Year	2003	2004	2005	2006	2007
Reported	41.9 MGY	54.6 MGY	61.6 MGY	58.6 MGY	44.8 MGY
	128.63 acre ft	167.62 acre ft	189.11 acre ft	179.90 acre ft	137.53 acre ft
	79.72 gpm	103.60 gpm	117.20 gpm	111.49 gpm	85.24 gpm

 $MGY = million \ gallons \ per \ year$ , gpm =gallons per minute

**Table 1-1: PINGP Reported Pumping Permit Appropriation** 

Stream	Description	Maximum	Average
		Flow	Flow
SD 001	Condenser/circulating water and	864	503
	Cooling Water		
SD 002	Steam Generator blowdown	0.576	0.012
SD 003	Radioactive waste Effluent	0.230	0.002
SD 004	Reverse Osmosis Effluent (Monitoring 0.244		0.051
	and Reporting requirements only)		
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	3.2 2.0	
	Reporting Requirements Only)		
WS 001 &	Combined U 1/U 2 Cooling water	69	25
SW 002	-		

**Table 1-2: PINGP Surface Water Discharge Streams** 

**Table 1-3: PINGP NPDES Permitted Flow Limits** 

Dates	Limiting Flow	Notes
	(mgd)	
April 15 to 30	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	

NPDES = National Pollution Discharge Elimination, System, mgd = million gallons per day, gpm = gallons per minute, cfs = cubic feet second (cfs).

<sup>\*\*</sup> This flow limit may be exceeded <u>if</u> 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.

Rule Reference	Description	Prairie Island Power Uprate	
Capacity	,	164 MWe	
Annual Capacity Factor		<ul> <li>88.8% during years with refueling outage</li> <li>97% during years without refueling outage</li> <li>Assumes a 3% forced outage rate</li> </ul>	
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	<ul> <li>88.8% during years with refueling outage</li> <li>97% during years without refueling outage</li> <li>Assumes a 3% forced outage rate</li> </ul>	
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	g \$0.00103/kWh	
7849.0250 C (8)	Efficiency Expressed In Heat Rate	9.94mmBtu /MWh	

mbtu = million british thermal units, kWh = kilo watt hour, MWh = mega watt hour

**Table 1-4: PINGP EPU Operational Information Summary** 

Table 3-1: Cost Comparison between the Proposed EPU, a 164 MW Coal PPA, a 164 MW Biomass Plant, and a Natural Gas Plant Present Value of Revenue Requirements (PVRR) Base Case\* Assumptions (\$ millions)

	Prairie	164 MW	164 MW	Unconstrained
	Island	Coal	Biomass	
	Uprate	PPA		
	Project			
PVRR	\$61,356	\$61,974	\$62,535	\$61,875
PVRR				
difference				
from		\$619	¢1 170	¢510
Prairie	-	\$019	\$1,179	\$519
Island				
Project				

<sup>\*</sup>The base case uses the same forecast, individual plant information, externality values, and fuel forecasts, and assumes compliance with the RES and DSM legislation.

Table 3-2: Air Emission Comparison between the Proposed EPU, a 164 MW Coal PPA, a 164 MW Biomass Plant, and a Natural Gas Plant

2008 – 2035 Emissions	NOx	PM10	$CO_2$	$SO_2$	VOC	CO
Differences	Tons	Tons	Tons	Tons	Tons	Tons
Prairie Island Uprate	0	0	0	0	0	0
Project						
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"	7,580	1,370	16,059,200	9,526	283	2,235
Natural Gas Combustion						
Turbine						

The table compares differences between the total emissions for the PINGP EPU project and three alternatives. The PINGP EPU project is set at "0" as the baseline, the data showing how much higher or lower other alternatives are.

