35.20 - 55.20	Pass
SPAP-4418	7/25/2012	Gr. Beta	43.74 ± 0.11	46.50	27.90 - 65.10	Pass
SPAP-4420	7/25/2012	Cs-134	4.54 ± 0.73	4.60	2.76 - 6.44	Pass
SPAP-4420	7/25/2012	Cs-137	104.70 ± 2.77	103.30	92.97 - 113.63	Pass
SPMI-4422	7/25/2012	Co-60	31.43 ± 2.12	31.62	21.62 - 41.62	Pass
SPMI-4422	7/25/2012	Cs-134	16.50 ± 1.17	16.15	6.15 - 26.15	Pass
SPMI-4422	7/25/2012	Cs-137	29.60 ± 2.61	26.64	16.64 - 36.64	Pass
SPMI-4422	7/25/2012	Sr-90	31.60 ± 1.35	30.47	24.38 - 36.56	Pass
SPW-4424	7/25/2012	Co-60	38.52 ± 1.76	37.95	27.95 - 47.95	Pass
SPW-4424	7/25/2012	Cs-137	33.23 ± 2.27	32.01	22.01 - 42.01	Pass
SPW-4424	7/25/2012	Sr-90	36.56 ± 1.58	40.60	32.48 - 48.72	Pass
SPF-4426	7/25/2012	Cs-134	947.50 ± 42.50	1025.00	922.50 - 1127.50	Pass
SPF-4426	7/25/2012	Cs-137	2692.00 ± 62.40	2480.00	2232.00 - 2728.00	Pass
SPW-4428	7/25/2012	C-14	4325.70 ± 15.80	4738.80	2843.28 - 6634.32	Pass
SPW-4430	7/25/2012	H-3	70119.40 ± 773.40	67570.00	54056.00 - 81084.00	Pass
SPW-4432	7/25/2012	Ni-63	187.20 ± 3.85	206.80	144.76 - 268.84	Pass
W-81712	8/17/2012	Ra-226	14.94 ± 0.40	16.70	11.69 - 21.71	Pass
SPW-5407	8/29/2012	U-238	42.95 ± 0.11	41.70	29.19 - 54.21	Pass
SPW-18022	9/10/2012	Ra-228	29.03 ± 2.80	28.21	19.75 - 36.67	Pass

TABLE A-3. In-House "Spiked" Samples

		Concentration (pCi/L)[a]				
Lab Code [b]	Date	Analysis	Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
W-91012	9/10/2012	Gr. Alpha	19.95 ± 0.42	20.00	10.00 - 30.00	Pass
W-91012	9/10/2012	Gr. Beta	43.47 ± 0.40	45.20	35.20 - 55.20	Pass
W-100312	10/3/2012	Gr. Alpha	19.95 ± 0.41	20.00	10.00 - 30.00	Pass
W-100312	10/3/2012	Gr. Beta	44.21 ± 0.40	45.20	35.20 - 55.20	Pass
W-101812	10/18/2012	Ra-226	18.80 ± 0.43	16.70	11.69 - 21.71	Pass
ESO-7235	12/6/2012	Sr-90	138.79 ± 2.67	161.05	128.84 - 193.26	Pass
SPW-7753	12/6/2012	U-238	45.55 ± 5.05	41.70	29.19 - 54.21	Pass
SPW-18023	12/18/2012	Ra-228	31.59 ± 2.99	25.98	18.19 - 33.77	Pass

[a] Liquid sample results are reported in pCi/Liter, air filters(pCi/filter), charcoal (pCi/m ^{3}), and solid samples (pCi/g).

[b] Laboratory codes : W (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).

[c] Results are based on single determinations.

[d] Control limits are established from the precision values listed in Attachment A of this report, adjusted to ± 2 σ.

NOTE: For fish, Jello is used for the Spike matrix. For Vegetation, cabbage is used for the Spike matrix.

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration (pCi/L)[a]		
				Laboratory results (4.66σ)		Acceptance
				LLD	Activity[c]	Criteria (4.66 σ)
SPW-41814	Water	2/15/2012	Ra-228	0.65	0.49 ± 0.36	2
W-22712	Water	2/27/2012	Gr. Alpha	0.42	-0.04 ± 0.29	1
W-22712	Water	2/27/2012	Gr. Beta	0.74	-0.54 ± 0.50	3.2
SPAP-1031	Air Filter	3/5/2012	Cs-134	1.89	-	100
SPAP-1031	Air Filter	3/5/2012	Cs-137	1.16	-	100
SPAP-1033	Air Filter	3/5/2012	Gr. Beta	0.003	0.013 ± 0.003	0.01
SPW-1035	Water	3/5/2012	Cs-134	2.40	-	10
SPW-1035	Water	3/5/2012	Cs-137	2.88	-	10
SPW-1035	Water	3/5/2012	I-131(G)	2.35	-	20
SPW-1035	Water	3/5/2012	Sr-90	0.60	-0.11 ± 0.26	1
SPMI-1037	Milk	3/5/2012	Cs-134	2.85	-	10
SPMI-1037	Milk	3/5/2012	Cs-137	3.73	-	10
SPMI-1037	Milk	3/5/2012	I-131(G)	3.24	-	20
SPW-1044	Water	3/5/2012	H-3	146.10	37.10 ± 74.40	200
SPW-1046	Water	3/5/2012	Ni-63	19.07	8.30 ± 11.79	20
SPW-1048	Water	3/5/2012	C-14	5.70	2.99 ± 3.04	200
SPW-1166	water	3/9/2012	C-14	6.79	1.11	200
W-31412	Water	3/14/2012	Ra-226	0.034	0.043 ± 0.027	1
SPW-1521	Water	3/23/2012	U-238	0.10	0.09 ± 0.11	1
W-51712	Water	4/24/2012	Ra-226	0.04	0.04 ± 0.03	1
W-61112	Water	6/11/2012	Gr. Alpha	0.47	-0.14 ± 0.32	1
W-61112	Water	6/11/2012	Gr. Beta	0.71	0.29 ± 0.51	3.2
SPW-41815	Water	7/7/2011	Ra-228	0.77	0.52 ± 0.42	2
SPAP-4417	Air Filter	7/25/2012	Gr. Beta	0.001	0.021 ± 0.003	0.01
SPMI-4421	Milk	7/25/2012	Co-60	4.29	-	10
SPMI-4421	Milk	7/25/2012	Cs-134	3.58	-	10
SPMI-4421	Milk	7/25/2012	Cs-137	4.60	-	10
SPMI-4421	Milk	7/25/2012	Sr-90	0.45	0.53 ± 0.27	1
SPW-4423	Water	7/25/2012	Co-60	1.88	-	10
SPW-4423	Water	7/25/2012	Cs-134	2.38	-	10
SPW-4423	Water	7/25/2012	Cs-137	2.80	-	10
SPW-4423	water	7/25/2012	Sr-90	0.45	0.08 ± 0.22	1
SPF-4425	Fish	7/25/2012	Co-60	6.74	-	100
SPF-4425	Fish	7/25/2012	Cs-134	7.47	-	100
SPF-4425	Fish	7/25/2012	Cs-137	9.62	-	100
SPW-4427	Water	7/25/2012	C-14	10.93	3.54 ± 5.84	200
SPW-4431	Water	7/25/2012	Ni-63	19.00	5.50 ± 11.70	20
W-81712	Water	8/17/2012	Ra-226	0.038	0.035 ± 0.030	1
SPW-5408	Water	8/29/2012	U-238	0.039	0.015 ± 0.057	1

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration (pCi/L)[a]		
				Laboratory results (4.66σ)		Acceptance
				LLD	Activity[c]	Criteria (4.66 σ)
SPW-18032	Water	9/10/2012	Ra-228	0.78	0.85 ± 0.46	2
W-91012	Water	9/10/2012	Gr. Alpha	0.42	0.027 ± 0.29	1
W-91012	Water	9/10/2012	Gr. Beta	0.75	-0.13 ± 0.52	3.2
W-100312	Water	10/3/2012	Gr. Beta	0.77	-0.32 ± 0.53	3.2
W-100312	Water	10/3/2012	Gr. Beta	0.43	0.06 ± 0.30	3.2
W-101812	Water	10/18/2012	Ra-226	0.04	0.038 ± 0.031	1
SPW-7754	Water	12/6/2012	U-238	0.10	0.022 ± 0.075	1
SPW-18033	Water	12/18/2012	Ra-228	0.98	0.43 ± 0.50	2

[a] Liquid sample results are reported in pCi/Liter, air filters(pCi/filter), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

[b] I-131(G); iodine-131 as analyzed by gamma spectroscopy.

[c] Activity reported is a net activity result. For gamma spectroscopic analysis, activity detected below the LLD value is not reported.

