Enclosure 4 to L-MT-08-018

MNGP Extended Power Uprate Environmental Assessment

ENCLOSURE 4

MNGP EXTENDED POWER UPRATE ENVIRONMENTAL ASSESSMENT

MARCH 2008

NUCLEAR MANAGEMENT COMPANY (NMC)

MONTICELLO NUCLEAR GENERATING PLANT

MONTICELLO, MINNESOTA

RENEWED LICENSE NO. DPR-22

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EXECUTIVE SUMMARY

This document presents an evaluation of the environmental impacts of the proposed Monticello extended power uprate from 1775 MWth to 2004 MWth. The intent of this document is to provide sufficient information for the NRC Staff to evaluate the environmental impacts of extended power uprate in accordance with the requirements of 10 CFR Part 51.

The environmental impacts of extended power uprate are identified and compared against the environmental impacts associated with the present power level which have been previously evaluated by the NRC Staff in the 1998 Monticello Nuclear Generating Plant (MNGP) Power Rerate Environmental Evaluation (Ref's. 17 and 18) as part of the MNGP Power Rerate Project and associated license amendment (Amendment 102) as well as the MNGP Operating License Renewal Environmental Evaluation, NUREG-1437 Supplement 26 (Ref's. 19 and 20). The original licensed power level environmental impacts have been previously evaluated by the NRC Staff in the Final Environmental Statement (Ref. 2) associated with the issuance of the Monticello full term operating license.

The environmental impacts identified by the NRC Staff in the Final Environmental Statement are based on conservative assumptions for source terms and other environmental parameters. Since initial operation, a variety of systematic environmental improvements have been implemented at Monticello that have further increased the margin of conservatism associated with these assumptions. By adjusting actual plant operating parameters for extended power uprate effects, it can be demonstrated that the previous assumptions and conclusions concerning the environmental impact of Monticello operation at present power levels continue to bound plant operation at extended power uprate conditions with significant margin.

In a few cases, the Final Environmental Statement and its associated documentation does not contain sufficient information necessary for a detailed comparison of the extended power uprate environmental impacts with previously evaluated impacts. In these instances, comparisons and conclusions are made using other appropriate environmental criteria established by the NRC. Where other environmental authorities govern Monticello operation such as in the matter of state water appropriation limits, comparisons and conclusions are made using the appropriate environmental permits and regulations.

The Monticello extended power uprate is being implemented without consequential changes to the plant systems that directly or indirectly interface with the environment. No environmental permits are adversely affected by extended power uprate. This evaluation demonstrates that the environmental impacts of extended power uprate are either well bounded or encompassed by previously evaluated criteria established by the NRC Staff in the FES, Rerate Environmental Evaluation and License Renewal Environmental Evaluation, NUREG-1437 Supplement 26, or well bounded by other appropriate regulatory criteria.

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1.0 INTRODUCTION

The Nuclear Management Company (NMC)[1] is committed to operating the Monticello Nuclear Generating Plant (MNGP) in an environmentally sound manner. All plant activities, including design, construction, maintenance, and operation, are conducted in a manner that involves strict compliance with environmental regulations and deliberate consideration of environmental practices and consequences. Numerous controls and modifications have been implemented to prevent and reduce impacts to the environment, and extensive environmental monitoring programs have been instituted at MNGP. In keeping with this important obligation and in accordance with regulatory requirements, NMC has conducted a comprehensive environmental evaluation of the proposed MNGP extended power uprate from 1775 MWth to 2004 MWth.

This environmental evaluation is provided pursuant to 10 CFR 51.41 and is intended to fully support the Commission in complying with the requirements of Section 102(2) of the National Environmental Policy Act (NEPA), as amended, for the proposed change to the MNGP operating power level. The scope of the evaluation is limited to that information necessary and sufficient to determine the environmental impact of those particular changes associated with the proposed extended power uprate at MNGP from 1775 MWth to 2004 MWth. This evaluation is not specifically intended to reestablish the current environmental licensing basis or to justify the environmental impacts of operating at the present power level.

The environmental impact of operation at the current licensed power level has been reviewed and determined to be acceptable by the NRC Staff. In 1971-1972, the Company provided an Environmental Report (Ref.1 & 3) to the Atomic Energy Commission (AEC) as part of NSP's application for a full term operating license. The Environmental Report addressed the environmental impacts of construction and operation of MNGP. The report was utilized by the AEC in preparing a Final Environmental Statement or FES (Ref. 2) in fulfillment of the requirements of the National Environmental Policy Act of 1969. The NRC subsequently issued a full term operating license to MNGP (Ref. 12). This license authorized a maximum power level of 1670 MWth. By the Notice of Issuance included as Enclosure 2 to Ref. 12, the Commission stated that "...issuance of this license will not result in any environmental impacts other than those evaluated in the Final Environmental Statement since the activity authorized by the license is encompassed by the overall action evaluated in the Final Environmental Statement." In September 1998, the Commission approved an increase in the maximum power level of MNGP from 1670 MWth to 1775 MWth (Ref. 18). This approval was supported by an "Environmental Assessment and Final Finding of No Significant Impact" that was transmitted to NSP in August 1998 (Ref. 17). The MNGP Facility Operating License was renewed in November 2006. This renewed operating license was supported by an Environmental Impact Statement, NUREG-1437 Supplement 26, prepared for MNGP (Ref. 19).

This evaluation demonstrates that the environmental impacts of extended power uprate are either well bounded or encompassed by previously evaluated criteria established by the NRC Staff in the FES, Rerate Evaluation and License Renewal Evaluation or well bounded by other appropriate regulatory criteria.

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[1] Note regarding company name use: NMC is the operating company for MNGP. MNGP is owned by Northern States Power (NSP) Company which is doing business in Minnesota as Xcel Energy. NMC is used in this report where the subject applies to a function of the operating company. The "Company" is used where the subject applies to the plant owner (NSP/Xcel Energy).

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2.0 OVERVIEW OF OPERATIONAL AND EQUIPMENT CHANGES

Monticello is a Boiling Water Reactor (BWR) that operates in a direct thermodynamic cycle between the reactor and the turbine. At extended power uprate conditions, thermodynamic processes are changed to extract additional work from the turbine. Simply put, extended power uprate involves an increase in the heat output of the reactor to support increased turbine inlet steam flow requirements and an increase in the heat dissipated by the condenser to support increased turbine exhaust steam flow requirements. In order to support an extended power uprate to 2004 MWth, the reactor core operating range will be expanded by increasing reactor power within existing rod and core flow control lines. No changes in operating pressure are necessary to support extended power uprate. In the turbine portion of the heat cycle, increases in steam flow will result in a slight increase in the heat rejected to the Mississippi River. The environmental impacts of these operational changes are discussed herein.

Several plant modifications are required to support operation at the extended power uprate power level. Enclosure 8 to this license amendment request contains a listing and brief description of the planned modifications. In summary, modifications are required to some systems to generate and/or accommodate the increased feedwater and steam flow rates to achieve EPU power levels. These modifications are planned to be installed over the course of two operating cycles and refueling outages to support the EPU project schedule in 2009 and 2011. There are other modifications planned for installation in the 2009 and 2011 outages. However, these other modifications are not specifically required to support EPU and many are planned to address life cycle management improvements. Additionally, the operating conditions and performance of the steam dryer will be closely monitored to determine if a modification or replacement will be necessary to support the extended power uprate.

3.0 PROPOSED ACTION AND NEED

3.1 Proposed Action

With the operational goal of increasing electrical generating capacity, NMC, in conjunction with the plant designer, General Electric, has comprehensively evaluated the effects of an extended power uprate at Monticello. This evaluation concluded that sufficient safety and design margins exist such that a prudent increase in the rated core thermal power from 1775 to 2004 MWth can be accomplished without any adverse impact on the health and safety of the public and without any significant impact on the environment. Accordingly, NMC is proposing an amendment to the MNGP Operating License to allow for an increase in the rated core thermal power level to 2004 MWth.

NMC does intend to raise power in increments at MNGP. The power level following the refueling outage in 2009 will be approximately 15 MWe higher. The maximum rated thermal power level of 2004 MWth will be implemented following startup from the refueling outage in 2011. The maximum power level proposed by this action and evaluated for environmental impact herein is 2004 MWth.

3.2 Need for Proposed Action

The Company filed a fifteen-year resource plan for the period 2008-2022 with the State of Minnesota (Ref. 21). This Resource Plan includes a forecasted average annual increase in expected customer peak demand of 1.2 percent through the 2008-2022 planning period. To meet this projected demand, generating capacity must have a net increase of 598 MWe to 11,314 MWe by 2012[1].

This Resource Plan forecast is first produced with a 50 percent probability that the energy or demand will be less than the forecast and a 50 percent probability it could be higher. These forecasts are referred to as the median forecasts. From these forecasts, the 90/10 probability forecasts are developed for both energy and demand. The forecasts include the impacts of past and future demand-side management ("DSM") programs[2]. These forecasts include a "business as usual" assumption in which there is no basic change in the relationship between the regional and national economies. The Company plans to the 50 percent energy forecast and the 90 percent demand forecast. The 90 percent forecast is used for capacity planning due to the significant financial penalties associated with not maintaining the 15 percent Mid-Continent Area Power Pool ("MAPP") reserve sharing requirement and the increasingly tight market for short-term purchases seen in recent years.

The Company has determined the need for additional generation resources through a comparison of the projected resource needs (Obligations) to the resources available to the Company (Committed Resources). The Company's resource obligations include forecasted summer peak net demand, MAPP minimum reserve requirements, and other contracted obligations. Committed resources include existing capacity, committed capacity additions, and committed capacity purchases. The results of this comparison are shown in Table 3.2-1 below.