## TABLE 4-1 PREVIOUSLY RECORDED AND REPORTED ARCHAEOLOGICAL SITES WITHIN THE PINGP STUDY AREA

Site No. and Name	Last site visit	Description	Location	Condition (per site form)
Recorded Sites		<u> </u>	<b>!</b>	·
21GD0002 Bartron Site	1970	Oneota/Blue Earth phase village on 20 acres	T113 R15W, Sec 4 SW-SW-SW	Moderately disturbed
21GD0058 Birch Lake Mounds (aka Prairie Island Mounds II)	1981	Possible Burial Site 8 mortuary mounds on 8.5 acres; Mississippian affiliation	T113N R15W, Sec 5 SW-SW-SE, SE- SE-SW	Unknown Johnson Data Recovery 1969
21GD0059 NSP II	1969	Possible Burial Site 6 mounds on 8 acres; Woodland affiliation	T113N R15W, Sec 5, S-NE-SE-SE, N- SE-SE-SE, C-E- WSE-SE	Johnson Data Recovery 1969; Heavily disturbed/ destroyed
21GD0062 Birch Lake Mound	1969	Possible Burial Site 1 mound; probable Woodland affiliation	T113N R15W, Sec 5, SE-SW-SE, CE- E-SW-SW-SE	Moderately disturbed
21GD0148 Cooling Tower	1980	Artifact scatter on 5.5 acres; Woodland and probable Mississippian affiliation	T113N R15W, Sec 4, C-S-SW-SW	Minimally disturbed
21GD0149 Substation	1980	Possible Burial Site 1 mound and artifact scatter on 3 acres; possible Woodland, probable Oneota affiliation	T113N R15W, Sec 4, SW-NW-NW	Heavily disturbed
21GD0207 Dike Site	1980	Artifact scatter on 1 acre; Woodland affiliation	T113N R15W, Sec 7, C-S-SW-NE SW, C-N-N-NW SW-SW	Unknown
Reported Sites				
21GDl Vergil Larson Mounds II	1999	Possible Burial Site - 3 mounds	T113N R15W, Sec 5, E-SW-SW-NW, SW-SE-SW-NW, N-N-NW-SW	Unknown, not field verified

## TABLE 4-1 (Cont.) PREVIOUSLY RECORDED AND REPORTED ARCHAEOLOGICAL SITES WITHIN THE PINGP STUDY AREA

Site No. and Name	Description	Location	Condition (per site form)
Minnesota			
21GD0001 Nauer Mound Group	Earthwork, 51 mounds covering 60 acres; Woodland/ Early Oneota affiliation	T113N R15W, Sec 9 NW, NW-NW-SE, NE- NE-SW, SW-SW-SW- NE	Heavily disturbed; perhaps 13 mounds still visible
21GD0060 Vergil Larson Mound I	3 mounds and artifact scatter on 29 acres; probable Woodland affiliation	T113N R15W, Sec 6, SE-NE	Heavily disturbed
21GD0063 Larson Lake Mound	1 mound; probable Woodland affiliation	T113N R15W, N-N- SW-SE, C-S-S-S-NW- SE	Moderately disturbed
21GD0064 Amos Owens Mound Group	1 mound; probable Woodland affiliation	T113N R15W, Sec 6, NW-NE-SE	Disturbed, site location confirmed by testing in 1992
21GD0071 (21GD114) Brink Mound Group (Mistakenly assigned 2 site numbers)	4 mounds on 4.5 acres; probable Woodland affiliation	T113N R15W, Sec 6, W-SW-SW	Moderately disturbed
21GD0074 Buffalo Slough Mounds	24 mounds on 46.5 acres; probable Woodland affiliation	T114N R15W, Sec 30 C-SW-SE, S-SE-SE, S- NW-SE-SE	Heavily disturbed; probably destroyed
21GD0075 Leith Mound Group	45 mounds on 28.5 acres; probable Woodland affiliation	T114N R15W, Sec 32, NE-SW, C-W-W-WSE, S-SW-SE-NW	Moderately disturbed; 24 mounds visible in Prairie Island Reservation in 1999
21GD0088 Fort LaJonquire/ Sturgeon Lake Post	Historic French trading post	T114N R15WM Sec 32, SW-SE; overlaps 21GD75	Destroyed
21GD0173 Sturgeon Lake II	Artifact scatter on 1.5 acres; Woodland affiliation	T114N R15W, Sec 32, SW-SE-SE-NW, SE- SW-SE-NW	Undisturbed
21GD0181 Pickeral Slough	Artifact scatter over 3.5 acres; Woodland affiliation	T113N R15W, Sec 9, NE-NW-SE, N-SENW- SE, W-W-NWNE-SE	Minimally disturbed
21GD0189 Rim Site	Artifact scatter; Middle Woodland/Havana affiliation	T114N R15W, Sec 33 SW-NW-SE-NW	Unknown; may be redeposited alluvial material
21GD0202 Prairie Island Marina Site	Lithic scatter; unknown affiliation	T114M R15W, Sec 32NE-SW-NW-NW	Undisturbed