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
CF-20, 21	1/3/2012	Gr. Beta	14.50 ± 0.29	15.02 ± 0.30	14.76 ± 0.21	Pass
CF-20, 21	1/3/2012	K-40	12.88 ± 0.55	12.40 ± 0.53	12.64 ± 0.38	Pass
CF-20, 21	1/3/2012	Sr-90	0.01 ± 0.01	0.01 ± 0.01	0.01 ± 0.00	Pass
P-9133, 9134	1/3/2012	H-3	108.86 ± 83.03	206.60 ± 86.38	157.73 ± 59.91	Pass
U-302, 303	1/17/2012	Beta (-K40)	6.84 ± 2.91	5.24 ± 2.56	6.04 ± 1.94	Pass
S-386, 387	1/23/2012	Ac-228	0.77 ± 0.11	0.79 ± 0.14	0.78 ± 0.09	Pass
S-386, 387	1/23/2012	Bi-214	0.80 ± 0.07	0.73 ± 0.11	0.77 ± 0.07	Pass
S-386, 387	1/23/2012	Pb-214	0.74 ± 0.06	0.75 ± 0.11	0.75 ± 0.06	Pass
S-386, 387	1/23/2012	Tl-208	0.21 ± 0.02	0.21 ± 0.04	0.21 ± 0.02	Pass
S-386, 387	1/23/2012	U-235	0.05 ± 0.02	0.12 ± 0.05	0.09 ± 0.03	Pass
WW-619, 620	1/31/2012	H-3	257.20 ± 86.00	305.80 ± 88.30	281.50 ± 61.63	Pass
MI-702, 703	2/6/2012	K-40	1337.00 ± 123.00	1460.40 ± 102.00	1398.70 ± 79.90	Pass
WW-892, 893	2/17/2012	Gr. Beta	3.46 ± 0.56	3.77 ± 0.59	3.61 ± 0.41	Pass
S-850, 851	2/22/2012	Cs-134	0.14 ± 0.02	0.13 ± 0.02	0.14 ± 0.01	Pass
S-850, 851	2/22/2012	Cs-137	0.21 ± 0.03	0.22 ± 0.03	0.22 ± 0.02	Pass
W-1251, 1252	3/6/2012	Gr. Alpha	1.20 ± 0.62	1.27 ± 0.92	1.24 ± 0.55	Pass
W-1251, 1252	3/6/2012	Gr. Beta	16.86 ± 1.43	15.14 ± 1.34	16.00 ± 0.98	Pass
W-1251, 1252	3/6/2012	H-3	5235.52 ± 230.91	4893.24 ± 224.55	5064.38 ± 161.05	Pass
W-1251, 1252	3/6/2012	Tc-99	19.67 ± 3.60	14.46 ± 3.51	17.07 ± 2.51	Pass
AP-1209, 1210	3/8/2012	Be-7	0.24 ± 0.12	0.20 ± 0.11	0.22 ± 0.08	Pass
XWW-1564, 1565	3/14/2012	H-3	308.00 ± 88.00	293.00 ± 87.00	300.50 ± 61.87	Pass
SG-1438, 1439	3/19/2012	Ac-228	6.01 ± 0.30	6.23 ± 0.31	6.12 ± 0.22	Pass
SG-1438, 1439	3/19/2012	Pb-214	4.69 ± 0.49	5.20 ± 0.54	4.95 ± 0.36	Pass
WW-1585, 1586	3/19/2012	H-3	3124.50 ± 176.96	2982.38 ± 173.62	3053.44 ± 123.96	Pass
AP-2103, 2104	3/28/2012	Be-7	0.080 ± 0.016	0.076 ± 0.013	0.078 ± 0.010	Pass
AP-2166, 2167	3/28/2012	Be-7	0.061 ± 0.020	0.071 ± 0.016	0.066 ± 0.013	Pass
AP-1632, 1633	3/29/2012	Be-7	0.26 ± 0.12	0.24 ± 0.12	0.25 ± 0.08	Pass
E-1653, 1654	4/2/2012	Gr. Beta	1.53 ± 0.05	1.55 ± 0.04	1.54 ± 0.03	Pass
E-1653, 1654	4/2/2012	K-40	1.34 ± 0.13	1.36 ± 0.14	1.35 ± 0.10	Pass
SG-1677, 1678	4/2/2012	Ac-228	6.63 ± 0.37	6.49 ± 0.33	6.56 ± 0.25	Pass
SG-1677, 1678	4/2/2012	Pb-214	4.77 ± 0.16	5.07 ± 0.14	4.92 ± 0.11	Pass
SWU-1719, 1720	4/3/2012	Gr. Beta	1.16 ± 0.41	1.53 ± 0.44	1.35 ± 0.30	Pass
W-1698, 1699	4/5/2012	Gr. Beta	10.86 ± 1.49	9.42 ± 1.32	10.14 ± 1.00	Pass
W-1698, 1699	4/5/2012	Ra-226	0.41 ± 0.15	0.67 ± 0.18	0.54 ± 0.12	Pass
W-1698, 1699	4/5/2012	Ra-228	1.46 ± 0.76	1.48 ± 0.74	1.47 ± 0.53	Pass
SG-1761, 1762	4/10/2012	Ac-228	16.26 ± 0.53	16.55 ± 0.44	16.41 ± 0.34	Pass
SG-1761, 1762	4/10/2012	Pb-214	14.16 ± 1.44	15.40 ± 1.56	14.78 ± 1.06	Pass
AP-2019, 2020	4/12/2012	Be-7	0.17 ± 0.10	0.17 ± 0.08	0.17 ± 0.07	Pass
DW-2272, 2273	4/20/2012	I-131	0.52 ± 0.24	0.49 ± 0.27	0.51 ± 0.18	Pass
DW-2356, 2357	4/24/2012	Gr. Beta	12.82 ± 2.01	9.47 ± 1.74	11.14 ± 1.33	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
G-2403, 2404	5/1/2012	Be-7	1.77 ± 0.21	1.55 ± 0.33	1.66 ± 0.20	Pass
G-2403, 2404	5/1/2012	K-40	6.38 ± 0.50	6.93 ± 0.72	6.66 ± 0.44	Pass
BS-2445, 2446	5/1/2012	Gr. Beta	8.92 ± 1.52	9.29 ± 1.63	9.11 ± 1.11	Pass
BS-2445, 2446	5/1/2012	K-40	5.86 ± 0.38	6.22 ± 0.48	6.04 ± 0.31	Pass
SWU-2550, 2551	5/1/2012	Gr. Beta	2.07 ± 0.65	1.59 ± 0.62	1.83 ± 0.45	Pass
WW-2614, 2615	5/1/2012	Gr. Beta	2.03 ± 1.04	2.36 ± 1.14	2.20 ± 0.77	Pass
WW-2614, 2615	5/1/2012	H-3	750.60 ± 106.20	653.20 ± 102.30	701.90 ± 73.73	Pass
BS-2656, 2657	5/2/2012	Cs-137	0.13 ± 0.07	0.07 ± 0.04	0.10 ± 0.04	Pass
BS-2656, 2657	5/2/2012	K-40	10.15 ± 0.97	11.13 ± 0.90	10.64 ± 0.66	Pass
SO-2635, 2636	5/3/2012	Cs-137	0.046 ± 0.024	0.050 ± 0.027	0.048 ± 0.018	Pass
SO-2635, 2636	5/3/2012	K-40	13.20 ± 0.74	14.01 ± 0.67	13.61 ± 0.50	Pass
MI-2677, 2678	5/7/2012	K-40	1415.30 ± 131.40	1348.10 ± 109.00	1381.70 ± 85.36	Pass
VE-2719, 2720	5/7/2012	K-40	4.15 ± 0.36	4.19 ± 0.38	4.17 ± 0.26	Pass
SWU-3221, 3222	5/8/2012	Gr. Beta	1.67 ± 0.47	1.39 ± 0.45	1.53 ± 0.33	Pass
SWU-3221, 3222	5/8/2012	H-3	236.90 ± 101.90	281.90 ± 103.70	259.40 ± 72.69	Pass
WW-3073, 3074	5/14/2012	H-3	339.12 ± 145.45	337.23 ± 98.19	338.18 ± 87.74	Pass
AP-2968, 2969	5/17/2012	Be-7	0.25 ± 0.12	0.21 ± 0.09	0.23 ± 0.07	Pass
F-3031, 3032	5/22/2012	H-3	11291.00 ± 372.80	11167.00 ± 315.00	11229.00 ± 244.03	Pass
F-3031, 3032	5/22/2012	K-40	3528.90 ± 372.80	3677.20 ± 392.40	3603.05 ± 270.63	Pass
G-3094, 3095	5/23/2012	Gr. Beta	7.89 ± 0.16	8.01 ± 0.16	7.95 ± 0.11	Pass
F-3412, 3413	5/23/2012	Gr. Beta	3.46 ± 0.10	3.33 ± 0.10	3.40 ± 0.07	Pass
F-3412, 3413	5/23/2012	K-40	2.40 ± 0.38	2.55 ± 0.43	2.48 ± 0.29	Pass
MI-3067, 3068	5/24/2012	K-40	1267.20 ± 105.00	1305.70 ± 109.80	1286.45 ± 75.96	Pass
SO-3305, 3306	5/30/2012	Cs-137	0.024 ± 0.013	0.030 ± 0.015	0.027 ± 0.010	Pass
SO-3305, 3306	5/30/2012	Gr. Beta	10.95 ± 0.89	10.86 ± 0.89	10.91 ± 0.63	Pass
SO-3305, 3306	5/30/2012	Tl-208	0.068 ± 0.018	0.062 ± 0.017	0.065 ± 0.012	Pass
LW-3454, 3455	5/31/2012	Gr. Beta	2.12 ± 0.86	2.27 ± 0.77	2.20 ± 0.58	Pass
BS-3697, 3698	6/14/2012	Be-7	2.05 ± 0.19	2.27 ± 0.38	2.16 ± 0.21	Pass
BS-3697, 3698	6/14/2012	Cs-137	2.32 ± 0.39	2.26 ± 0.66	2.29 ± 0.38	Pass
BS-3697, 3698	6/14/2012	K-40	6.67 ± 0.28	6.64 ± 0.42	6.66 ± 0.25	Pass
VE-3798, 3799	6/20/2012	K-40	5.93 ± 0.38	6.03 ± 0.37	5.98 ± 0.26	Pass
WW-4790, 4791	6/20/2012	H-3	251.33 ± 86.51	372.48 ± 92.27	311.90 ± 63.24	Pass
DW-30103, 30104	6/27/2012	Ra-226	0.30 ± 0.08	0.42 ± 0.09	0.36 ± 0.06	Pass
DW-30103, 30104	6/27/2012	Ra-228	0.76 ± 0.54	0.78 ± 0.54	0.77 ± 0.38	Pass
LW-3970, 3971	6/28/2012	Gr. Beta	1.49 ± 1.06	0.72 ± 0.53	1.11 ± 0.59	Pass
DW-3949, 3950	6/29/2012	I-131	0.54 ± 0.26	0.25 ± 0.26	0.40 ± 0.18	Pass
SG-4075, 4076	7/2/2012	Ac-228	0.33 ± 0.09	0.34 ± 0.06	0.34 ± 0.05	Pass
SG-4075, 4076	7/2/2012	K-40	6.71 ± 0.58	7.20 ± 0.32	6.96 ± 0.33	Pass
SG-4075, 4076	7/2/2012	Pb-214	0.46 ± 0.05	0.49 ± 0.03	0.48 ± 0.03	Pass
AP-4390, 4391	7/3/2012	Be-7	0.09 ± 0.02	0.09 ± 0.01	0.09 ± 0.01	Pass
AP-4390, 4391	7/3/2012	Be-7	0.11 ± 0.02	0.10 ± 0.01	0.11 ± 0.01	Pass
AP-4012, 4013	7/5/2012	Be-7	0.27 ± 0.09	0.29 ± 0.16	0.28 ± 0.09	Pass
SW-4033, 4034	7/5/2012	H-3	614.99 ± 107.99	512.31 ± 103.83	563.65 ± 74.91	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
VE-4054, 4055	7/9/2012	K-40	7.28 ± 0.56	7.42 ± 0.63	7.35 ± 0.42	Pass
VE-4222, 4223	7/13/2012	Be-7	0.16 ± 0.08	0.22 ± 0.09	0.19 ± 0.06	Pass
VE-4222, 4223	7/13/2012	K-40	7.20 ± 0.30	6.60 ± 0.30	6.90 ± 0.21	Pass
DW-30113, 30114	7/13/2012	Ra-228	1.93 ± 0.66	1.03 ± 0.53	1.48 ± 0.42	Pass
DW-30115, 30116	7/13/2012	Gr. Alpha	7.46 ± 1.21	7.02 ± 1.14	7.24 ± 0.83	Pass
DW-30124, 30125	7/13/2012	Ra-226	1.16 ± 0.15	0.90 ± 0.12	1.03 ± 0.10	Pass
DW-30124, 30125	7/13/2012	Ra-228	1.38 ± 0.56	1.72 ± 0.60	1.55 ± 0.41	Pass
DW-30126, 30127	7/13/2012	Gr. Alpha	6.23 ± 1.16	6.75 ± 1.29	6.49 ± 0.87	Pass
AP-4433, 4434	7/19/2012	Be-7	0.17 ± 0.09	0.21 ± 0.10	0.19 ± 0.07	Pass
SG-4475, 4476	7/19/2012	Gr. Alpha	17.03 ± 4.17	15.56 ± 3.96	16.30 ± 2.88	Pass
SG-4475, 4476	7/19/2012	Gr. Beta	13.23 ± 2.61	14.36 ± 2.47	13.80 ± 1.80	Pass
WW-4685, 4686	7/24/2012	H-3	289.00 ± 99.00	375.00 ± 103.00	332.00 ± 71.43	Pass
AP-4706, 4707	7/26/2012	Be-7	0.28 ± 0.14	0.24 ± 0.14	0.26 ± 0.10	Pass
SO-4748, 4749	7/26/2012	Gr. Beta	20.45 ± 1.04	19.22 ± 0.94	19.84 ± 0.70	Pass
SO-4748, 4749	7/26/2012	U-233/4	0.11 ± 0.02	0.10 ± 0.01	0.11 ± 0.01	Pass
SO-4748, 4749	7/26/2012	U-238	0.12 ± 0.02	0.11 ± 0.01	0.12 ± 0.01	Pass
VE-4832, 4833	8/1/2012	K-40	4.06 ± 0.22	4.08 ± 0.24	4.07 ± 0.16	Pass
DW-30149, 30150	8/1/2012	Ra-226	2.69 ± 0.22	2.79 ± 0.22	2.74 ± 0.16	Pass
DW-30149, 30150	8/1/2012	Ra-228	2.77 ± 0.75	1.61 ± 0.57	2.19 ± 0.47	Pass
SG-4916, 4917	8/3/2012	Ac-228	11.03 ± 0.33	11.08 ± 0.44	11.06 ± 0.28	Pass
SG-4916, 4917	8/3/2012	K-40	6.39 ± 0.80	6.98 ± 0.88	6.69 ± 0.59	Pass
F-5313, 5314	8/9/2012	Cs-137	0.05 ± 0.02	0.05 ± 0.02	0.05 ± 0.01	Pass
F-5313, 5314	8/9/2012	Gr. Beta	4.12 ± 0.08	4.10 ± 0.08	4.11 ± 0.06	Pass
F-5313, 5314	8/9/2012	K-40	3.07 ± 0.42	3.14 ± 0.40	3.11 ± 0.29	Pass
VE-5166, 5167	8/15/2012	K-40	4.26 ± 0.28	3.66 ± 0.47	3.96 ± 0.27	Pass
VE-5376, 5377	8/22/2012	Gr. Beta	7.72 ± 0.17	7.61 ± 0.16	7.67 ± 0.12	Pass
VE-5334, 5335	8/27/2012	K-40	1.65 ± 0.17	1.72 ± 0.15	1.68 ± 0.12	Pass
VE-5481, 5482	8/28/2012	Be-7	2.52 ± 0.19	2.65 ± 0.21	2.59 ± 0.14	Pass
VE-5481, 5482	8/28/2012	K-40	5.05 ± 0.37	4.79 ± 0.39	4.92 ± 0.27	Pass
VE-5481, 5482	8/28/2012	Sr-90	0.01 ± 0.00	0.01 ± 0.01	0.01 ± 0.00	Pass
DW-30164, 30165	8/30/2012	Ra-226	1.33 ± 0.15	1.59 ± 0.17	1.46 ± 0.11	Pass
DW-30164, 30165	8/30/2012	Ra-228	2.76 ± 0.66	1.54 ± 0.56	2.15 ± 0.43	Pass
VE-5166, 5167	9/4/2012	K-40	2.05 ± 0.32	2.53 ± 0.36	2.29 ± 0.24	Pass
ME-5607, 5608	9/4/2012	Gr. Beta	2.92 ± 0.08	2.89 ± 0.08	2.90 ± 0.06	Pass
ME-5607, 5608	9/4/2012	K-40	2.06 ± 0.32	2.53 ± 0.36	2.29 ± 0.24	Pass
SW-5901, 5902	9/17/2012	H-3	10909.00 ± 311.00	10817.00 ± 310.00	10863.00 ± 219.56	Pass
BS-6048, 6049	9/24/2012	K-40	1.24 ± 0.20	1.18 ± 0.21	1.21 ± 0.14	Pass
AP-6482, 6483	9/27/2012	Be-7	0.09 ± 0.02	0.09 ± 0.03	0.09 ± 0.02	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
G-6090, 6091	10/1/2012	Be-7	3.74 ± 0.33	3.54 ± 0.30	3.64 ± 0.22	Pass
G-6090, 6091	10/1/2012	Gr. Beta	10.81 ± 0.34	10.72 ± 0.33	10.77 ± 0.24	Pass
G-6090, 6091	10/1/2012	K-40	5.99 ± 0.47	5.45 ± 0.44	5.72 ± 0.32	Pass
SO-6111, 6112	10/1/2012	Cs-137	0.06 ± 0.03	0.04 ± 0.02	0.05 ± 0.02	Pass
SO-6111, 6112	10/1/2012	K-40	19.66 ± 0.84	20.09 ± 0.80	19.88 ± 0.58	Pass
W-6795, 6796	10/1/2012	H-3	215.20 ± 88.00	292.80 ± 91.60	254.00 ± 63.51	Pass
AP-6461, 6462	10/2/2012	Be-7	0.07 ± 0.01	0.07 ± 0.02	0.07 ± 0.01	Pass
WW-6279, 6280	10/3/2012	Gr. Beta	1.54 ± 0.68	1.67 ± 0.75	1.61 ± 0.51	Pass
W-6346, 6347	10/3/2012	Ra-226	0.30 ± 0.10	0.36 ± 0.10	0.33 ± 0.07	Pass
VE-6503, 6504	10/9/2012	K-40	5.23 ± 0.83	6.00 ± 0.45	5.04 ± 0.27	Pass
WW-6606, 6607	10/10/2012	Gr. Beta	3.18 ± 1.31	2.42 ± 1.27	2.80 ± 0.91	Pass
WW-6606, 6607	10/10/2012	H-3	273.10 ± 85.70	219.80 ± 83.10	246.45 ± 59.69	Pass
WW-7237, 7238	10/12/2012	H-3	175.44 ± 99.84	180.75 ± 100.03	178.10 ± 70.66	Pass
F-6627, 6628	10/15/2012	K-40	3.05 ± 0.39	3.23 ± 0.37	3.14 ± 0.27	Pass
VE-6669, 6670	10/16/2012	Be-7	0.48 ± 0.26	0.50 ± 0.13	0.49 ± 0.15	Pass
VE-6669, 6670	10/16/2012	K-40	4.06 ± 0.28	3.68 ± 0.26	3.87 ± 0.19	Pass
SS-6711, 6712	10/16/2012	Ac-228	0.16 ± 0.05	0.17 ± 0.06	0.17 ± 0.04	Pass
SS-6711, 6712	10/16/2012	Bi-214	0.13 ± 0.03	0.16 ± 0.03	0.14 ± 0.02	Pass
SS-6711, 6712	10/16/2012	Gr. Beta	14.20 ± 0.89	12.67 ± 0.88	13.44 ± 0.63	Pass
SS-6711, 6712	10/16/2012	Pb-212	0.15 ± 0.06	0.13 ± 0.02	0.14 ± 0.03	Pass
SS-6711, 6712	10/16/2012	Tl-208	0.06 ± 0.02	0.04 ± 0.02	0.05 ± 0.01	Pass
WW-7258, 7259	10/22/2012	H-3	214.69 ± 85.42	314.60 ± 90.25	264.65 ± 62.13	Pass
WW-7655, 7656	10/25/2012	H-3	159.00 ± 86.10	159.00 ± 86.10	159.00 ± 60.88	Pass
WW-7747, 7748	10/25/2012	H-3	156.50 ± 84.70	170.20 ± 85.30	163.35 ± 60.10	Pass
MI-6963, 6964	10/28/2012	K-40	1384.60 ± 111.70	1421.60 ± 107.60	1403.10 ± 77.55	Pass
MI-7174, 7175	11/5/2012	K-40	1283.60 ± 97.45	1293.20 ± 91.37	1288.40 ± 66.79	Pass
SG-7221, 7222	11/9/2012	Pb-214	31.49 ± 0.70	30.11 ± 0.80	30.80 ± 0.53	Pass
DW-30216, 30217	11/9/2012	Gr. Alpha	2.23 ± 0.86	2.31 ± 0.92	2.27 ± 0.63	Pass
DW-30216, 30217	11/9/2012	Ra-226	0.72 ± 0.12	0.82 ± 0.14	0.77 ± 0.09	Pass
DW-30216, 30217	11/9/2012	Ra-228	0.92 ± 0.52	1.26 ± 0.53	1.09 ± 0.37	Pass
MI-7363, 7364	11/13/2012	K-40	1304.40 ± 103.30	1496.10 ± 121.30	1400.25 ± 79.66	Pass
CF-7384, 7385	11/13/2012	K-40	11.75 ± 0.52	10.94 ± 0.59	11.35 ± 0.39	Pass
VE-7489, 7490	11/16/2012	K-40	2.22 ± 0.23	1.91 ± 0.22	2.06 ± 0.16	Pass
AP-7531, 7532	11/21/2012	Be-7	0.19 ± 0.10	0.29 ± 0.17	0.24 ± 0.10	Pass
BS-7573, 7574	11/24/2012	K-40	7.21 ± 0.41	7.57 ± 0.39	7.39 ± 0.28	Pass
LW-7865, 7866	12/5/2012	Gr. Beta	2.16 ± 0.56	1.64 ± 0.62	1.90 ± 0.42	Pass
SG-8095, 8096	12/19/2012	Ac-228	25.15 ± 0.73	25.47 ± 0.54	25.31 ± 0.45	Pass
SG-8095, 8096	12/19/2012	Gamma	26.98 ± 2.72	28.68 ± 2.89	27.83 ± 1.98	Pass