Table 3.2-1
Company Total Resource Needs (MWe)

	2008	2012	2016	2020
Net Forecasted Obligations	10,716	11,314	11,892	12,465
Committed Resources	10,818	11,086	10,113	10,103

Included in Table 3.2-1 above is 2,400 MW of wind capacity that will be added between 2010 and 2022 to comply with the 2007 Renewable Energy Standard legislation requiring the Company to provide 25 percent of its retail sales through wind resource by 2025[3]. The proposed increase in electrical generating capacity due to the Monticello extended power uprate is not included in the Committed Resource values displayed above. As shown in Table 3.2-1, the Company expects to require increasing additional capacity through 2020. The effects of existing and new DSM programs necessary to assume a 1.1 percent reduction in retail sales has already been factored into the energy

[1] Net peak forecast after load management programs and including a 15 percent reserve margin as required by MAPP.
[2] DSM savings of 1.1 percent assumed to comply with 2007 Next Generation Act.
[3] The committed resources assumes Prairie Island Units 1 and 2 are both relicensed to operate an additional 20 years past their current licenses which expire in 2013 and 2014.

and demand forecasts. Additionally, the net forecasted demand obligations have already been reduced by the expected peak savings due to load management programs.

4.0 SOCIOECONOMIC EFFECTS

This section addresses the effect of extended power uprate on the social and economic conditions of communities affected by MNGP operation. The Company, as a matter of policy, factors in environmental costs in determining its selection of generation resources, but does not quantify socioeconomic effects of new generation. Therefore, the following discussions include the environmental costs as found in Table 4.0-1.

Table 4.0-1
Environmental Cost Values

Effluent	
SO2	$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)
CO2	$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.

The Company (including the employees of NMC) is a major employer in the community (second behind the school district) and the largest single contributor, by far, to the local tax base. MNGP personnel have higher incomes than the area on average and contribute significantly to the local tax base by payment of sales taxes and property taxes. Many MNGP personnel are actively involved in volunteer work within the local community and contribute to local service agencies. All these activities have a positive impact on the local and regional economies.

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4.1 Economic Structure

Extended power uprate does not significantly affect the size of the MNGP work force and does not have a material effect on the labor force required for future plant outages.

In 2007, the Company (including the employees of NMC) employed approximately 327 full-time workers at MNGP. These workers have a disproportionate influence on the economics of the region because of higher than average incomes. Estimated per capita and median household income in 1999 for Monticello, St. Cloud, Sherburne County, and Wright County are presented in Table 4.1-1. (The 2000 Census is the most recent demographic information available that covers all categories in Table 4.1-1 below.) The 1999 estimated average annual wage of MNGP employees was $56,720. The 2006 estimated average annual salary was $64,200.

Table 4.1-1
2000 Census Per Capita Personal and Median Household Income

Jurisdiction	Per Capita Personal Income	Median Household Income
Communities		
Monticello	$19,229	$45,384
St. Cloud	$19,769	$37,346
Counties		
Sherburne	$21,322	$57,014
Wright	$21,844	$53,945
Two-County Average	$21,583	$55,480 (rounded)
Minnesota	$23,198	$47,111

Source = http://facfinder.census.gov

4.2 Economic Benefits of Extended Power Uprate Equipment on Service Suppliers

Although the amount of plant modification and new equipment required to implement the extended power uprate is relatively small[1], there is a significant positive economic benefit to local and national businesses derived from extended power uprate at MNGP. There is a direct impact on the economy due to contracts awarded for project implementation. General Electric – Hitachi (GEH) was awarded the contract for the major engineering services associated with extended power uprate. Other local engineering firms, equipment suppliers, and service industries are receiving payments for extended power uprate related activities. This direct impact of these revenues from the Company will eventually cease within a few years of extended power uprate implementation. Successful implementation of

[1] The reactor system will require few modifications, but a number of balance-of-plant improvements and a new steam turbine will be necessary to take advantage of the increased steam flow.

extended power uprate at MNGP could result in additional follow-on revenue for equipment and service suppliers as other nuclear plant owners similarly decide to implement extended power uprate projects.

4.3 Tax Benefits of Extended Power Uprate

It is expected that the extended power uprate project will contribute approximately $1.2 million annually in property taxes above that associated with the continued operation of the plant without the extended power uprate project. The uprate will result in a payment of over $4.5 million in sales taxes. In addition, the extended power uprate project will result in an increase in state and federal income taxes being paid by workers during the implementation. Moreover, the Company will pay an estimated $30.5 million in additional state and federal income taxes over the project life.

The ability of the local community to provide public services at a reasonable tax rate is largely due to Company payments to local taxing jurisdictions. Public services, including law enforcement, fire protection, public education, and health services, receive a substantial amount of economic support through tax revenues generated by MNGP. The Company paid a total of $5,610,014 in local taxes to the City of Monticello, Wright County, School District 882, and Monticello/Big Lake Community Hospital in 2007. A significant reduction in the Company contribution from MNGP operations will result in economic penalties and/or loss of services to businesses, farmers, and homeowners as the Company tax contribution differential is apportioned to the remaining tax revenue sources.

Market values and tax disbursements for 1995, 2000, 2005, and 2007 can be found in Table 4.3-1 and Table 4.3-2 below.

Table 4.3-1
Assessed Market Values of MNGP

	1995	2000	2005	2007
Assessed Value	$262,339,700	$260,934,300	$232,574,300	$244,145,500

Table 4.3-2
Company Tax Disbursements

Taxing Jurisdiction	Taxes Paid			
	1995	2000	2005	2007
State	0	0	$567,703	$607,788
City	$2,203,800	$3,166,500	$2,727,683	$2,072,853
County	$3,718,600	$2,834,800	$1,600,493	$1,499,495
School District	$7,416,900	$5,425,700	$1,353,213	$1,285,806
Hospital	$311,700	$201,300	$124,034	$144,072
Total	$13,651,000	$11,628,300	$6,373,126	$5,610,014

4.4 Economic Competitiveness of MNGP Under Extended Power Uprate Conditions

The socioeconomic effects of extended power uprate are, in part, dependent on whether extended power uprate is economically competitive. Although implementation of extended power uprate is not the sole factor affecting the future economic competitiveness of MNGP, it is a real and material factor. While MNGP is not the least cost provider among the Company's generation assets, it is a low cost provider as compared to other base load generation. Additionally, the base load operation of a non-carbon emitting plant provides a significant hedge against future carbon regulation due to the increasing concern over the effect of carbon emissions has on global warming. The economic impact of that potential carbon hedge is estimated to be a savings of between $158 million and $295 million over the life of the plant - based on a hypothetical carbon tax of between $9/ton and $40/ton.

4.5 Environmental Justice Information

Minority and Low Income Populations

In the environmental justice analyses for previous license renewal applications, NRC used a 50-mile plant radius as the overall area that could contain environmental impact sites, and the state as the geographic area for comparative analysis. NMC adopts a similar approach in order to identify and analyze the minority and low-income populations that could be affected by operation at extended power uprate conditions at MNGP. The following information is taken from the recent MNGP Operating License Renewal Environmental Report (Ref. 27).

Minority Populations

Minority populations were identified using the Year 2000 Census demographic data to the block group level for the following racial minority categories: Black or African American, American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, Other Single Race, and Two or More Races. The Hispanic or Latino origin ethnicity designation is also identified. In addition to these groups, the minority

population as a whole (an aggregate minority category) was included in the analysis, in accordance with NRC guidance. The aggregate minority category included data from the following minority categories: Black or African American, American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, Other Single Race, and Two or More Races. The minority population determination for the MNGP environmental justice analysis included an evaluation of the seven minority categories used in the census and the aggregate minority population as indicated by NRC. NRC guidance specifies that a minority population exists in either of the following cases:

Exceeds 50 Percent – the minority population of the environmental impact site exceeds 50 percent or

More than 20 Percentage Points Greater – the minority population percentage of the impact site is significantly greater (typically at least 20 percentage points) than the minority population percentage in the geographic area chosen for comparative analysis.

The area within a 50-mile radius of MNGP was used in this analysis to define the area of potential environmental impact. Census block groups with greater than 50 percent of their area located outside the 50-mile radius, as defined above, were excluded from this area. The 50-mile radius of MNGP is located entirely within the State of Minnesota, and encompasses all or part of 21 counties (see Figure 4.5-1). The geographic area chosen for comparative analysis consisted of the State of Minnesota. The population demographic data from the State comprises average numbers for both the minority population as a whole and each minority category for comparison (see Table 4.5-2). The percentage of each minority group in an individual census block group was calculated as a percentage using the following:

$$[(\text{minority group population})_{\text{block group}} / \text{total population}] * 100$$

To calculate the aggregate minority population in an individual census block group, the populations of each of the six minority groups (Black or African American, American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, Other Single Race, and Two or More Races) and the Hispanic ethnicity designation were added together and used in the above equation. Since Hispanics may be of any race, and therefore, are included within the other racial categories, the number of persons identified as white Hispanics was included in the calculation of the aggregate minority population.

Census 2000 data for the block group level from Minnesota was analyzed to determine which block groups meet either or both of the above criteria (exceed 50 percent or more than 20 percentage points greater). The 50-mile radius includes 2,166 census block groups. Table 4.5-2 shows the number of census blocks groups in each county with a minority population, and the threshold values for determining if a minority population exists. No block groups exhibit minority populations greater than 50 percent. Therefore the applicable threshold values were calculated using the "greater than 20 percent points" criterion.

There were no census block groups with a minority population of Native Hawaiian or other Pacific Islander within the 50-mile radius of MNGP. There were 325 census block groups with an aggregate minority population (see Figure 4.5-1).

For the individual minority categories:

- 149 census block groups had a minority population of Black or African Americans (see Figure 4.5-2 and Table 4.5-2),
- 3 census block groups had a minority population of American Indian or Native Alaskan (see Figure 4.5-3 and Table 4.5-2),
- 46 census block groups had a minority population of Asians (see Figure 4.5-4 and Table 4.5-2),
- 11 census block groups had a minority population of "other" single race (see Figure 4.5-5 and Table 4.5-2),
- 1 census block group had a minority population of two or more races (see Figure 4.5-6 and Table 4.5-2), and
- 52 census block groups had a minority population of Hispanics or Latino origin (see Figure 4.5-7 and Table 4.5-2).