## TABLE 4-1 (Cont.) PREVIOUSLY RECORDED AND REPORTED ARCHAEOLOGICAL SITES WITHIN THE PINGP STUDY AREA

Site No. and Name	Description	Location	Condition (per site form)
21GD0208 CSAH 18 Findspot	Single projectile point; precontact	T113N R15W, Sec 7 NW-NE-NW-NW	Unknown
21GD0250	Lithic scatter; precontact	T114N R15W, Sec 31, SE-SE-SW	Unknown
21GD0251	Artifact scatter;	T113N R15W, Sec 6, NW-NW-NW	Unknown
Wisconsin		1	
47PI0185	6 conical mounds; Woodland affiliation	T25N R18W, Sec 19, NW	Unknown

Name of Historic Site	Location	Approximate Distance from the Plant	Comments
Bartron	Undisclosed	0-1 miles	Prehistoric site
Archaeological Site	location on Prairie		
	Island		
Metro	Pierce County	1-2 miles	810 acres prehistoric site
Archeological	Wisconsin		
District	Restricted		
	Address		
Mendota to	Cannon Bottom	2-4 miles	48 acre military roadway
Wabasha Military	Road, Red Wing,		
Road	MN		
Alexander	West of Red Wing	2-4 miles	50 acres, brick, stone structure of
Anderson Estate	on U.S. 61		architecture and engineering
			significance
Cross of Christ	U.S. 61 Red Wing	4.5 miles	50 acres, architecture, engineering,
Lutheran Church			religious significance.
Silvenale Site	Goodhue County	4-5 miles	No Information available
	Restricted		
	Address		

**Table 4-2 National Register Sites within Five Miles of the PINGP Plant** 

		Da	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

Table 4-3 Summary of Measured Ambient Noise Levels (L90) Around the PINGP

**Table 4-4** Sources of Surface Water Discharge Streams from PINGP

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

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

		Ice						
		Thickness			Date			
	Average	Fourth	Thinnest	Thickest	Thickest			
	Flow Rate	Week	Ice	Ice	Measured	Outage	Outage	
Year	Jan-Mar	February	Measured	Measured	Ice	Start	End	Unit
1999	13,798	18	15	18	Feb W4	11/9/1998	1/1/1999	Unit 2
2000	13,669	10	7	14	Feb W2 & 3	None		
2001	9,153	21	19	26	Mar W5	1/19/2001	2/25/2001	Unit 1
2002	10,869	11	10	13	Mar W2	2/1/2002	3/2/2002	Unit 2
2003	10,178	25	12	25	Feb W4 & Mar W2	11/15/2002	12/6/2002	Unit 1
2004	9,452	21	19	21	Feb W4 & Mar W1	None		
2005	12,068	25	23	25	Feb W3 thru Mar W1	None		
2006	18,941	17	12	17	Feb W4	None		
2007	12,138	13	10	14	Mar W1	11/14/2006	12/15/2006	Unit 2
2008	8,405	26	23	28	Mar W2	2/13/2008	3/23/2008	Unit 1
Ten-year								
average	11,867	19	15	20				

Table 4-5 Ice thickness measurements for Lake Pepin (Survey Station 770) from 1999 through 2008 (obtained from the U.S. Army Corps of Engineers)

**Table 4-6 Background Radiation Sources and Exposure**<sup>1</sup>

Sources	Approximate Annual Dose (mrem/yr)	Percentage of Annual Dose			
Natural Sources					
Radon in Indoor Air	200	55			
Ingested Foods	39	11			
Building Materials	28	8			
Cosmic Rays (average)	28	8			
Man-made Sources					
Medical Procedures	53	15			
Consumer Products	11	3			
Nuclear Fallout, Nuclear Fuel Cycle	< 2	< 1			

mrem = millirem

<sup>1</sup>. National Council on Radiation Protection and Measurements. *Ionizing Radiation Exposure of the Population of the United States*. NCRP Report No. 93. Bethesda, MD: NCRP; 1987.