Note: Duplicate analyses are performed on every twentieth sample received in-house. Results are not listed for those analyses with activities that measure below the LLD.

[a] Results are reported in units of pCi/L, except for air filters (pCi/Filter), food products, vegetation, soil, sediment (pCi/g).

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
STW-1670	02/01/12	I-129	9.31 ± 0.31	12.29	8.60 - 15.98	Pass
STSO-1766 [d]	02/01/12	Am-241	88.50 ± 8.30	159.00	111.00 - 207.00	Fail
STSO-1766	02/01/12	Co-57	1352.10 ± 4.00	1179.00	825.00 - 1533.00	Pass
STSO-1766	02/01/12	Co-60	1.70 ± 0.70	1.56	1.00 - 2.00	Pass
STSO-1766	02/01/12	Cs-134	842.20 ± 4.30	828.00	580.00 - 1076.00	Pass
STSO-1766	02/01/12	Cs-137	0.40 ± 0.90	0.00	0.00 - 1.00	Pass
STSO-1766	02/01/12	K-40	1729.60 ± 22.20	1491.00	1044.00 - 1938.00	Pass
STSO-1766	02/01/12	Mn-54	647.60 ± 4.20	558.00	391.00 - 725.00	Pass
STSO-1766	02/01/12	Ni-63	781.50 ± 9.70	862.00	603.00 - 1121.00	Pass
STSO-1766	02/01/12	Pu-238	142.40 ± 9.70	136.00	97.00 - 177.00	Pass
STSO-1766	02/01/12	Pu-239/40	66.10 ± 6.40	65.80	46.10 - 85.50	Pass
STSO-1766	02/01/12	Sr-90	383.20 ± 15.30	392.00	274.00 - 510.00	Pass
STSO-1766	02/01/12	Tc-99	289.60 ± 10.90	374.00	262.00 - 486.00	Pass
STSO-1766	02/01/12	U-233/4	63.20 ± 5.40	68.10	47.70 - 88.50	Pass
STSO-1766	02/01/12	U-238	310.80 ± 12.10	329.00	230.00 - 428.00	Pass
STSO-1766	02/01/12	Zn-65	766.70 ± 6.70	642.00	449.00 - 835.00	Pass
STAP-1772	02/01/12	Am-241	0.062 ± 0.02	0.073	0.051 - 0.10	Pass
STAP-1772	02/01/12	Co-57	0.010 ± 0.01	0.00	0.000 - 1.00	Pass
STAP-1772	02/01/12	Co-60	2.40 ± 0.08	2.18	1.53 - 2.84	Pass
STAP-1772	02/01/12	Cs-134	2.33 ± 0.13	2.38	1.67 - 3.09	Pass
STAP-1772	02/01/12	Cs-137	2.07 ± 0.10	1.79	1.25 - 2.33	Pass
STAP-1772	02/01/12	Mn-54	3.77 ± 0.14	3.24	2.27 - 4.21	Pass
STAP-1772	02/01/12	Pu-238	0.003 ± 0.004	0.002	0.000 - 0.10	Pass
STAP-1772	02/01/12	Pu-239/40	0.098 ± 0.017	0.097	0.07 - 0.13	Pass
STAP-1772	02/01/12	Sr-90	-0.010 ± 0.060	0.000	-0.10 - 0.13	Pass
STAP-1772 [e]	02/01/12	U-233/4	0.016 ± 0.006	0.019	0.013 - 0.024	Pass
STAP-1772	02/01/12	U-238	0.11 ± 0.02	0.12	0.09 - 0.16	Pass
STAP-1772	02/01/12	Zn-65	3.67 ± 0.20	2.99	2.09 - 3.89	Pass
STAP-1773	02/01/12	Gr. Alpha	0.51 ± 0.05	1.20	0.40 - 2.00	Pass
STAP-1773	02/01/12	Gr. Beta	2.75 ± 0.10	2.40	1.20 - 3.60	Pass
STVE-1776	02/01/12	Co-57	14.57 ± 0.28	12.00	8.40 - 15.60	Pass
STVE-1776	02/01/12	Co-60	6.45 ± 0.23	6.05	4.24 - 7.87	Pass
STVE-1776	02/01/12	Cs-134	8.39 ± 0.29	8.43	5.90 - 10.96	Pass
STVE-1776	02/01/12	Cs-137	0.01 ± 0.09	0.00	0.00 - 0.10	Pass
STVE-1776	02/01/12	Mn-54	0.03 ± 0.08	0.00	0.00 - 0.10	Pass
STVE-1776	02/01/12	Zn-65	10.31 ± 0.67	8.90	6.23 - 11.57	Pass
STW-1960	02/01/12	Gr. Alpha	1.68 ± 0.09	2.14	0.64 - 3.64	Pass
STW-1960	02/01/12	Gr. Beta	6.33 ± 0.10	6.36	3.18 - 9.54	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
STW-1964	02/01/12	Am-241	1.28 ± 0.12	1.63	1.14 - 2.12	Pass
STW-1964	02/01/12	Co-57	33.30 ± 0.40	32.90	23.00 - 42.80	Pass
STW-1964	02/01/12	Co-60	23.20 ± 0.40	23.72	16.60 - 30.84	Pass
STW-1964	02/01/12	Cs-134	0.30 ± 3.00	0.00	0.00 - 1.00	Pass
STW-1964	02/01/12	Cs-137	40.10 ± 0.60	39.90	27.90 - 51.90	Pass
STW-1964 [f]	02/01/12	Fe-55	65.10 ± 9.50	81.90	57.30 - 106.50	Pass
STW-1964	02/01/12	H-3	460.00 ± 12.10	437.00	306.00 - 568.00	Pass
STW-1964	02/01/12	K-40	153.00 ± 4.20	142.00	99.00 - 185.00	Pass
STW-1964	02/01/12	Mn-54	32.70 ± 0.60	31.80	22.30 - 41.30	Pass
STW-1964	02/01/12	Ni-63	49.80 ± 2.90	60.00	42.00 - 78.00	Pass
STW-1964	02/01/12	Pu-238	0.58 ± 0.06	0.63	0.44 - 0.82	Pass
STW-1964	02/01/12	Pu-239/40	1.30 ± 0.15	1.34	0.94 - 1.74	Pass
STW-1964	02/01/12	Sr-90	0.10 ± 0.20	0.00	0.00 - 1.00	Pass
STW-1964	02/01/12	Tc-99	23.70 ± 0.80	27.90	19.50 - 36.30	Pass
STW-1964	02/01/12	U-233/4	0.40 ± 0.05	0.39	0.27 - 0.51	Pass
STW-1964	02/01/12	U-238	2.67 ± 0.13	2.76	1.93 - 3.59	Pass
STW-1964	02/01/12	Zn-65	0.01 ± 0.20	0.00	0.00 - 1.00	Pass
STW-5391	08/01/12	I-129	5.73 ± 0.28	6.82	4.77 - 8.87	Pass
STSO-5392	08/01/12	Am-241	129.30 ± 12.70	111.00	78.00 - 144.00	Pass
STSO-5392	08/01/12	Ni-63	376.20 ± 20.60	406.00	284.00 - 528.00	Pass
STSO-5392	08/01/12	Pu-238	118.70 ± 9.30	105.80	74.10 - 137.50	Pass
STSO-5392	08/01/12	Pu-239/40	140.70 ± 9.90	134.00	94.00 - 174.00	Pass
STSO-5392	08/01/12	Sr-90	483.52 ± 16.47	508.00	356.00 - 660.00	Pass
STSO-5392	08/01/12	Tc-99	432.50 ± 23.10	469.00	328.00 - 610.00	Pass
STSO-5394	08/01/12	Co-57	1528.00 ± 4.10	1316.00	921.00 - 1711.00	Pass
STSO-5394	08/01/12	Co-60	592.00 ± 3.20	531.00	372.00 - 690.00	Pass
STSO-5394	08/01/12	Cs-134	933.60 ± 5.82	939.00	657.00 - 1221.00	Pass
STSO-5394	08/01/12	Cs-137	1319.80 ± 5.50	1150.00	805.00 - 1495.00	Pass
STSO-5394	08/01/12	K-40	737.30 ± 17.70	632.00	442.00 - 822.00	Pass
STSO-5394	08/01/12	Mn-54	1083.20 ± 5.20	920.00	644.00 - 1196.00	Pass
STSO-5394	08/01/12	U-233/4	55.80 ± 4.20	60.30	42.20 - 78.40	Pass
STSO-5394	08/01/12	U-238	231.20 ± 8.60	263.00	184.00 - 342.00	Pass
STSO-5394	08/01/12	Zn-65	696.10 ± 7.00	606.00	424.00 - 788.00	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
STVE-5395 [g]	08/01/12	Co-57	7.44 ± 0.17	5.66	3.96 - 7.36	Fail
STVE-5395	08/01/12	Co-60	5.90 ± 0.15	5.12	3.58 - 6.66	Pass
STVE-5395	08/01/12	Cs-134	7.40 ± 0.31	6.51	4.56 - 8.46	Pass
STVE-5395	08/01/12	Cs-137	5.45 ± 0.18	4.38	3.07 - 5.69	Pass
STVE-5395	08/01/12	Mn-54	4.06 ± 0.21	3.27	2.29 - 4.25	Pass
STAP-5398	08/01/12	Gr. Alpha	0.41 ± 0.05	0.97	0.29 - 1.65	Pass
STAP-5398	08/01/12	Gr. Beta	2.11 ± 0.09	1.92	0.96 - 2.88	Pass
STAP-5401 [h]	08/01/12	Am-241	0.12 ± 0.02	0.08	0.05 - 0.10	Fail
STAP-5403	08/01/12	Co-57	1.96 ± 0.05	1.91	1.34 - 2.48	Pass
STAP-5403	08/01/12	Co-60	1.76 ± 0.07	1.73	1.21 - 2.25	Pass
STAP-5403	08/01/12	Cs-134	2.74 ± 0.18	2.74	1.92 - 3.56	Pass
STAP-5403	08/01/12	Cs-137	0.00 ± 0.03	0.00	-0.01 - 0.01	Pass
STAP-5403	08/01/12	Mn-54	2.52 ± 0.10	2.36	1.65 - 3.07	Pass
STAP-5403	08/01/12	Pu-238	0.050 ± 0.015	0.063	0.044 - 0.081	Pass
STAP-5403	08/01/12	Pu-239/40	0.001 ± 0.004	0.00081	0.000 - 0.010	Pass
STAP-5403 [i]	08/01/12	U-233/4	0.009 ± 0.011	0.014	0.010 - 0.018	Fail
STAP-5403	08/01/12	U-238	0.08 ± 0.02	0.10	0.070 - 0.130	Pass
STAP-5403	08/01/12	Zn-65	0.01 ± 0.06	0.00	-0.010 - 0.010	Pass
STW-5445	08/01/12	Fe-55	79.80 ± 4.10	89.30	62.50 - 116.10	Pass
STW-5445	08/01/12	Ni-63	74.30 ± 3.40	66.30	46.40 - 86.20	Pass
STW-5445	08/01/12	U-233/4	0.46 ± 0.05	0.45	0.32 - 0.59	Pass
STW-5445	08/01/12	U-238	3.14 ± 0.14	3.33	2.33 - 4.33	Pass
STW-5445 [j]	08/01/12	Am-241	0.64 ± 0.04	1.06	0.74 - 1.38	Fail