Hennepin County, Minnesota has 123 block groups with a Black or African American minority population, Ramsey County has 25, and Carver County had one block group (see Table 4.5-2). Hennepin County is the only county within the 50-mile radius of MNGP to have block groups with an American Indian or Native Alaskan minority population (three block groups). Hennepin and Ramsey counties had block groups with Asian minority populations and were the only two counties within the 50-mile radius with an Asian minority.

The majority of the block groups with minority populations (581 of 587) were located in Hennepin and Ramsey counties, part of the Minneapolis-St. Paul metropolitan area. In conclusion, the minority populations in the 50-mile radius of MNGP are concentrated near an urban center with a high population density approximately 30 or more miles from the plant.

Low-Income Populations

As for the minority group analysis above, information about the percentage of low-income households within the 50-mile radius of MNGP was compiled using Census 2000 data to the block group level. NRC guidance specifies that a low-income population exists in either of the following cases:

<u>Exceeds 50 Percent</u> – the percentage of households below the poverty level in the census block group or environmental impact site exceeds 50 percent or

<u>More than 20 Percentage Points Greater</u> – the percentage of households below the poverty level in the census block group or environmental impact site is significantly greater (typically at least 20 percentage points) than the percentage of households below the poverty level in the geographic area chosen for comparative analysis.

The environmental impact area and geographic area for comparative analysis used to identify low-income populations are identical to those described above for identifying minority populations (i.e., all block groups extending 50 percent or more within the 50-mile radius and counties with at least one block group extending within the 50-mile radius, respectively). The percentage of households below poverty level in the State of Minnesota comprised average regional number for comparison (see Table 4.5-2). Data for both the total number of households and the number of households with an income below the poverty level was obtained for each census block group within the 50-mile radius of MNGP. The number of households below poverty in each census block group was then calculated as a percentage using the following:

$$[(\text{households below poverty})_{\text{block group}} / \text{total households}] * 100$$

Any census block group with a percentage of households below the poverty level greater than 27.9 percent (see Table 4.5-2) was considered a low-income population in this assessment.

A total of 91 census block groups within the 50-mile radius of MNGP meet the criteria for low-income populations (see Table 4.5-2). The majority of the census block groups with a low-income population were located in Hennepin County (61 block groups) and Ramsey County (23 block groups) 35 miles or more from the plant. The two other counties with census block groups that have low-income populations are Sherburne and Stearns counties (1 and 6 census blocks, respectively; see Table 4.5-2).
The NRC reviewed similar Environmental Justice information for the MNGP License Renewal (Ref. 19) and concluded for that licensing action that the offsite impacts to minority and low-income populations were small and no mitigation actions were warranted.