Table 4-7 Activity and Estimated Dose of Gaseous Effluents<sup>1</sup>

	Activity (Ci/yr)		Estimated Doses (mrem/yr)	
	Noble Gases	Particulate and Iodine	Whole Body	Organ
Average actual releases (2001 – 2005)	11.2	164 E-06	0.0026	0.073
Estimated value with 10% increase due to power uprate	12.3	179 E-06	0.0028	0.080

mrem = millirem, Ci/yr = curies per year

<sup>1</sup> Prairie Island Nuclear Generating Plant, Application for a Generating Plant Site Permit, August 2008, Section 4.3.

Table 4-8 Activity and Estimated Dose of Liquid Effluents<sup>1</sup>

	Activity (Ci/yr)		Estimated Doses (mrem/yr)		
	Non- Tritium <sup>2</sup>	Tritium	Whole Body	Organ	
Average actual releases (2001 – 2005)	0.098	626	0.0026	0.0043	
Estimated value with 10% increase due to power uprate	0.108	689	0.0028	0.0047	

mrem = millirem, Ci/yr = curies per year

Prairie Island Nuclear Generating Plant, Application for a Generating Plant Site Permit, August 2008, Section 4.3.
 Non-tritium elements present in liquid effluents include iron, silver, manganese, tin, cesium, sodium,

<sup>&</sup>lt;sup>2</sup> Non-tritium elements present in liquid effluents include iron, silver, manganese, tin, cesium, sodium, chromium, cobalt, cerium, lanthanum, barium, niobium, strontium, tellurium, antimony, thallium, and zirconium.

Table 4-9 PINGP Volume and Activity of Solid Wastes<sup>1</sup>

	Volume (ft³/yr)	Activity (Ci/yr)
Average actual releases (2001 – 2005)	15,597	343
Estimated value with 10% increase due to power uprate	15,597	377

Ci/yr = curies per year

<sup>1</sup> Prairie Island Nuclear Generating Plant, Certificates of Need Application, May 2008, Section 8.2.6.

Table 4-10 Summary of Estimated Doses and Cancer Incidences for the General Public and Plant Personnel with Extended Power Uprate<sup>1</sup>

General Public				
Exposure Pathway	Estimated Whole Body Dose (mrem/yr)	Estimated Additional Risk of Cancer Incidence <sup>2</sup>	Estimated Additional Cancer Incidences <sup>3</sup>	
Gaseous Effluents	0.01	0.07 in 100,000	0.0003	
Liquid Effluents	$0.04^{4}$	0.28 in 100,000	0.0012	
Solid Wastes	5			
Plant Personnel <sup>6</sup>				
Plant Operations and Maintenance	132	660 in 100,000	6.1	

mrem = millirem

1 ~

<sup>&</sup>lt;sup>1</sup> See Chapter 1, Section 4.13 for a discussion of assumptions and calculations.

<sup>&</sup>lt;sup>2</sup> For residents within 2 miles (approximately 450 persons) who receive the estimated dose annually for 70 years.

<sup>&</sup>lt;sup>4</sup> See Chapter 1, Section 4.13 for a discussion of liquid effluents. Estimated dose is based on exposure to tritium through groundwater / drinking water.

<sup>&</sup>lt;sup>5</sup> Solid wastes are processed, packaged, and shipped off-site for permanent disposal in a federally licensed, low level radioactive waste disposal facility. Accordingly, assuming proper and long-term functioning of the disposal facility, exposure to the general public from these wastes is insignificant.

<sup>&</sup>lt;sup>6</sup> Average plant personnel dose estimated from a collective dose of 122 person-rem/yr divided over 923 plant personnel. Exposure received for a working lifetime of 50 years. Actual personnel doses will vary with job functions and will be managed by the PINGP radiation protection program.

Table 4-11 Summary of Radiological Effluents from the Prairie Island Plant with Extended Power Uprate<sup>1</sup>

Effluents	Estimated Annual Radiological Release - Activity (curies /yr)
Gaseous Effluents	12.3
Liquid Effluents	689.1
Solid Wastes	377.0
TOTAL	1,078.4

<sup>1</sup> This table incorporates information from Chapter 1, Tables 4-7, 4-8, and 4-9.