[a] Results are reported in units of Bq/kg (soil), Bq/L (water) or Bq/total sample (filters, vegetation).

[b] Laboratory codes as follows: STW (water), STAP (air filter), STSO (soil), STVE (vegetation).

[c] MAPEP results are presented as the known values and expected laboratory precision (1 sigma, 1 determination) and control limits as defined by the MAPEP. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". MAPEP does not provide control limits.

[d] Investigation was inconclusive, there was not enough sample for reanalysis. ERA results (A-7) for the same matrix were acceptable.

[e] No errors found in calculation or procedure, original analysis result; 0.010 ± 0.010 Bq/filter.

[f] Reanalysis results were within limits, but low. ERA results (A-7) for the same matrix were acceptable. The efficiency factor was recalculated for the second round of MAPEP testing. Original analysis results 55.8 ± 12.6 Bq/L.

[g] Result of reanalysis; 6.74 ± 0.15 Bq/sample. Gamma emitters for the vegetation matrix exhibited a high bias, only Co-57 exceeded acceptance limits. Recounted using a geometry more closely matched to the MAPEP sample size.

[h] Result of reanalysis; 0.070 ± 0.013 Bq/filter.

[i] Result of reanalysis; 0.013 ± 0.005 pCi/filter. A larger sample size was used to reduce the counting error.

[j] Result of reanalysis 1.07 ± 0.06 pCi/L. The analyses of the MAPEP sample matrix resulted in recovery factors greater than 100%. A correction was made using recovery based on analysis of blank samples. A new tracer solution is on order, future samples for MAPEP testing will include batch spike and blank samples.

TABLE A-7. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA) [a].

Lab Code [b]	Date	Analysis	Concentration (pCi/L) [b] Laboratory Result [c]	ERA Result [d]	Control Limits	Acceptance
ERAP-1393	03/19/12	Co-60	917.5 ± 7.0	880.0	681.0 - 1100.0	Pass
ERAP-1393	03/19/12	Cs-134	586.6 ± 7.4	656.0	417.0 - 814.0	Pass
ERAP-1393	03/19/12	Cs-137	1255.9 ± 9.4	1130.0	849.0 - 1480.0	Pass
ERAP-1393	03/19/12	Mn-54	< 3.4	0.0	-	Pass
ERAP-1393	03/19/12	Zn-65	1085.2 ± 18.0	897.0	642.0 - 1240.0	Pass
ERAP-1394	03/19/12	Am-241	86.9 ± 2.9	68.8	42.4 - 93.1	Pass
ERAP-1394	03/19/12	Pu-238	70.2 ± 3.6	63.2	43.3 - 83.1	Pass
ERAP-1394	03/19/12	Pu-239/40	66.0 ± 1.0	63.0	45.6 - 82.4	Pass
ERAP-1394	03/19/12	Sr-90	112.5 ± 15.4	89.6	43.8 - 134.0	Pass
ERAP-1394	03/19/12	U-233/4	43.4 ± 0.8	47.5	29.4 - 71.6	Pass
ERAP-1394	03/19/12	U-238	44.0 ± 1.2	47.1	30.4 - 65.1	Pass
ERAP-1394	03/19/12	Uranium	89.1 ± 2.2	96.7	53.5 - 147.0	Pass
ERAP-1396	03/19/12	Gr. Alpha	81.1 ± 1.5	77.8	26.1 - 121.0	Pass
ERAP-1396	03/19/12	Gr. Beta	68.4 ± 0.7	52.5	33.2 - 76.5	Pass
ERSO-1397	03/19/12	Ac-228	1303.4 ± 89.3	1570.0	1010.0 - 2180.0	Pass
ERSO-1397	03/19/12	Am-241	856.0 ± 123.7	938.0	549.0 - 1220.0	Pass
ERSO-1397	03/19/12	Bi-212	1379.2 ± 247.2	1550.0	413.0 - 2280.0	Pass
ERSO-1397	03/19/12	Bi-214	965.2 ± 38.4	1100.0	665.0 - 1590.0	Pass
ERSO-1397	03/19/12	Co-60	3693.6 ± 32.1	3500.0	2370.0 - 4820.0	Pass
ERSO-1397	03/19/12	Cs-134	2257.3 ± 45.4	2180.0	1420.0 - 2620.0	Pass
ERSO-1397	03/19/12	Cs-137	9444.5 ± 58.4	8770.0	6720.0 - 11300.0	Pass
ERSO-1397	03/19/12	K-40	11277.0 ± 275.1	11600.0	8470.0 - 15600.0	Pass
ERSO-1397	03/19/12	Mn-54	< 21.0	0.0	-	Pass
ERSO-1397	03/19/12	Pb-212	1208.4 ± 26.3	1510.0	992.0 - 2110.0	Pass
ERSO-1397	03/19/12	Pb-214	1041.6 ± 46.9	1110.0	647.0 - 1650.0	Pass
ERSO-1397	03/19/12	Pu-238	921.0 ± 112.6	984.0	592.0 - 1360.0	Pass
ERSO-1397	03/19/12	Pu-239/40	1028.0 ± 112.6	879.0	575.0 - 1210.0	Pass
ERSO-1397	03/19/12	Sr-90	8128.0 ± 329.0	8800.0	3360.0 - 13900.0	Pass
ERSO-1397	03/19/12	Th-234	2711.3 ± 253.6	2000.0	632.0 - 3760.0	Pass
ERSO-1397	03/19/12	U-233/4	1859.3 ± 126.6	1960.0	1200.0 - 2510.0	Pass
ERSO-1397	03/19/12	U-238	2003.3 ± 130.3	2000.0	1240.0 - 2540.0	Pass
ERSO-1397	03/19/12	Uranium	3939.5 ± 283.8	4030.0	2190.0 - 5320.0	Pass
ERSO-1397	03/19/12	Zn-65	4200.4 ± 65.9	3650.0	2910.0 - 4850.0	Pass

TABLE A-7. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA) [a].