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FIGURE 4.5-1

AGGREGATE MINORITY POPULATION

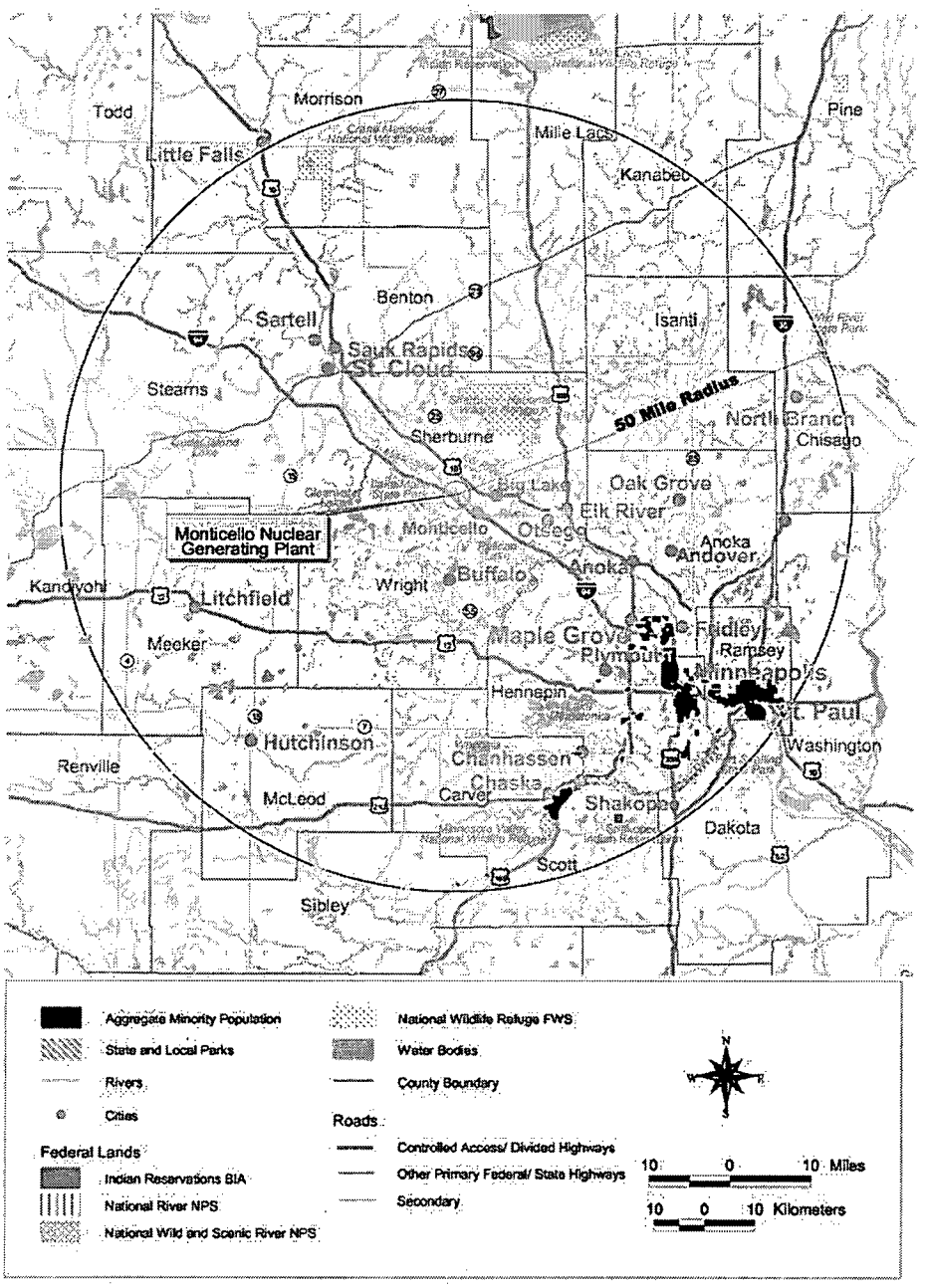

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FIGURE 4.5-2

BLACK OR AFRICAN AMERICAN MINORITY POPULATION

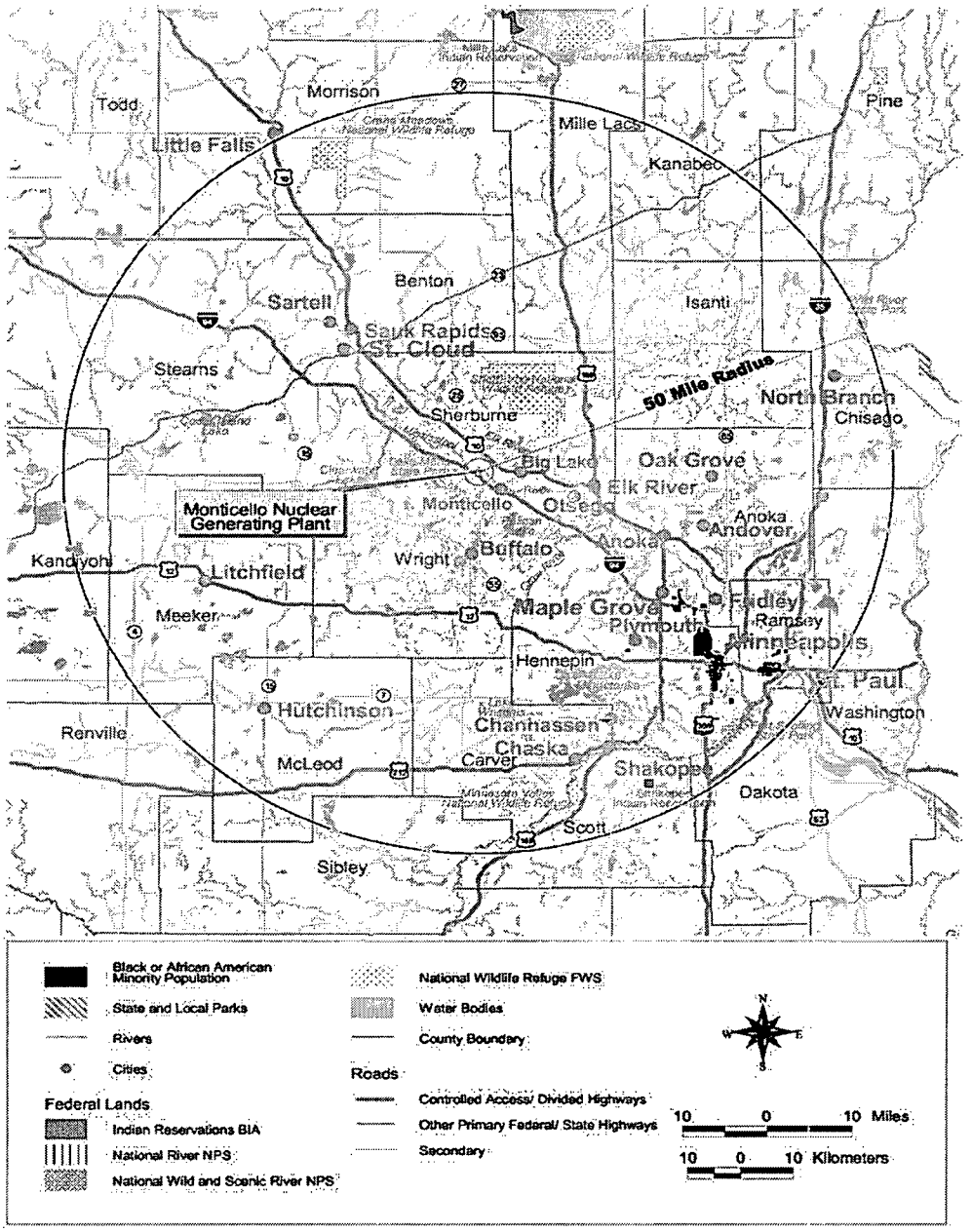

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FIGURE 4.5-3

NATIVE AMERICAN MINORITY POPULATION

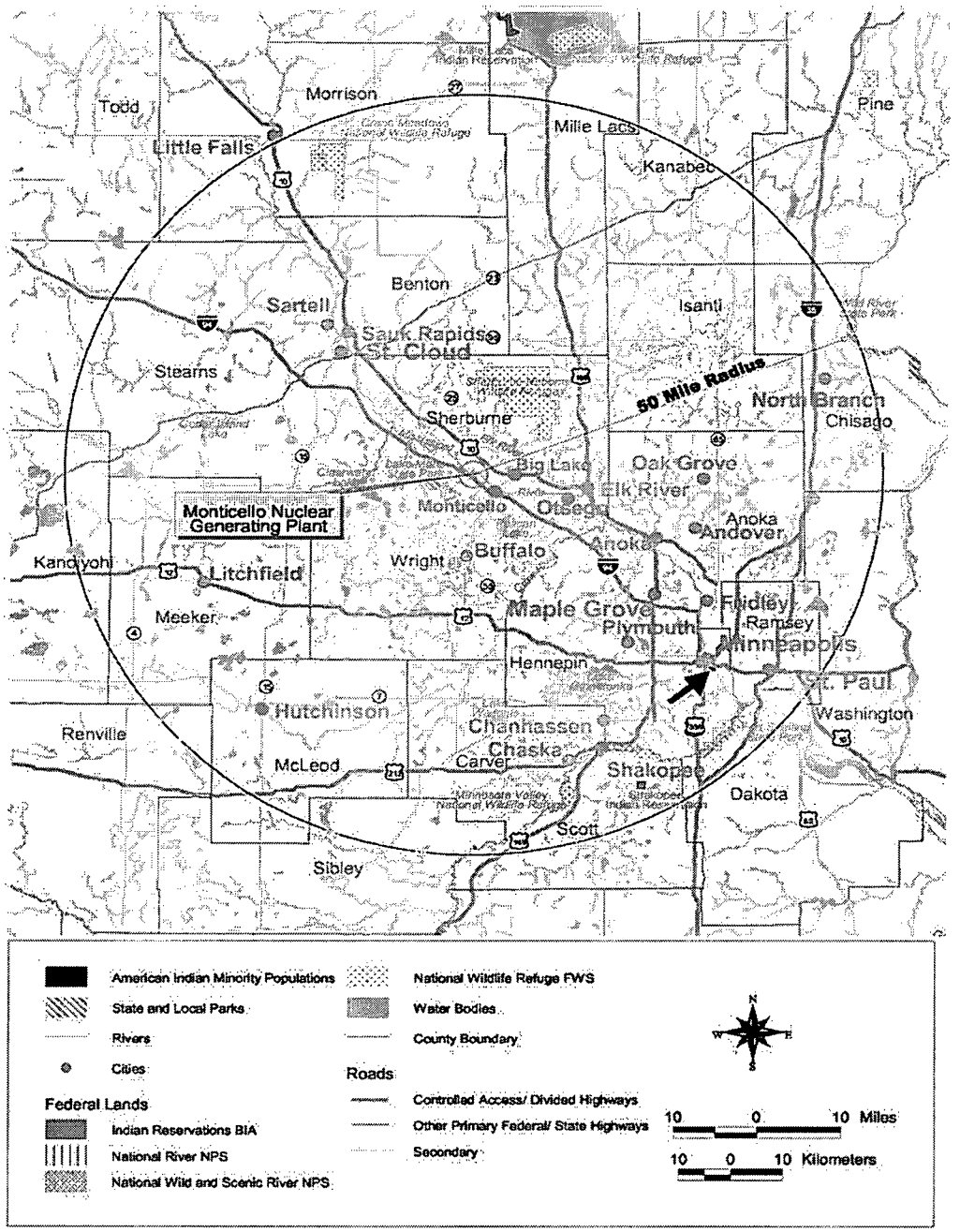

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FIGURE 4.5-4

ASIAN MINORITY POPULATION

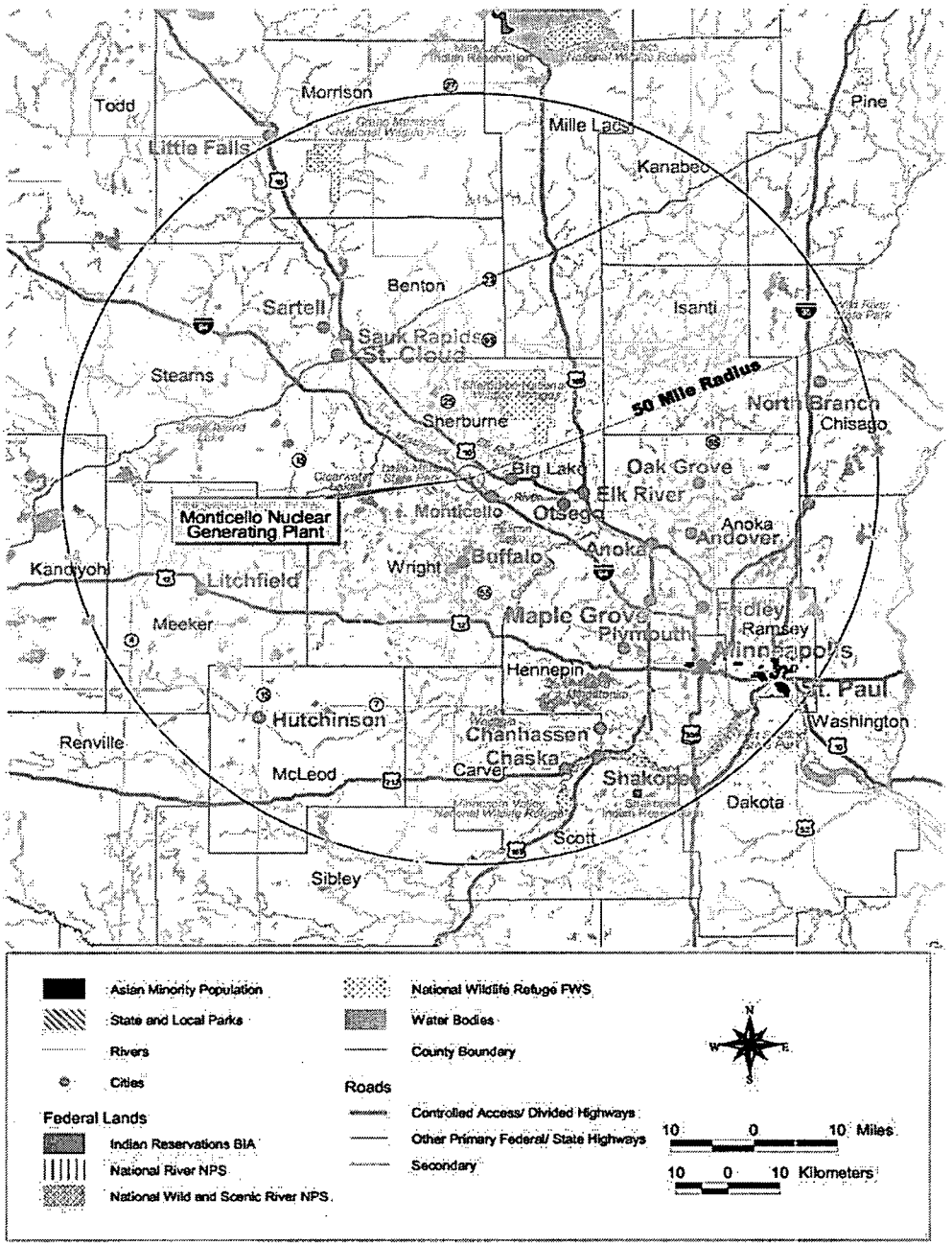

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FIGURE 4.5-5

OTHER SINGLE RACE MINORITY POPULATION

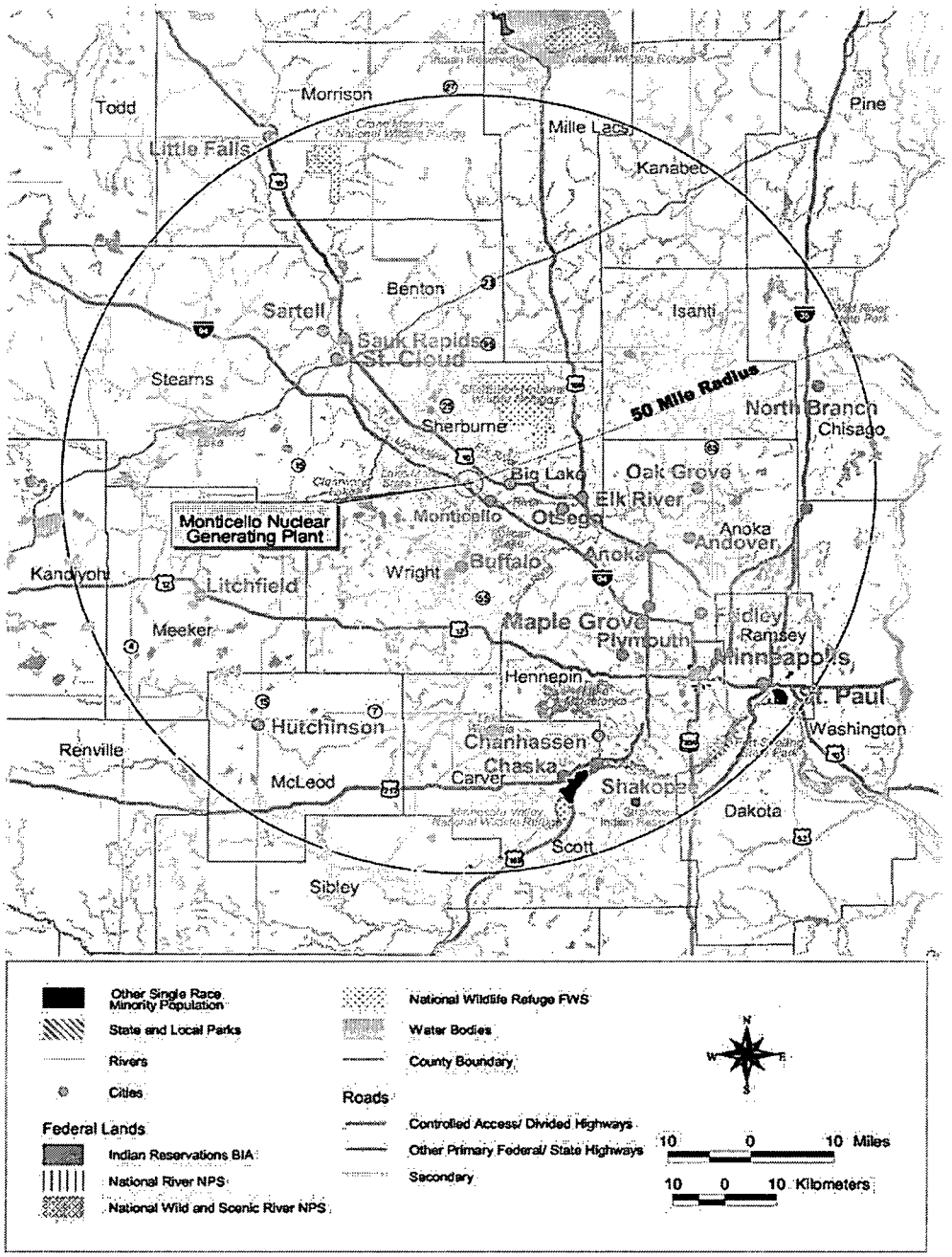

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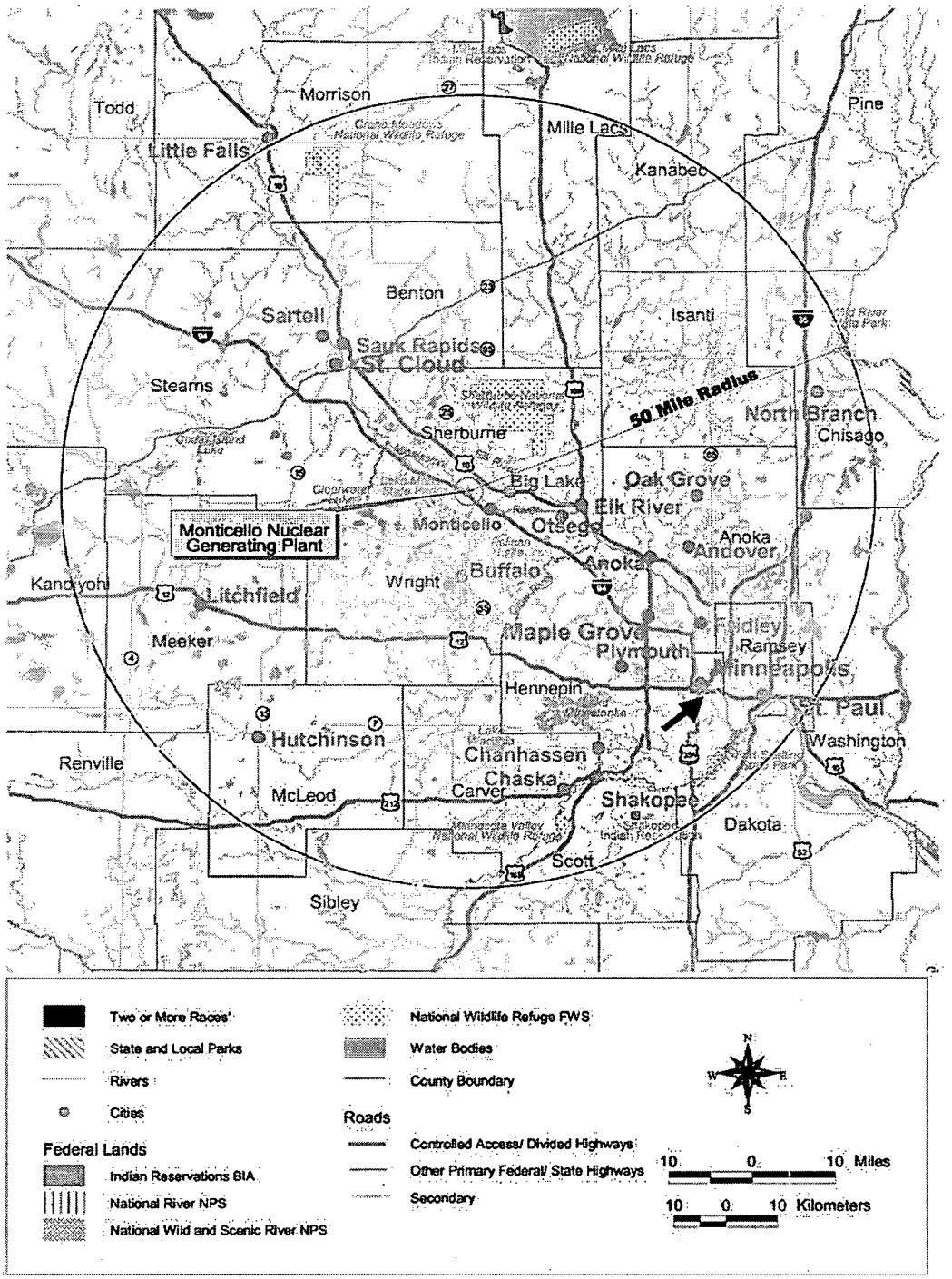
FIGURE 4.5-6

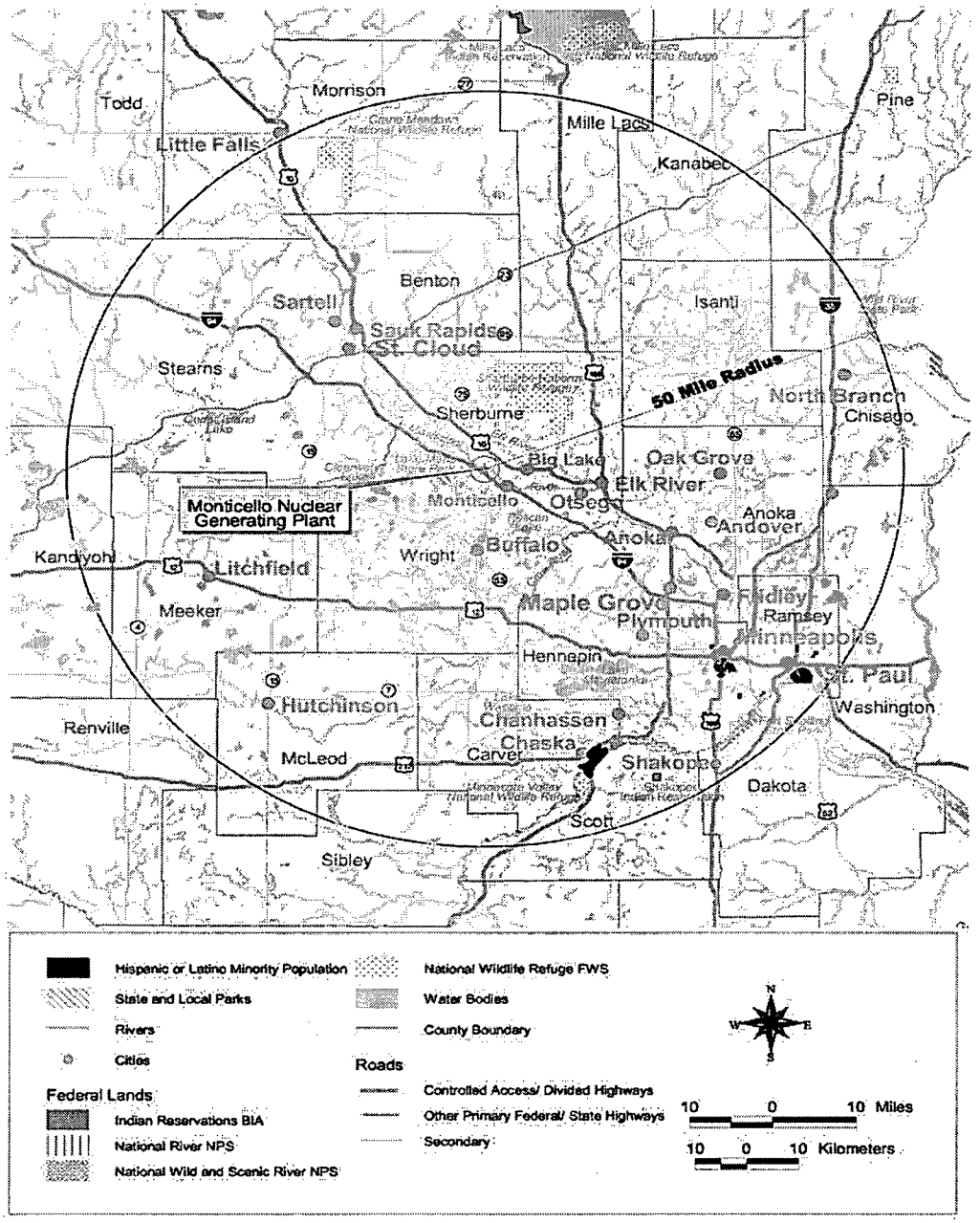
MINORITY POPULATIONS OF TWO OR MORE RACES



ENCLOSURE 4

FIGURE 4.5-7

HISPANIC OR LATINO POPULATION



ENCLOSURE 4

TABLE 4.5-1
ESTIMATED POPULATIONS AND ANNUAL GROWTH RATES IN WRIGHT AND SHERBURNE COUNTIES FROM 1970 TO 2040

	Wright		Sherburne	
Year	Population[a]	Percent[b]	Population[a]	Percent[b]
1970	38,933	--	18,344	--
1980	58,681	4.19	29,908	5.01
1990	68,710	1.59	41,945	3.44
2000	89,986	2.73	64,417	4.38
2010	109,700	2.00	86,320	2.97
2020	126,420	1.43	105,620	2.04
2030	139,020	0.95	121,920	1.45
2040	152,876	0.95	140,736	1.45

a. Source: Reference 27

b. Annual percent growth rate calculated using the equation N[t] = N[o] (1+r)t where N is population, t is time in years, and r is the annual growth rate expressed as a decimal.