Lab Code [b]	Concentration (pCi/L) [b]					
	Date	Analysis	Laboratory Result [c]	ERA Result [d]	Control Limits	Acceptance
ERVE-1400	03/19/12	Am-241	4194.8 ± 199.5	4540.0	2780.0 - 6040.0	Pass
ERVE-1400	03/19/12	Cm-244	1471.2 ± 113.1	1590.0	779.0 - 2480.0	Pass
ERVE-1400	03/19/12	Co-60	2347.8 ± 47.9	2210.0	1520.0 - 3090.0	Pass
ERVE-1400	03/19/12	Cs-134	2847.5 ± 64.0	2920.0	1880.0 - 3790.0	Pass
ERVE-1400	03/19/12	Cs-137	1503.5 ± 52.5	1340.0	972.0 - 1860.0	Pass
ERVE-1400	03/19/12	K-40	34105.7 ± 745.3	28600.0	20700.0 - 40100.0	Pass
ERVE-1400	03/19/12	Mn-54	< 26.8	0.0	-	Pass
ERVE-1400	03/19/12	Pu-238	2509.0 ± 213.6	2350.0	1400.0 - 3220.0	Pass
ERVE-1400	03/19/12	Pu-239/40	2690.4 ± 208.9	2570.0	1580.0 - 3540.0	Pass
ERVE-1400	03/19/12	Sr-90	7881.5 ± 470.8	8520.0	4860.0 - 11300.0	Pass
ERVE-1400	03/19/12	U-233/4	3149.6 ± 165.2	3610.0	2370.0 - 4640.0	Pass
ERVE-1400	03/19/12	U-238	3203.6 ± 166.5	3580.0	2390.0 - 4550.0	Pass
ERVE-1400	03/19/12	Uranium	6463.7 ± 363.2	7350.0	4980.0 - 9150.0	Pass
ERVE-1400	03/19/12	Zn-65	2701.9 ± 105.5	2310.0	1670.0 - 3240.0	Pass
ERW-1403	03/19/12	Am-241	119.9 ± 3.2	135.0	91.0 - 181.0	Pass
ERW-1403	03/19/12	Fe-55	713.7 ± 127.4	863.0	514.0 - 1170.0	Pass
ERW-1403	03/19/12	Pu-238	131.9 ± 6.4	135.0	99.9 - 168.0	Pass
ERW-1403	03/19/12	Pu-239/40	108.9 ± 10.2	112.0	86.9 - 141.0	Pass
ERW-1403	03/19/12	U-233/4	93.1 ± 7.9	105.0	78.9 - 135.0	Pass
ERW-1403	03/19/12	U-238	96.9 ± 5.5	104.0	79.3 - 128.0	Pass
ERW-1403	03/19/12	Uranium	190.0 ± 13.8	214.0	157.0 - 277.0	Pass
ERW-1405	03/19/12	Co-60	858.7 ± 5.6	875.0	760.0 - 1020.0	Pass
ERW-1405	03/19/12	Cs-134	560.4 ± 4.4	609.0	447.0 - 700.0	Pass
ERW-1405	03/19/12	Cs-137	1239.9 ± 7.4	1250.0	1060.0 - 1500.0	Pass
ERW-1405	03/19/12	Mn-54	< 7.4	0.0	-	Pass
ERW-1405	03/19/12	Sr-90	944.3 ± 26.2	989.0	644.0 - 1310.0	Pass
ERW-1405	03/19/12	Zn-65	786.9 ± 20.6	749.0	624.0 - 945.0	Pass
ERW-1406	03/19/12	Gr. Alpha	85.9 ± 3.0	103.0	36.6 - 160.0	Pass
ERW-1406	03/19/12	Gr. Beta	45.7 ± 1.6	43.7	25.0 - 64.7	Pass
ERW-1409	03/19/12	H-3	9045.0 ± 284.0	9150.0	6130.0 - 13000.0	Pass

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurements Laboratory Quality Assessment Program (EML).

[b] Laboratory codes as follows: STW (water), STAP (air filter), STSO (soil), STVE (vegetation). Results are reported in units of pCi/L, except for air filters (pCi/Filter), vegetation and soil (pCi/kg).

[c] Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

[d] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". Control limits are not provided.

APPENDIX B

DATA REPORTING CONVENTIONS

Data Reporting Conventions

1.0. All activities, except gross alpha and gross beta, are decay corrected to collection time or the end of the collection period.

2.0. Single Measurements

Each single measurement is reported as follows: $x \pm s$
where: x = value of the measurement;
s = 2σ counting uncertainty (corresponding to the 95% confidence level).

In cases where the activity is less than the lower limit of detection L, it is reported as: < L, where L = the lower limit of detection based on 4.66σ uncertainty for a background sample.

3.0. Duplicate analyses

If duplicate analyses are reported, the convention is as follows. :

3.1 Individual results: For two analysis results; $x_1 \pm s_1$ and $x_2 \pm s_2$

Reported result: $x \pm s$; where $x = (1/2)(x_1 + x_2)$ and $s = (1/2)\sqrt{s_1^2 + s_2^2}$

3.2. Individual results: $< L_1$, $< L_2$ Reported result: < L, where L = lower of L_1 and L_2

3.3. Individual results: $x \pm s$, $< L$ Reported result: $x \pm s$ if $x \geq L$; < L otherwise.

4.0. Computation of Averages and Standard Deviations

4.1 Averages and standard deviations listed in the tables are computed from all of the individual measurements over the period averaged; for example, an annual standard deviation would not be the average of quarterly standard deviations. The average $\bar{x}$ and standard deviation "s" of a set of n numbers $x_1, x_2 \ldots x_n$ are defined as follows:

$$\bar{x} = \frac{1}{n} \sum x \qquad s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$$

4.2 Values below the highest lower limit of detection are not included in the average.

4.3 If all values in the averaging group are less than the highest LLD, the highest LLD is reported.

4.4 If all but one of the values are less than the highest LLD, the single value x and associated two sigma error is reported.

4.5 In rounding off, the following rules are followed:

4.5.1. If the number following those to be retained is less than 5, the number is dropped, and the retained numbers are kept unchanged. As an example, 11.443 is rounded off to 11.44.

4.5.2. If the number following those to be retained is equal to or greater than 5, the number is dropped and the last retained number is raised by 1. As an example, 11.445 is rounded off to 11.45.

APPENDIX C

Maximum Permissible Concentrations of Radioactivity in Air and Water Above Background in Unrestricted Areas

Table C-1. Maximum permissible concentrations of radioactivity in air and water above natural background in unrestricted areas[a].

	Air (pCi/m^3)	Water (pCi/L)	
Gross alpha	1×10^{-3}	Strontium-89	8,000
Gross beta	1	Strontium-90	500
Iodine-131[b]	2.8×10^{-1}	Cesium-137	1,000
		Barium-140	8,000
		Iodine-131	1,000
		Potassium-40[c]	4,000
		Gross alpha	2
		Gross beta	10
		Tritium	1×10^{6}

[a] Taken from Table 2 of Appendix B to Code of Federal Regulations Title 10, Part 20, and appropriate footnotes. Concentrations may be averaged over a period not greater than one year.

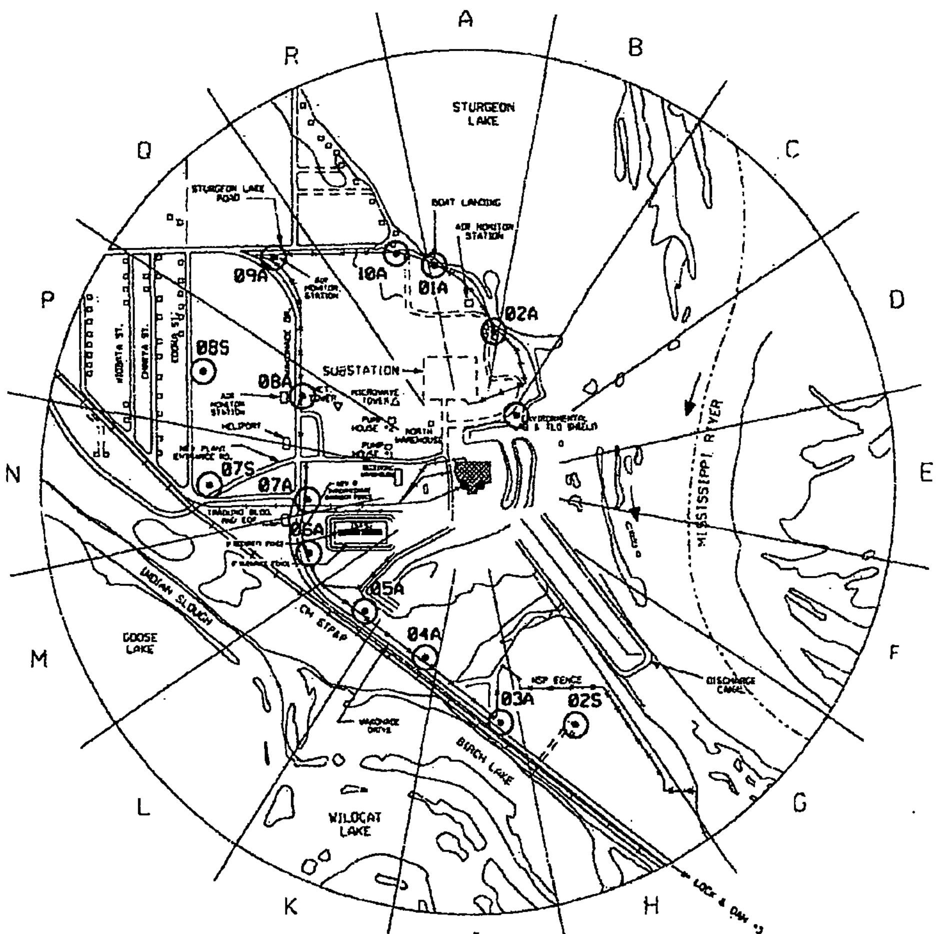
[b] Value adjusted by a factor of 700 to reduce the dose resulting from the air-grass-cow-milk-child pathway.

[c] A natural radionuclide.

APPENDIX D

Sampling Location Maps

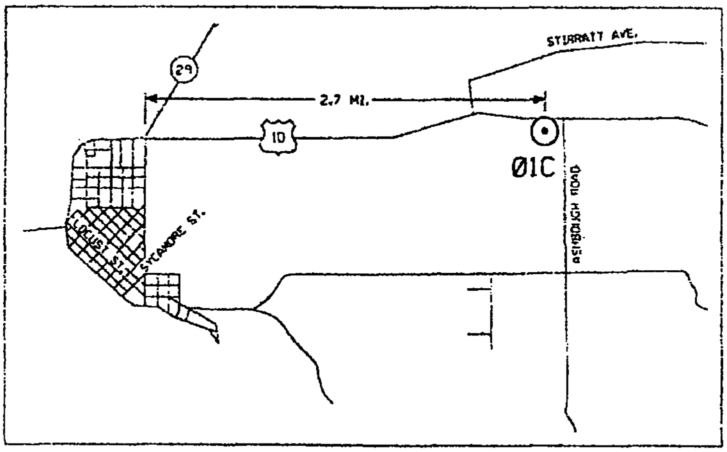
TLD LOCATIONS
ONE MILE RADIUS



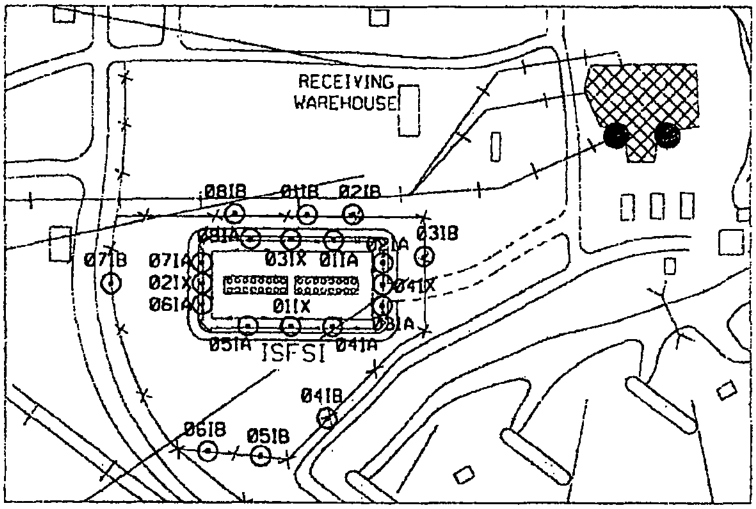
PLANT AREA ENLARGED PLAN [1.00 MILE RADIUS]
[NO SCALE]

MONITORING LEGEND:
⊙ PRAIRIE ISLAND TLD POINTS

TLD LOCATIONS



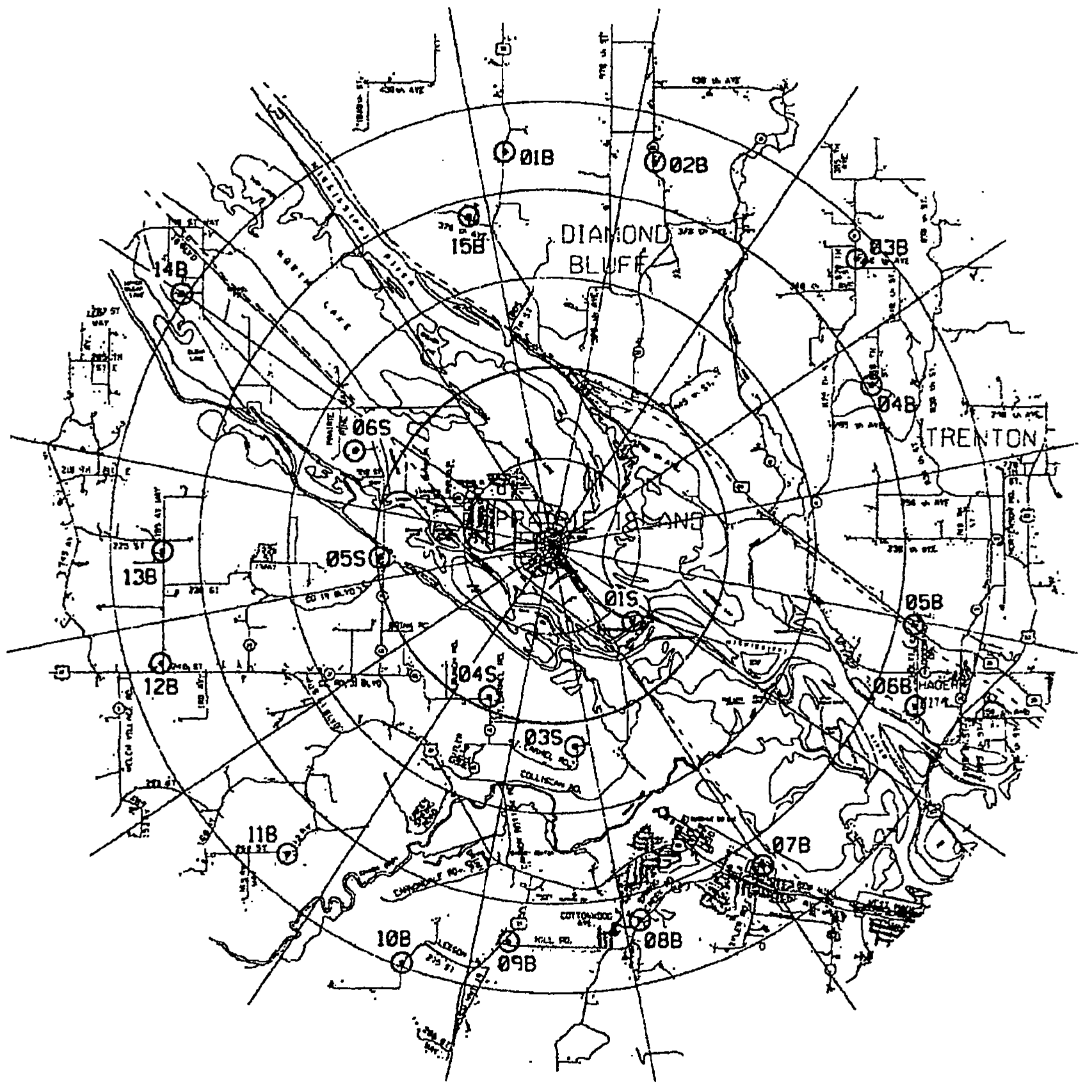
CONTROL POINTS
PRESCOTT, WISCONSIN



ISFSI AREA TLD LOCATIONS

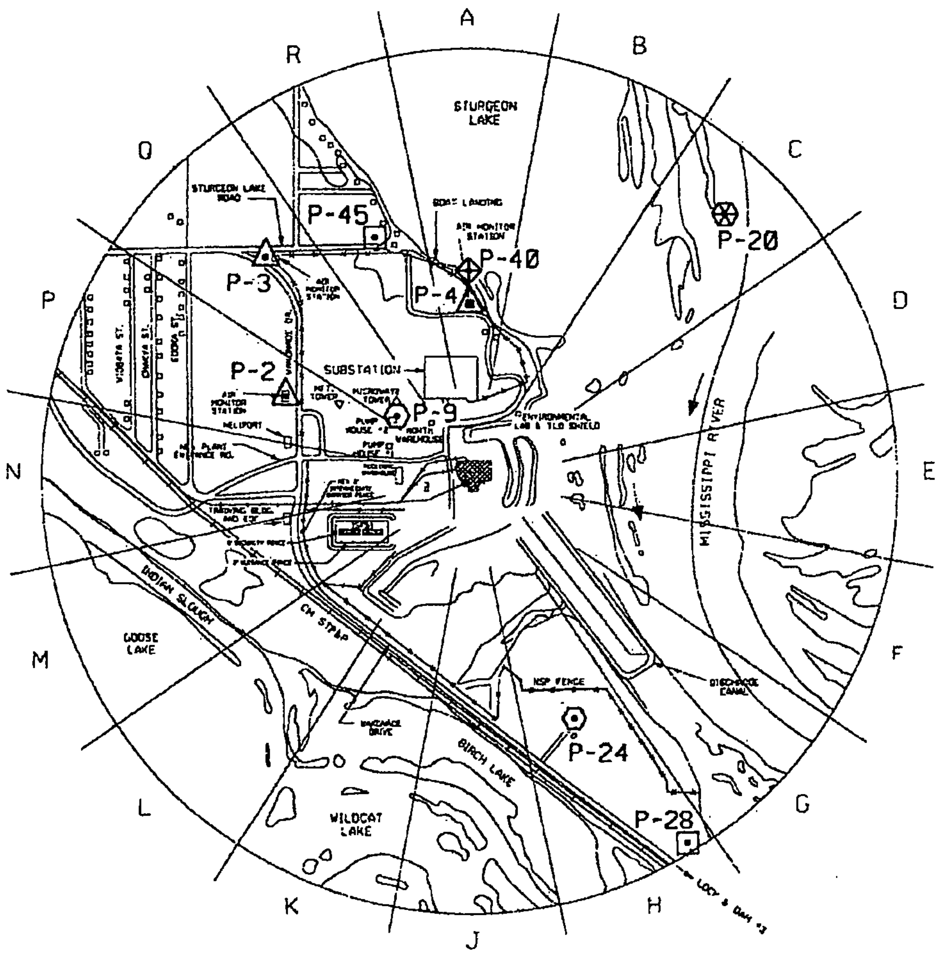
MONITORING LEGEND:
⊙ PRAIRIE ISLAND TLD POINTS

TLD LOCATIONS
FIVE MILE RADIUS



MONITORING LEGEND:
⊙ PRAIRIE ISLAND TLD POINTS

ENVIRONMENTAL SAMPLING POINTS
ONE MILE RADIUS



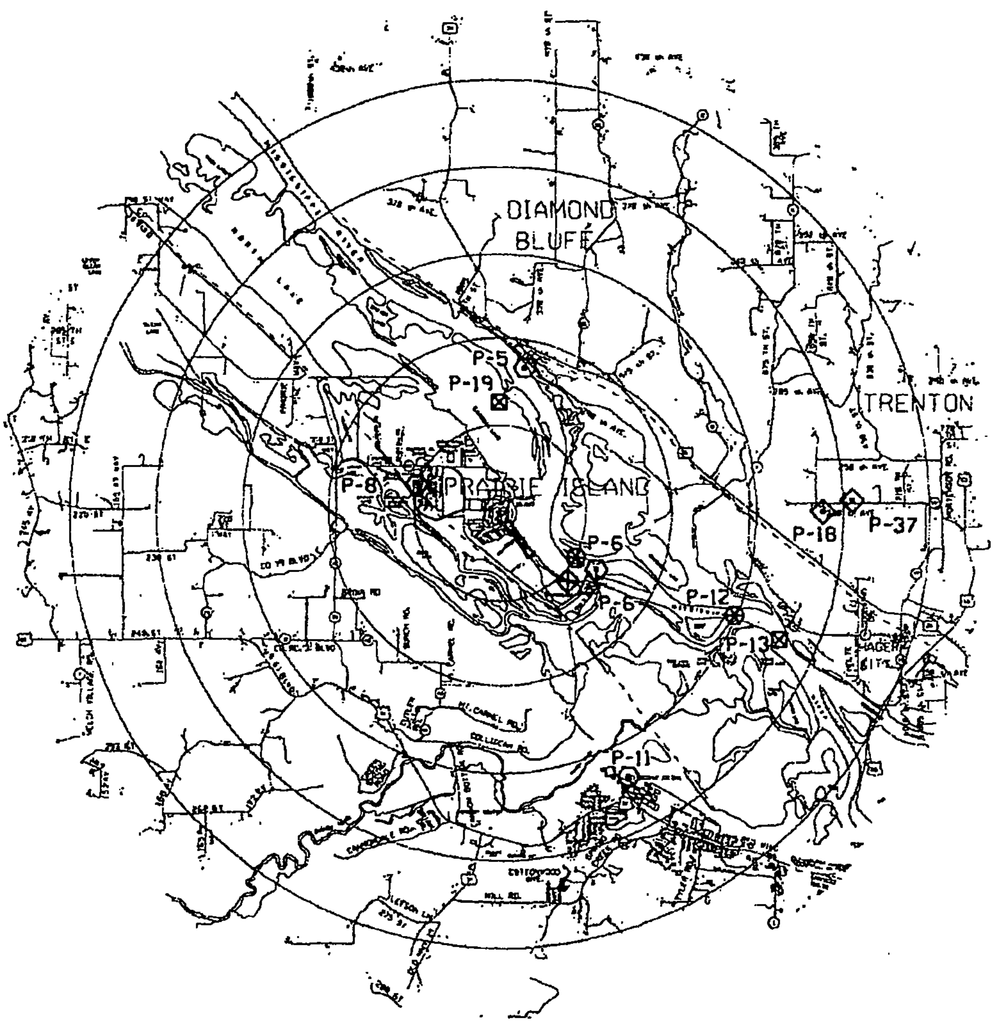
PLANT AREA ENLARGED PLAN [1.00 MILE RADIUS]

[NO SCALE]

MONITORING LEGEND

- MILK SAMPLING POINT ID NUMBERS P-18, P-37, P-43
- FISH SAMPLING POINT ID NUMBERS P-13, P-19
- AIR SAMPLING POINT ID NUMBERS P-1, P-2, P-3, P-4, P-6
- INVERTEBRATES POINT ID NUMBERS P-6, P-40
- WATER SAMPLING POINT ID NUMBERS P-5, P-6, P-8, P-9, P-11, P-24, P-43
- SEDIMENT SAMPLING POINT ID NUMBERS P-6, P-12, P-20
- VEGETATION / VEGETABLES ID NUMBERS P-28, P-38, P-45

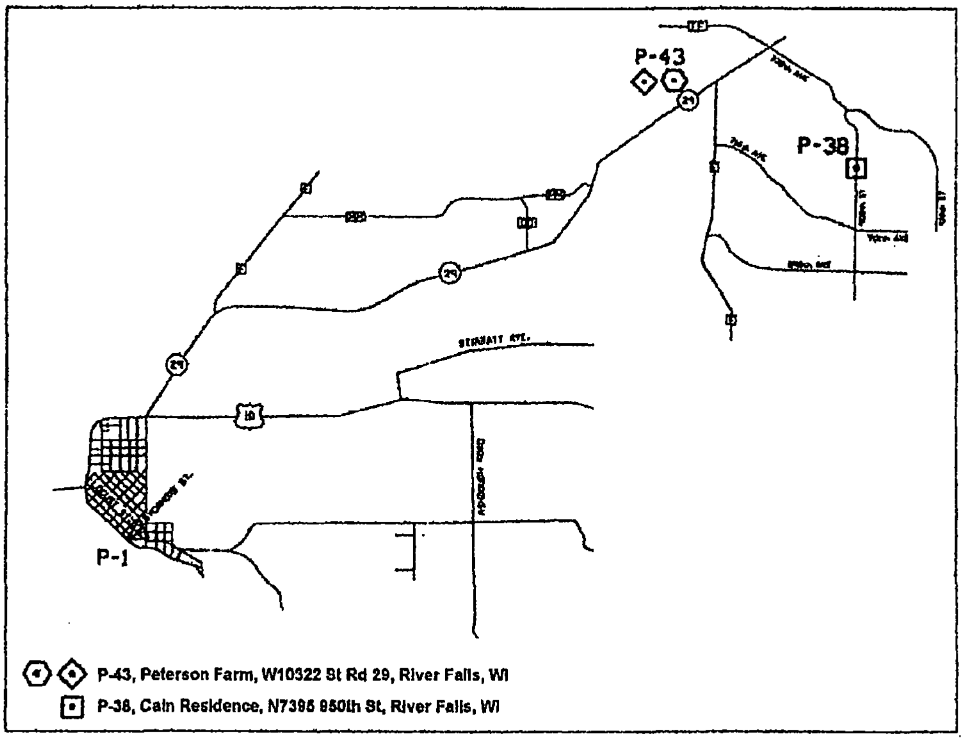
ENVIRONMENTAL SAMPLING POINTS
FIVE MILE RADIUS



MONITORING LEGEND

- MILK SAMPLING POINT ID NUMBERS P-18, P-37, P-43
- AIR SAMPLING POINT ID NUMBERS P-1, P-2, P-3, P-4, P-6
- WATER SAMPLING POINT ID NUMBERS P-5, P-6, P-8, P-9, P-11, P-24, P-43
- VEGETATION / VEGETABLES ID NUMBERS P-28, P-38, P-45
- FISH SAMPLING POINT ID NUMBERS P-13, P-19
- INVERTEBRATES POINT ID NUMBERS P-6, P-40
- SEDIMENT SAMPLING POINT ID NUMBERS P-6, P-12, P-20

ENVIRONMENTAL SAMPLING POINTS



CONTROL POINTS
PRESCOTT, WISCONSIN

MONITORING LEGEND

- MILK SAMPLING POINT ID NUMBERS P-18, P-37, P-41, P-42, P-43
- AIR SAMPLING POINT ID NUMBERS P-1, P-2, P-3, P-4, P-6
- WATER SAMPLING POINT ID NUMBERS P-5, P-6, P-8, P-9, P11, P-43
- VEGETATION / VEGETABLES ID NUMBERS P-28, P-38, P-45

APPENDIX E

Special Well and

Surface Water Samples

1.0 INTRODUCTION

This appendix to the Radiation Environmental Monitoring Program Annual Report to the United States Nuclear Regulatory Commission summarizes and interprets results of the special well and surface water samples taken at the Prairie Island Nuclear Generating Plant, Red Wing, Minnesota, during the period January - December, 2012. This supplemental special sampling program was established in December of 1989 when higher than expected levels of tritium were detected in a nearby residence well sample.