TABLE 4.5-2
NUMBER OF CENSUS BLOCKS WITH MINORITY AND LOW-INCOME POPULATIONS WITHIN THE 50-MILE RADIUS OF MNGP

State	County	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Other Single Minority	Two or More Races	Hispanic	Aggregate Minority	Low Income
	Regional Percent[a]	3.5	1.10	2.90	0.04	1.30	1.70	2.90	11.8	7.9
	Threshold for Minority Population[b]	23.5	21.1	22.9	20.0	21.3	21.7	22.9	31.8	27.9
MN	Anoka	0	0	0	0	0	0	0	0	0
MN	Benton	0	0	0	0	0	0	0	0	0
MN	Carver	**1**	0	0	0	0	0	**1**	**1**	0
MN	Chisago	0	0	0	0	0	0	0	0	0
MN	Dakota	0	0	0	0	0	0	0	0	0
MN	Hennepin	**123**	**3**	**7**	0	**5**	**1**	**36**	**211**	**61**
MN	Isanti	0	0	0	0	0	0	0	0	0
MN	Kanabec	0	0	0	0	0	0	0	0	0
MN	Kandiyohi	0	0	0	0	0	0	0	0	0
MN	McLeod	0	0	0	0	0	0	0	0	0
MN	Meeker	0	0	0	0	0	0	0	0	0
MN	Mille Lacs	0	0	0	0	0	0	0	0	0
MN	Morrison	0	0	0	0	0	0	0	0	0
MN	Pine	0	0	0	0	0	0	0	0	0
MN	Ramsey	**25**	0	**39**	0	**5**	0	**14**	**112**	**23**

TABLE 4.5-2 (CONTINUED)
NUMBER OF CENSUS BLOCKS WITH MINORITY AND LOW-INCOME POPULATIONS WITHIN THE 50-MILE RADIUS OF MNGP

State		Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Other Single Minority	Two or More Races	Hispanic	Aggregate Minority	Low Income
	Regional Percent[a]	3.5	1.10	2.90	0.04	1.30	1.70	2.90	11.8	7.9
	Threshold for Minority Population[b]	23.5	21.1	22.9	20.0	21.3	21.7	22.9	31.8	27.9
MN	Scott	0	0	0	0	1	0	**1**	**1**	0
MN	Sherburne	0	0	0	0	0	0	0	0	**1**
MN	Sibley	0	0	0	0	0	0	0	0	0
MN	Stearns	0	0	0	0	0	0	0	0	**6**
MN	Washington	0	0	0	0	0	0	0	0	0
MN	Wright	0	0	0	0	0	0	0	0	0
	Total	**149**	**3**	**46**	0	**11**	**1**	**52**	**325**	**91**

Source: Reference 27.

a. Regional percent calculated using the summary data from each county with at least one block group located within the 50-mile radius.

b. At least 20 percentage points greater than the regional percent.

5.0 COST - BENEFIT ANALYSIS

The Company estimates that the MNGP extended power uprate project will result in a net present value savings of $200 to $540 million over the remaining life of the plant. The required capital investment costs will be more than offset by fuel and emission savings, and by the avoided cost of additional capacity. These savings will be directly passed on to the Company's ratepayers.

The Company used the resource planning software Strategist to evaluate the uprate project in comparison to other capacity alternatives. The model performs detailed simulations of the NSP system to estimate operational cost impacts and performs rigorous accounting calculations to forecast the cost recovery of capital projects. Strategist is widely used throughout the energy industry and has been used by the Company in numerous resource plans, certificates of need, and all source solicitations.

The MNGP uprate project was compared to coal, biomass, and natural gas based alternatives as part of the Company's 2007 Integrated Resource Plan. The 71MW uprate project was the least cost option followed by natural gas, then coal, and the biomass based alternative was estimated to be the most expensive.

The costs and benefit of the various alternatives can be categorized into three groups.

1. Capital and Fixed Costs
2. Operating Costs
3. Emission Costs

In general, the capital cost for the uprate project is lower than the expected capital costs for either new biomass or new coal based generation. However, in comparison to natural gas, the uprate project has a higher capital cost. The impact on annual fixed O&M costs is expected to be negligible. The Net Present Value (NPV) of ratepayer benefit from the MNGP uprate project for capital and fixed costs is estimated to be in the range of $151 to $188 million.

Operating cost savings are primarily due to decreased fuel costs. Other elements include variable O&M and the avoided cost of additional purchased power. The operating costs of the natural gas option were very high and canceled out its lower capital cost. The NPV of ratepayer benefit from the MNGP uprate project for operating cost is estimated to be in the range of $77 to $267 million.

Emission costs were decidedly lowest for the uprate project in comparison to the alternatives. While the Company imputed costs to many air emissions as detailed in Table 4.0-1, the total cost was primarily driven by CO2. The Company encountered varying opinions regarding the appropriate CO2 emission rate to be applied to the biomass alternative. While some argue that biomass fuel is carbon neutral, the fact remains that emissions from biomass plants are roughly twice that from coal, and that alternative uses for biomass fuel may likely keep the CO2 from entering the atmosphere. The Company took the conservative approach of applying the full cost of CO2 emissions to the biomass alternative. The NPV of ratepayer benefit from the MNGP uprate project for emissions is estimated to be in the range of $81 to $277 million.

Finally, the MNGP uprate project maintains the Company's fuel diversity and provides a natural hedge against fuel cost volatility in the coal and natural gas markets. The Company tested this benefit by varying the fuel cost assumptions used in Strategist. One result was

that when natural gas prices were increased by 20 percent the NPV of the MNGP uprate project increased by $70 million.

In summary, all modeling results indicate that the uprate project is in the best interest of ratepayers by lowering total forecasted revenue requirements, reducing exposure to future CO2 regulation, and by maintaining fuel diversity.

6.0 NON-RADIOLOGICAL ENVIRONMENTAL IMPACT

6.1 Terrestrial Effects

6.1.1 Land Use

The MNGP extended power uprate does not result in any activity which will change or otherwise modify the present requirements for land use at the plant site. There are no plans to build facilities or modify access roads, parking areas, or laydown areas. As discussed in 6.1.2.A below, it is possible that onsite transmission/distribution equipment may be replaced/modified to support extended power uprate activities at MNGP. Except for transportation of equipment and routine disposal of waste, extended power uprate maintenance activities are confined to the inner-plant security fenced area. Extended power uprate does not affect the storage requirements for above ground or below ground tanks. Other lands located outside the inner security fence will not be modified or changed to support extended power uprate activities. Extended power uprate does not involve changes to any aesthetic resources and does not involve any impacts to lands with historical or archaeological significance.

NMC does not anticipate the need to construct additional or new low-level radioactive waste storage buildings to support present or extended power uprate activities. The replaced turbine components will be decontaminated as necessary, and recycled to the extent possible, or transferred to an approved disposal facility.

6.1.2 Transmission Facilities

A. Transmission Design and Equipment

A feasibility study for the MNGP EPU was performed in a manner consistent with the MAPP Design Review Standards (DRS) and Midwest Independent System Operator (MISO) practices for interconnection and transmission studies. The results of this study indicate that some transmission system improvements to existing equipment may be required to support the MNGP generation increase for EPU. The study acknowledges that the results may change depending on which generation projects (and corresponding transmission improvements) listed in the MISO interconnection queue ahead of the MNGP EPU actually progress to construction. This study cannot take the place of the System Impact Study (SIS) effort to be performed by MISO under the Large Generation Interconnection Process (LGIP) which will ultimately determine the required changes to the transmission system, if any, to support the increased generation at MNGP. Any required changes will be completed as directed by MISO.

B. Shock Hazards

Two 345-kV transmission lines (Monticello to Coon Creek and Monticello to Parkers Lake circuits) were originally constructed to connect MNGP to the transmission system and were evaluated in the Final Environmental Statement (FES) for initial operations. However, changes to the 345-kV transmission system and to these lines have fully integrated the Company's Monticello Substation into the 345-kV system. Based on these considerations, the Company's Monticello Substation now constitutes the transmission interconnection for MNGP.

All lines emanating from the Company's Monticello Substation were designed, constructed and are operated in compliance with the applicable sections of the National Electrical Safety Code (NESC®). Specifically, these lines meet the requirement in effect since the 1990 edition of the Code for lines exceeding 98kV alternating current to ground, which limits "the steady state current due to electrostatic effects to 5 milliamp if the largest anticipated truck, vehicle or equipment under the line were short-circuited to ground," (Section 232.C.1.c. and 232.D.3.c.). This current is induced in vehicles by the transmission line electric field, which is proportional to the voltage of the line and inversely proportional to the distance from the line. The Electric Power Research Institute (EPRI) has performed measurements on objects beneath lines to determine the level of electric field that will induce current in various objects. Results indicate that an electric field of 7.8 kV per meter at 1 meter above ground is required to induce a 5 milliamp current through a large tractor trailer. The 345-kV lines associated with MNGP produce a maximum electric field at 1 meter above ground of 6.0 kV per meter. The unloaded sag at 120°F is limited by the NESC® to a minimum distance to ground of 30 feet in order to meet the minimum clearance required for operation at 212°F, which is the highest temperature that Xcel Energy operates the lines (NESC® Section 232). For a large vehicle, the electric field values indicated above could potentially generate an induced current of 3.84 milliamp, which is below the NESC® code criteria of 5 milliamp.