Tabulations of the special sampling program individual analyses made during the year are included in this appendix. A summary table of tritium analyses is also included in this appendix.

2.0 SUMMARY

This special sampling program was established following the detection of tritium in a residence well water sample south of the PINGP during 1989. This program is described and the results for 2012 are summarized and discussed.

Program findings for 2012 detected low levels of tritium in nearby residence wells and ground water surface samples at or near the expected natural background levels with the exception of sample wells P-10 and MW-8. The 2012 sample results (except for P-10 and MW-8) ranged from <19 pCi/L to 83 pCi/L. Sample well P-10 ranged from 41 pCi/L to 247 pCi/L. Sample well MW-8 ranged from 229 pCi/L to 398 pCi/L. All tritium results are far below the Environmental Protection Agency's drinking water standard of 20,000 pCi/L and present no harm to any members of the public.

None of the water samples monitored for gamma-emitting isotopes showed any activity greater than the LLD.

3.0 Special Tritium Sampling Program

3.1 Program Design and Data Interpretation

The purpose of this sampling program is to assess the impact of any tritium leaching into the environment (ground water system) from the PINGP. For this purpose, special water samples are collected and analyzed for tritium content.

3.2 Program Description

The sampling and analysis schedule for the special water sampling program is summarized in Table E-4.1 and briefly reviewed below. Table E-4.2 defines the additional sample locations and codes for the special water sampling program.

Special well, tank, and surface water samples were collected quarterly (spring, summer, fall) at seven locations, quarterly at one location, monthly at six locations, semi-annually at five locations, and annually at forty-two locations. The Peterson (P-43) and Hanson (SW-1) farm wells are used as control locations for these special samples.

To detect low levels of tritium at or below natural background levels, analyses of the samples have been contracted to a laboratory (University of Waterloo Laboratories) capable of detecting tritium concentrations down to 19 pCi/L. Waterloo Laboratories report tritium analyses results in Tritium Units (1 TU = 3.2 pCi/L). The tritium results in this report are indicated in pCi/L.

3.3 Program Execution

The special water sampling was executed as described in the preceding section.

3.4 Program Modifications

Changes to the program in 2012 include:

- samples were taken from monitoring wells P-10 and MW-8 and stormwater runoff S-6 and S-7 and were sent to Environmental Incorporated for analysis for hard-to-detect nuclides in accordance with American Nuclear Insurers recommendation
- samples were taken from PIIC-21, PIIC-27, SW-6, and SW-7 because these wells became available for sampling in 2012
- no samples were taken from the warehouse septic or the D5 Fuel Oil Storage Tank vault because these locations were not required to be sampled

3.5 Results and Discussion

Results show tritium in well water and ground water samples at or near expected natural background levels except the P-10 and MW-8 sample wells. Table E-4.4 provides the complete data table of results for each period and sampling location.

The tritium level annual averages have shown a downward trend since the special sampling began in 1989.

Except for sample wells P-10 and MW-8, the 2012 sample results are within the range of expected background tritium levels in shallow ground water and surface water due to tritium concentrations measured in precipitation. Sampling points in North America have shown tritium concentrations in precipitation ranging from 5 pCi/L to 157 pCi/L (Environmental Isotope Data No. 10; World Survey of Isotope Concentration in Precipitation (1988-1991)).

The higher level results at the Suter residence and Birch Lake in 1989 were possibly due to seepage from the PINGP discharge canal water into the ground water. This is thought to occur due to the elevation difference between the Vermillion River and the discharge canal. The Suter residence is located between the discharge canal and Birch Lake, which connects to the Vermillion River. The PINGP discharge canal piping was lengthened during 1991, so that liquid discharges from the plant are released near the end of the discharge canal, diffused and discharged to the Mississippi River. In 1992, the underground liquid discharge pipe from the plant to the discharge canal piping was replaced with a double walled leak detectable piping system. This year's sample results continue to indicate that these modifications have eliminated the suspected radioactive effluent flow into the local ground water.

The elevated tritium levels in sample wells P-10 and MW-8 in 2012 may be due to prior leakage from the PINGP liquid radwaste discharge pipe, discharge of turbine building sump water into the landlocked area, or discharge of heating steam condensate from the main warehouse in 1978/1979. The liquid radwaste discharge pipe was replaced in 1992 and the discharge to the landlocked area has been terminated, the last discharge took place on 11/14/09. The main warehouse heating system was repaired in 1979. An additional discharge of 27 gallons of heating steam condensate was released in 2012 from the main warehouse. Corrective actions were taken to repair the main warehouse condensate return pumps. The heating steam system was not used in the outer plant buildings during the 2012 – 2013 heating season.

None of the water samples monitored for gamma-emitting isotopes showed any activity greater than the LLD.

Table E-4.1. Sample collection and analysis program for special well, storage tank, and surface water samples, Prairie Island Nuclear Generating Plant, 2012.

Medium	No.	Location codes and type [a]	Collection type and frequency [b]	Analysis type [c]
Well water Annual	29	P-8, REMP P-6, PIIC-02, PIIC-03, PIIC-19, PIIC-20, PIIC-21, PIIC-22, PIIC-23, PIIC-24, PIIC-26, PIIC-27, PIIC-28, P-7, P-11, PZ-1, PZ-2, PZ-4, PZ-5, PZ-7, MW-6, P-26, P-30, SW-3, SW-4, SW-5, SW-6, SW-7, P-9	G/A	H-3
Well water quarterly	1	P-24D	G/Q	H-3
Well water quarterly'	7	P-2, P-3, P-5, P-6, PZ-8, MW-4, MW-5	G/Q'	H-3
Well water monthly	5	P-43(C), SW-1(C), MW-7, MW-8, P-10	G/M	H-3
Surface water	8	S-1, S-2, S-3, S-4, S-5, S-6, S-7, P-31	G/A[d]	H-3
Storage Tank	5	11 CST, 21 CST, 22 CST, U1/2 Demin Hdr	G/S	H-3
Storage Tank	1	Septic Tank	G/M	H-3
Snow	5	S-6, S-7, S-8, S-9, P-43(C)	G/A	H-3

[a] Location codes are defined in table D-4.2. Control Stations are indicated by (C). All other stations are indicators.

[b] Collection type is codes as follows: G/ = grab. Collection frequency is coded as follows: M = monthly; Q = quarterly; Q' = quarterly (spring, summer, and fall), S= semiannually: A = annually.

[c] Analysis type is coded as follows: H-3 = tritium.

[d] Location S-6 and S-7 are sampled semi-annually.

Table E-4.2. Sampling locations for special well, storage tank, and surface water samples, Prairie Island Nuclear Generating Plant, 2012.

Code	Collection site	Type of sample [a]	Distance and direction from reactor
P-8	PI Community well	WW	1.0 mi. @ 321°/WNW
REMP P-6	Lock & Dam #3 well	WW	1.6 mi. @ 129°/SE
PIIC-02	2077 Other Day Road	WW	1.4 mi. @ 315°/NW
PIIC-03	6096 Whipple Way	WW	1.4 mi. @ 310°/NW
PIIC-19	6372 Sturgeon Lake Rd	WW	1.7 mi. @ 293°/WNW
PIIC-20	2158 Holmquist Road	WW	1.6 mi @ 300°/WNW
PIIC-21	1802 Messiah Road	WW	0.9 mi @ 281°/W
PIIC-22	1773 Buffalo Slough Rd	WW	1 mi. @ 315°/NW
PIIC-23	2.7 miles NW	WW	2.7 mi @315°/NW
PIIC-24	6424 Sturgeon Lake Rd	WW	1.7 mi. @ 293°/WNW
PIIC-26	1771 Buffalo Slough Rd	WW	1 mi. @ 315°/NW
PIIC-27	6372 Sturgeon Lake Rd	WW	1.7 mi. @ 293°/WNW
PIIC-28	1960 Larson Lane	WW	1.5 mi @ 288°/WNW
P-24D	Suter residence	WW	0.6 mi. @ 158°/SSE
P-43	Peterson Farm (Control)	WW	13.9 mi. @ 355°/N
SW-1	Hanson Farm (Control)	WW	2.2 mi. @ 315°/NW
P-2	Sample well	WW	See map
P-3	Sample well	WW	See map
P-5	Sample well	WW	See map
P-6	Sample well	WW	See map
P-7	Sample well	WW	See map
P-10	Sample well	WW	See map
P-11	Sample well	WW	See map
PZ-1	Sample well	WW	See map
PZ-2	Sample well	WW	See map
PZ-4	Sample well	WW	See map
PZ-5	Sample well	WW	See map
PZ-7	Sample well	WW	See map
PZ-8	Sample well	WW	See map
MW-4	Sample well	WW	See map
MW-5	Sample well	WW	See map
MW-6	Sample well	WW	See map
MW-7	Sample well	WW	See map
MW-8	Sample well	WW	See map
P-26	PITC well	WW	0.4 mi. @ 258°/WSW
P-30	Environ lab well	WW	0.2 mi. @ 32°/NNE

Table E-4.2. Sampling locations for special well, storage tank, and surface water samples, Prairie Island Nuclear Generating Plant, 2012 (continued).

Code	Collection site	Type of sample [a]	Distance and direction from reactor
SW-3	Cooling Tower pump	WW	See map
SW-4	New Admin Bldg	WW	0.05 mi. @ 315°/NW
SW-5	Plant Screenhouse well	WW	0.05 mi. @ 0°/N
SW-6	Restroom Trailer well	WW	0.2 mi @ 310°/NW
SW-7	Distribution Center	WW	0.35 mi @ 271°/W
P-9	Plant well # 2	WW	0.3 mi. @ 306°/NW
S-1	Upstream Miss. River	SW	See map
S-2	Recirc/Intake canal	SW	See map
S-3	Cooling water canal	SW	See map
S-4	Discharge Canal (end)	SW	See map
S-5	Mid Discharge Canal	SW	See map
S-6	Roof Stormwater Runoff (also snow)	SW	0.05 mi. @ 0°/N
S-7	Parking Lot Stormwater (also snow)	SW	0.3 mi @ 306°/NW
S-8	P-10 area snow	SW	See map
S-9	MW-7/8 area snow	SW	See map
P-31	Birch Lake Seepage	SW	
11 CST	Storage Tank	ST	Turbine Building
21 CST	Storage Tank	ST	Turbine Building
22 CST	Storage Tank	ST	Turbine Building
Unit 1/2 demin hdr	Storage Tank	ST	Turbine Building
Septic System	Storage Tank	ST	Outside #1 Warehouse
Warehouse Septic	Storage Tank	ST	Outside #1 Warehouse
D5 Vault	Concrete Vault	ST	Outside Turbine Bldg

[a] Sample codes: WW = Well water; SW = Surface Water: ST = Storage Tank.

Table E-4.3 Radiation Environmental Monitoring Program Summary: Special well, storage tank, and surface water samples.

Name of Facility Prairie Island Nuclear Power Station Docket No. 50-282, 50-306

Location of Facility Goodhue, Minnesota (County, State) Reporting Period January – December, 2012

Sample Type (Units)	Type and Number of Analyses [a]		LLD [b]	Indicator Locations Mean (F) [c] Range [c]	Location with Highest Annual Mean: Location [d]	Location with Highest Annual Mean: Mean (F) [c] Range [c]	Control Locations Mean (F) [c] Range [c]	Number Non-Routine Results [e]
Offsite Well Water (pCi/L)	H-3	17	19	30 (7/17) (20-48)	PIIC-23	39 (1/1)	(See Control Below)	0
Onsite Well Water (pCi/L)	H-3	74	19	112 (55/74) (20-398)	MW-8	306 (12/12) (229-398)	(See Control Below)	14
Onsite Surface Water (pCi/L)	H-3	15	19	59 (8/15) (23-180)	S-9	180 (1/1)	(See Control Below)	0
Onsite Storage Tank (pCi/L)	H-3	22	19	100 (13/22) (25-238)	Septic System	114 (11/12) (31-238)	(See Control Below)	1
Control (offsite well water)	H-3	24	19	none	P-43	20 (1/12)	20 (1/24)	0

[a] H-3 = tritium

[b] LLD = Nominal lower limit of detection based on 4.66 sigma error for background sample. Value shown is lowest for the period.