Transmission line compliance with the provisions of the NESC® code discussed above is verified by periodic air patrols (monthly), which monitor construction activities beneath and near the lines that could alter corridor terrain and clearances. Based on these considerations, NMC concludes that the Monticello 345-kV transmission lines meet the NESC® recommendations for preventing shock from induced currents.

C. Electromagnetic Fields (EMF)

The increased electrical output under EPU conditions will cause a corresponding current rise on the transmission system and this will result in an increased magnetic field. However, according to the NRC Staff, the chronic effects of EMF on humans are unquantified at this time, and no significant impacts to terrestrial biota have been identified (Sections 4.5.4.2.3 and 4.5.6.3.4 of Ref. 5). According to the National Institute of Environmental Health Sciences, the overall scientific evidence for human health risk from EMF exposure is weak and there is no consistent pattern of biological effects (Ref. 8). The chronic effects from EMF exposure have not been conclusively established and scientists are still debating whether EMF is a hazard to health.

6.1.3 Miscellaneous Wastes

Sanitary wastes from MNGP are discharged directly to the Monticello Wastewater Treatment Plant in accordance with a permit issued by the City of Monticello. Acid drains are processed in a retention basin in accordance with NPDES permit requirements. Other waste sources include hazardous waste generation from routine plant operations and air emissions from the plant heating boiler and diesel generators. Effluents from these pathways are controlled as required by state and federal permits. Extended power uprate does not have any significant impact on the quality or quantity of effluents from these sources, and operation under extended power uprate conditions will not significantly reduce the margin to the limits established by the appropriate permits. See Section 6.2.5 herein for additional information on water quality.

6.1.4 Cooling Tower Drift, Icing, and Fog

In Reference 19, the NRC Staff concluded that:

> "Impacts from salt drift, icing, fogging, or increased humidity with cooling tower operation have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal period."

Drift, icing, and fog from the MNGP cooling towers have been negligible and have had no discernible impacts on vegetation, agriculture, recreational activities, highway safety, air traffic, or river traffic. The Mississippi River does not contain the salt content of other water sources, and sufficient rainfall is available to prevent undesirable chemical concentrations in the soil from trace chemicals in the drift.

Extended power uprate may involve an estimated extra 20 days of cooling tower operation (see Section 6.2.2 herein). These changes will not have a significant effect on the environment. Assuming cooling tower operation from April to October (seven months), the NRC Staff conservatively estimated a total fogging time of 45 hr/yr in Reference 2. The fogging rate associated with an estimated 150 days of cooling tower operation at extended power uprate conditions is bounded by the fogging rate associated with an estimated 210 days of cooling tower operation (April to October assumed in Reference 2).

6.1.5 Noise

In Reference 19, the NRC Staff concluded that:

> "Noise has not been found to be a problem at operating plants and is not expected to be a problem at any plant during the license renewal term."

Extended power uprate does not result in any significant changes to the character, sources, or energy of noise generated at MNGP. The new equipment necessary to implement extended power uprate will be primarily installed within existing plant buildings. This includes the upgraded HP 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. No significant increases in ambient noise levels are expected within the plant.

6.1.6 Terrestrial Biota

6.1.6.1 Threatened and Endangered Species

The United States Fish and Wildlife Service (FWS) has designated 11 species known to occur in Minnesota as threatened or endangered at the federal level and four species known to occur in the state as candidates for such listing (Ref. 28). However, only one of these species, the Higgins' eye pearlymussel (*Lampsilis higginsii*) is indicated by the Minnesota Department of Natural Resources (MNDNR) as occurring in the vicinity of MNGP (Ref. 25). Similarly, threatened and endangered species have been designated at the state level under programs administered by the MNDNR as implemented by Minnesota Rule 6134.0150. Three bird species, one reptile species, one mollusk species, one insect species, and one plant species designated as endangered or threatened at the state level in Minnesota have been documented by MNDNR as occurring in the vicinity of MNGP or the transmission corridors of interest. Pertinent information related to the status of these species is provided in the following sections (see Table 6.1.6.1-1). Note that the bulk of the information provided in the Section 6.1.6.1 subsections is retained from Reference 27 unless otherwise referenced.

TABLE 6.1.6.1-1
THREATENED AND ENDANGERED SPECIES OCCURRING IN THE VICINITY OF MNGP AND THE ASSOCIATED TRANSMISSION CORRIDORS[a]

Common Name	Scientific Name	Status[b] Minnesota	Status[b] U.S.
Birds			
Loggerhead Shrike	*Lanius ludovicianus*	T	
Peregrine Falcon	*Falco peregrinus*	T	
Trumpeter Swan	*Cygnus buccinator*	T	
Reptile			
Blanding's turtle	*Emydoidea blandingii*	T	
Mollusks			
Higgins' eye pearlymussel	*Lampsilis higginsii*	E	E
Insects			
Uncas Skipper	*Hesperia uncas*	E	
Plants			
Tall Nut-rush	*Scleria triglomerata*	E	

a. Based on occurrences reported by the MNDNR in the Minnesota Natural Heritage database (Ref. 29) and Reference 25.
b. E = Endangered, T = Threatened

6.1.6.1.1 Fauna

The bald eagle was originally included in the above table for the MNGP License Renewal Environmental Report (Ref. 27). The bald eagle is known to occur in the vicinity of the MNGP site. Originally listed as endangered by the FWS in 1967, the bald eagle was down-listed to threatened in 1995, and was de-listed in 2007 (Ref. 22). Several factors aided in the recovery of this species including a national ban on DDT and other organochlorine pesticides by the EPA in mid-1970's and the reduced use of lead shot for waterfowl hunting. These efforts have considerably benefited bald eagle populations in the State of Minnesota. The state's first bald eagle survey in 1973 found 115 active nests; by 1995 the survey found over 600. In 2000, MNDNR surveyed over 1,300 known breeding areas and identified 681 occupied nests in the state, 76.5 percent of which included young. The 2000 survey documents the continuing recovery of the species. In comparing the early survey results with year 2000 data, MNDNR concluded that Minnesota's bald eagle population is growing at a slower but healthy level. Bald eagles are typically found near forested rivers and lakes where there is ready access to preferred nest sites and food. Preferred nesting habitat includes tall trees or cliffs. Bald

eagles primarily prey on fish and ducks. Bald eagles are known to nest in the vicinity of the MNGP site.

Three bird species listed as threatened by the State of Minnesota are known to occur either on or in the vicinity of MNGP and associated transmission corridors of interest: peregrine falcon (*Falco peregrinus*), loggerhead shrike (*Lanius ludovicianus*), and trumpeter swan (*Cygnus buccinator*). Though peregrine falcon populations were greatly reduced in the 1950's and 60's by the effects of pesticide poisoning, reintroduction programs are having success in Minnesota. Peregrine falcons prefer open wetlands where there is access to nesting sites on cliffs, such as those along the Mississippi River Valley and Lake Superior. This species also demands a ready supply of prey such as ducks, shorebirds, and seabirds. However, they have proven to be adaptable. MNDNR reported that in 2003, 25 pairs successfully raised 48 young at traditional cliff sites and new man-made habitats which include power plant stacks, skyscraper balconies and rooftops, and bridges. With the installation of a nest box on the MNGP Off Gas Stack in 1992, peregrine falcons have been successfully nesting at the site since 1995. Since 1993, peregrine falcons have also been successfully nesting at the Sherco site, which is five miles upstream from MNGP.

Loggerhead shrikes are known to occur on and in the vicinity of MNGP and are documented in several areas along the transmission corridor in Anoka and Sherburne Counties. Preferring open country and dry upland prairie with hedgerows, shrubs, and small trees, the birds can also be found around planted shelterbelts of trees, old orchards, pastures, cemeteries, grassy roadsides, and farmsteads. The scattered trees, shrubs, and fencerows in these areas provide places for the shrikes to hunt and rest. Power lines are used as perches from which to hunt as well. Red cedar, hawthorn (*Crataegus spp.*) and plum (*Prunus americana*) trees are often used for nesting.

In recent years, wintering trumpeter swans have been observed in increasing numbers on the Mississippi River downstream from MNGP. The swans in this area are drawn to the open water in the winter months, which results from MNGP's discharge of warm water to the River, and to food supplied by a local resident at the City of Monticello's Mississippi Drive Park. Having disappeared from Minnesota in 1880's, the trumpeter swan has been successfully restored to the state with recent MNDNR and FWS surveys showing more than 75 nesting pairs and nearly 900 year round residents.

One reptile species, the Blanding's turtle (*Emydoidea blandingii*) is listed by the State of Minnesota as a threatened species and is documented by MNDNR as occurring in the vicinity of the transmission corridors in Anoka and Sherburne Counties. The turtles require both wetland and upland habitats to complete their life cycle. In Minnesota, the turtles are primarily marsh and pond inhabitants. Calm, shallow water bodies with mud bottoms and abundant aquatic vegetation, such as cattails, and water lilies are preferred, though extensive marshes

bordering rivers are also suitable habitat for the turtles. Nesting occurs in open (grassy and brushy) sandy uplands.