[c] Mean and range are based on detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).

[d] Locations are specified by code.

[e] Non-routine results are those which exceed ten times the control station value.

Table E-4.4 Radiological Environmental Monitoring Program , Complete Data Table, 2012.

	SAMPLE DATES	JAN 2012	FEB 2012	MAR 2012	APR 2012	MAY 2012	JUN 2012	JUL 2012	AUG 2012	SEP 2012	OCT 2012	NOV 2012	DEC 2012
CODE	SAMPLE LOCATIONS	Concentration H-3 (pCi/L)											
	OFFSITE WELLS												
P-8	Pl Comm. Well										< 19		
REMP P-6	Lock & Dam #3 well							< 19					
PIIC-02	2077 Other Day Road										< 19		
PIIC-03	6096 Whipple Way										< 19		
PIIC-19	6372 Sturgeon Lake Rd										20		
PIIC-20	2158 Holmquist Rd										26		
PIIC-21	1802 Messiah Road										< 19		
PIIC-22	1773 Buffalo Slough Rd										22		
PIIC-23	2.7 miles NW of plant										39		
PIIC-24	6424 Sturgeon Lake Rd										< 19		
PIIC-26	1771 Buffalo Slough Rd										33		
PIIC-27	6372 Sturgeon Lake Rd										< 19		
PIIC-28	1960 Larson Lane										< 19		
P-24D	Suter residence		48		< 19			< 19			24		
P-43	Peterson Farm(Control	< 19	< 19	< 19	< 19	< 19	20	< 19	< 19	< 19	< 19	< 19	< 19
SW-1	Hanson Farm (Control)	< 19	< 19	< 19	< 19	< 19	< 19	< 19	< 19	< 19	< 19	< 19	< 19

Table E-4.4 Radiological Environmental Monitoring Program , Complete Data Table, 2012 (continued).

	SAMPLE DATES	JAN 2012	FEB 2012	MAR 2012	APR 2012	MAY 2012	JUN 2012	JUL 2012	AUG 2012	SEP 2012	OCT 2012	NOV 2012	DEC 2012
CODE	SAMPLE LOCATIONS	Concentration H-3 (pCi/L)											
	ONSITE WELLS												
P-2	Sample well				83			49			< 19		
P-3	Sample well				23			20			< 19		
P-5	Sample well				69			49			28		
P-6	Sample well				23			< 19			< 19		
P-7	Sample well							53					
P-10	Sample well	234	247	191	122	96	75	41	46	56	60	115	103
P-11	Sample well							27					
PZ-1	Sample well							< 19					
PZ-2	Sample well							< 19					
PZ-4	Sample well							24					
PZ-5	Sample well							23					
PZ-7	Sample well							32					
PZ-8	Sample well				31			39			< 19		
MW-4	Sample well				32			< 19			< 19		
MW-5	Sample well				< 19			32			< 19		
MW-6	Sample well							< 19					
MW-7	Sample well	39	31	30	25	55	21	23	27	51	< 19	43	31
MW-8	Sample well	270	398	373	319	349	284	252	253	273	229	327	338
P-26	PITC well							36					
P-30	Env. lab well							< 19					
SW-3	CT pump							32					
P-9	Plant well # 2							27					
SW-4	New Admin							< 19					
SW-5	Plnt Scmhs							< 19					
SW-6	Restroom Trailer	< 19						< 19					
SW-7	Dist Center							< 19					

Table E-4.4 Radiological Environmental Monitoring Program , Complete Data Table, 2012 (continued).

	SAMPLE DATES	JAN 2012	FEB 2012	MAR 2012	APR 2012	MAY 2012	JUN 2012	JUL 2012	AUG 2012	SEP 2012	OCT 2012	NOV 2012	DEC 2012
CODE	SAMPLE LOCATIONS	Concentration H-3 (pCi/L)											
	ONSITE SURFACE WATER												
S-1	Mississippi River upstream							38					
S-2	Recirculation/Intake canal							< 19					
S-3	Cooling water canal							< 19					
S-4	Discharge Canal (end)							< 19					
S-5	Discharge Canal (midway)							28					
S-6	Stormwater runoff					< 19					26		
S-7	Parking Lot runoff	76 *				58					< 19		
S-8	P-10 area snow	46 *											
S-9	MW-7/8 area snow	180 *											
P-31	Birch Lake Seepage		< 19					23			< 19		

* snow samples

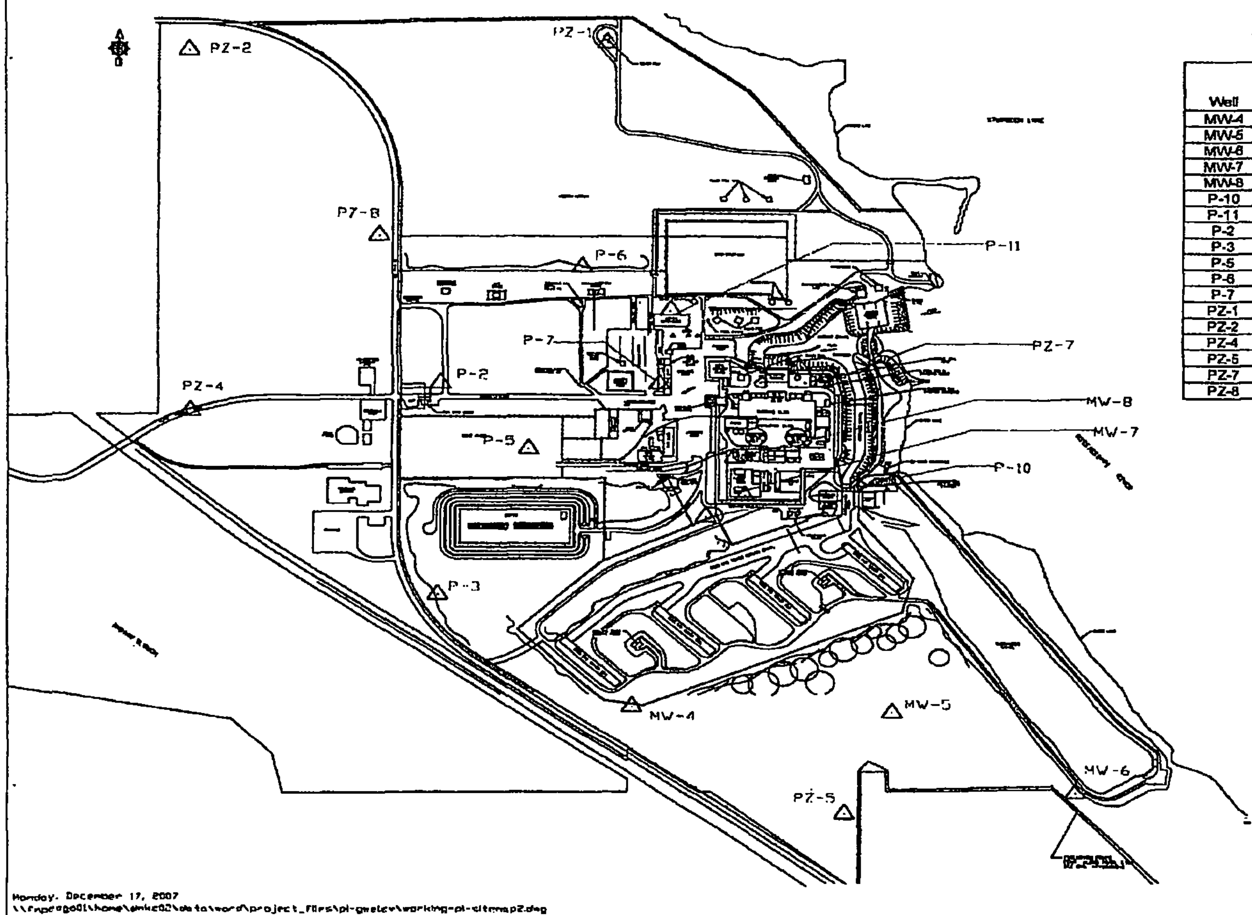
Table E-4.4 Radiological Environmental Monitoring Program , Complete Data Table, 2012 (continued).

	SAMPLE DATES	JAN 2012	FEB 2012	MAR 2012	APR 2012	MAY 2012	JUN 2012	JUL 2012	AUG 2012	SEP 2012	OCT 2012	NOV 2012	DEC 2012
CODE	SAMPLE LOCATIONS	Concentration H-3 (pCi/L)											
	ONSITE STORAGE TANKS												
11 CST	Storage tank					< 19					< 19		
21 CST	Storage tank					< 19					< 19		
22 CST	Storage tank								< 19		< 19		
U1/U2 Demin Header	Storage tank		28/ < 19								25/ < 19		
Septic System	Storage tank	< 19	43	238	175	92	64	146	89	56	31	180	137

Table E-4.5. Results of analyses for iron-55, nickel-63, strontium-90, isotopic plutonium, americium-241 and isotopic curium in four samples.

Location	S-6	S-7	P-10 Well	MW-8 Well
Collection Date	05-05-12	05-02-12	06-19-12	06-19-12
Lab Code	PXW-3056	PXW-3057	PXWW-3769	PXWW-3770
Isotope	Concentration (µCi/mL)			
Fe-55	< 9.1 E-07	< 7.7 E-07	< 8.9 E-07	< 8.6 E-07
Ni-63	< 8.2 E-09	< 8.2 E-09	< 9.9 E-09	< 1.0 E-08
Sr-90	< 6.6 E-10	< 5.3 E-10	< 4.8 E-10	< 4.8 E-10
Pu-238	< 1.3 E-10	< 8.7 E-11	< 1.1 E-10	< 1.1 E-10
Pu-239/240	< 1.3 E-10	< 1.7 E-10	< 1.1 E-10	< 1.1 E-10
Am-241	< 6.3 E-10	< 8.9 E-11	< 1.0 E-10	< 1.5 E-10
Cm-242	< 6.3 E-10	< 8.9 E-11	< 1.0 E-10	< 1.0 E-10
Cm-243/244	< 6.3 E-10	< 8.9 E-11	< 1.0 E-10	< 1.0 E-10

The error given is the probable counting error at 95% confidence level. Less than (<), value is based on a 4.66 sigma counting error for the background sample.



Survey by Johnson & Scofield Inc
November 21, 2007

Well	North	East	Top of Riser Pipe Elev
MW-4	592236	2355090	693.02
MW-5	592201	2356566	686.83
MW-6	591642	2367697	682.33
MW-7	593686	2355714	695.54
MW-8	593944	2365654	697.47
P-10	593538	2355497	693.16
P-11	594949	2355297	698.19
P-2	594449	2354002	697.72
P-3	592998	2353997	698.19
P-5	594002	2354501	695.51
P-6	595250	2354802	699.3
P-7	594449	2355235	697.97
PZ-1	596790	2354934	682.91
PZ-2	596743	2352589	689.05
PZ-4	594262	2352598	696.53
PZ-5	591602	2356299	695.93
PZ-7	594469	2356158	697.85
PZ-8	595471	2353662	696.52

Groundwater Monitoring Well Locations

ATTACHMENT 3

AREVA Inc. Affidavit
Pursuant to 10 CFR 2.390

1 page follows

AFFIDAVIT PURSUANT
TO 10 CFR 2.390

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

I, Jayant Bondre, depose and say that I am a Vice President and Chief Operating Officer (VP & COO) of AREVA Inc., duly authorized to execute this affidavit, and have reviewed or caused to have reviewed the information which is identified as proprietary and referenced in the paragraph immediately below. I am submitting this affidavit in conformance with the provisions of 10 CFR 2.390 of the Commission's regulations for withholding this information.

The document for which proprietary treatment is sought is listed below. The calculations listed below are intended to be submitted to the United States Nuclear Regulatory Commission by Xcel Energy:

- AREVA Inc., Calculation # TN40HT-0510 Revision 0, "Representative Source Terms for the Prairie Island ISFSI"
- AREVA Inc., Calculation # TN40HT-0511 Revision 0, "Dose Rates Estimate for Prairie Island ISFSI Comprised with TN40HT Casks Loaded with WE 14x14 OFA and WE 14x14 STD Fuel Assemblies"

The document has been appropriately designated as proprietary.

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

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

1) The information sought to be withheld from public disclosure involves details and analysis related to the design of a dry spent fuel storage system which are owned and have been held in confidence by AREVA Inc.

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

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

Further the deponent sayeth not.

Jayant Bondre
VP & COO, AREVA Inc.

Subscribed and sworn to me before this 16th day of July, 2014.

Patricia Hoch
Notary Public
My Commission Expires 11 / 17 / 14

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