One mollusk species, the Higgins' eye pearlymussel (*Lampsilis higginsii*) is listed by both the U.S. Fish and Wildlife Service and the MNDNR as an endangered species and occurring in the vicinity of MNGP (Ref. 25, Ref. 28). The Higgins' eye is a medium-sized (reaching approximately 100 mm in length) freshwater mussel with a smooth, yellow, yellowish green, or brown with green rays that are obscure on some individuals. Like other freshwater mussels, the Higgins' eye feeds by filtering food particles from the water column. The specific food habits of the species are unknown, but other juvenile and adult freshwater mussels have been documented to feed on detritus, diatoms, phytoplankton, and zooplankton. The diet of Higgins' eye glochidia, like other freshwater mussels, comprises water (until encysted on a fish host) and fish body fluids (once encysted). Higgins' eye has been characterized as a large river mussel species. No correlation was found between overall mussel density and substrate size in the Wisconsin River where Higgins' eye was found. It was found that burrowing times for Higgins' eye were similar in clay, silt and sand, but longer in pebble-gravel substrate. The species is not associated with firmly packed clay, flocculent silt, organic material, bedrock, concrete, or unstable moving sand. It has been indicated that Higgins' eye were most common in sand/gravel substrate. Substratum that was free of plants and consisted of stable, gravelly sand was considered as suitable. It was also noted that immediately downstream of wingdams, mussel diversity was high and new species were found at a more rapid rate on the wingdam than in gravelly sand. The species was found immediately below the wingdam at McMillan Island and has been collected on wingdams near Prairie du Chien. Higgins' eye may be primarily adapted to large river habitats with moderate current, such as the East channel of the Mississippi River near Prairie du Chien, Wisconsin. Water velocities less than 1 meter per second during periods of low discharge are considered ideal for this species. (Higgins' Eye information from Ref. 26)

One insect species, the Uncas skipper (*Hesperia uncas*), a state-listed endangered species, is documented by MNDNR as occurring in the vicinity of the transmission corridor in Sherburne County. Preferred habitat for the Uncas skipper includes short-grass prairie and open woodlands. Adults feed on flower nectar, and the plant hosts for the caterpillar stage are blue grama grass (*Bouteloua gracilis*) and needlegrass (*Stipa sp.*). Though found in many areas of the western North America, where arid environments are common, the Uncas skipper is listed as endangered in Minnesota because of habitat scarcity. With fire no longer a natural part of the regional ecosystem, forestation of former savanna has occurred and reduced the available habitat.

6.1.6.1.2 Flora

Tall nut-rush (*Scleria triglomerata)* is a state-listed endangered species documented by MNDNR as occurring in the vicinity of the transmission

corridor. Tall nut-rush can be found in dry or moist sandy ground and tolerates open to shaded light conditions. It is found in prairies and in the borders of marshes. Common or indicator plant associates in dry sand prairie habitats include bluejoint grass, cordgrass, rush, sedges, twig-rush, and shrubby cinquefoil. In wet-mesic prairie habitats common or indicator plant associates include big bluestem, little blue stem, cord grass, prairie dropseed, and bee-balm.

6.1.6.1.3 Terrestrial Biota Conclusion

The EPU project does not involve land disturbance or a measurable increase in noise levels outside the plant. The project also does not increase the size of the MNGP workforce or change right-of-way maintenance practices. As a result, there will be no impacts to terrestrial biota (including threatened or endangered species) beyond those described in the FES for operation and the Generic Environmental Impact Statement for MNGP License Renewal.

6.2 Hydrology

6.2.1 Groundwater

Extended power uprate does not affect groundwater resources and does not involve significant increases in the consumptive use of these resources at MNGP. Station groundwater use is governed by water appropriation limits of the MNDNR. The domestic water supply is obtained from six wells located on the plant property. No dewatering or collector-type wells (Ranney wells) are used at MNGP. The Domestic Water System, which is serviced by two 100 gpm wells, provides domestic water to lavatories, showers, and laundries and provides raw water to the reverse-osmosis system and seal water to certain pumps located at the plant intake structure. Groundwater appropriation permit number 670083 (issued by MNDNR) establishes limits associated with these 100 gpm wells. Extended power uprate does not affect compliance with these limits. The annual appropriation limit is 20 million gallons and average annual usage over the last five years (2002-2007) is less than 17 million gallons. Any increases in makeup to plant systems under extended power uprate from these sources are expected to be minor, and operation within the allowable limit will continue. Four smaller capacity wells (that are not required to be addressed via a groundwater appropriation permit) provide water to office, warehouse, and security facilities not serviced by the Domestic Water System. The wells are of standard vertical construction. Extended power uprate has no effect on these sources.

6.2.2 Surface Water Appropriation

Surface water use at MNGP is in accordance with the water appropriation limits of the MNDNR. Under surface water appropriation permit number PA 66-1172-S, the Company may withdraw a maximum of 645 cubic feet per second (cfs) of water from the Mississippi River at MNGP. Special operating restrictions apply at lower than average river flows of 860 cfs and 240 cfs. Extended power uprate does not introduce any significant changes to the screen wash, service water, or circulating water flow requirements. Extended power uprate does not involve any changes to the water appropriation requirements of this permit.

Currently, the surface water consumption due to open cycle evaporative losses and cooling tower evaporation and drift is estimated at approximately 6,800 acre-ft/year assuming 130 days of cooling tower operation, 235 days of open-cycle operation and nominal values of cooling tower flow (approximately 509 cubic feet/second). Using the maximum surface water appropriation limit of 645 cubic feet/second as the cooling tower flow value results in an estimated total consumption of 7,800 acre-ft/year.

For extended power uprate, assuming an increase in open cycle consumption of 20 percent, an increase in days of cooling tower operation to 150 days/year, and nominal values of cooling tower flow, results in an estimated consumption of 7,700 acre-ft/year. Using the maximum surface water appropriation limit of 645 cubic feet/second as the cooling tower flow value results in an estimated total consumption of approximately 8,700 acre-ft/year. Note that using the appropriation limit for cooling tower flow is very conservative because the cooling towers are typically operated in "Helper" mode (i.e., not all circulating water flow is passed over the cooling towers).

Even the most conservative estimate (i.e., 8,700 acre-ft/year) of consumption is below the value of 9,000 acre-ft/year that has been previously evaluated by the NRC in the MNGP FES (Ref. 2) for a combined consumption of open cycle and cooling tower operations. This estimate is also well below the 13,000 acre-ft/year the NRC evaluated in Ref. 19 and concluded that "the consumptive loss due to evaporation from the cooling towers represents four percent of the river flow, which is not considered significant." The NRC further concluded that "the staff expects that the existing State restrictions on water withdrawal during low-flow conditions in the Mississippi River are appropriate and no additional mitigation measures are warranted." The nominal value of 7,700 acre-ft/year, which is most representative of actual cooling tower operating flow rates, is well below the 9,000 acre-ft/year value used in the FES (Ref. 2) and the 13,000 acre-ft/year referenced in Ref. 19.

Additionally, cooling tower operation at power uprate conditions is estimated at 150 days per year which is less than the FES assumption of approximately 210 days per year (April through October).

In conclusion, the estimated additional consumption due to extended power uprate is bounded by values previously evaluated by the NRC and is not considered to be significant.

6.2.3 Discharges

Surface water and wastewater discharges are regulated by the State of Minnesota. The National Pollutant Discharge Elimination System (NPDES) permit is periodically reviewed and re-issued by the Minnesota Pollution Control Agency (MPCA). The present NPDES permit for MNGP, permit number MN0000868, which expires September 30, 2012, authorizes discharges from five stations. The stations and their effluent limits are listed in Table 6.2.3-1 herein. None of the limits listed in this table will require modification to implement extended power uprate. Additionally, Attachment A contains a summary of the environmental authorizations for current plant operations.

ENCLOSURE 4

Table 6.2.3-1. NPDES Discharge Limit Summary

Discharge Station No.	Description	Parameter	Limit
SD001	Plant Cooling Water	Flow (mgd) Phosphorus Total (as P) Bromine (as Br) Chlorination Chlorine Rate Oxidants, Total Residual Plant Capacity Factor, Percent of Capacity Temperature, Water	Monitor Only Monitor Only Monitor Only 2.0 hr/day Monitor Only 0.2 mg/l (instantaneous maximum) Monitor Only Seasonal[a]
SD003	Holdup Pond Effluent	Flow (mgd) Total Suspended Solids pH Phosphorus Total (as P)	Monitor Only 9.9 kg/day monthly average 30 mg/l monthly average 33.2 kg/day daily maximum 100 mg/l daily maximum pH (6.0 to 9.0) Monitor Only
SD004	Turbine Building Sump & Misc Discharge	Flow (mgd) Total Suspended Solids pH Oil and Grease, Total Recoverable (Hexane Extractions)	Monitor Only 12.7 kg/day monthly average 30 mg/l monthly average 42.3 kg/day daily maximum 100 mg/l daily maximum pH (6.0 to 9.0) 4.2 kg/day monthly average 10 mg/l monthly average 15 mg/l daily maximum 6.3 kg/day maximum calendar week average
SD005	Screen Backwash	Flow (mgd)	Monitor Only
SD006	Roof/Yard Drains and Screen Backwash	Flow (mgd)	Monitor Only
SW001	Water intake	Phosphorus Total (as P) Temperature, Water	Monitor Only Monitor Only
WS001	Mid-downstream discharge canal	Oxidants, Total Residual	0.05 mg/L daily maximum

[a] In no case shall the maximum daily average temperature at the end of the discharge canal exceed the following limits:

(i) During the months of April through October: 95 °F
(ii) During the months of November and March: 85 °F
(iii) During the months of December through February: 80 °F

6.2.4 Increase in Circulating Water Discharge Temperature

At extended power uprate conditions, the heat rejected by the condenser increases. This results 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. The heat dissipation system at MNGP is the source of thermal discharges from the plant. No physical modifications or operational changes are required for these systems to implement extended power uprate.

The NPDES permit issued by the MPCA limits maximum average daily discharge temperatures at the end of the discharge canal (Note 'a' to Table 6.2.3-1 above). Extended power uprate will not involve any changes to the MPCA discharge temperature limits. The slight discharge canal temperature increase will not result in one half of the surface width of the river temperature exceeding the 90°F maximum as delineated in the FES. Extensive field studies have been performed to confirm that the limits imposed by the NPDES permit are conservative and assure no significant adverse impact on the environment. These temperature studies ended in 1988 when the MPCA determined that 20 years of temperature monitoring had adequately characterized the thermal impacts of MNGP operation. Based on studies that evaluate the MNGP impact on the river ecosystem, cooling tower operation during the summer months has adequately prevented detrimental environmental effects and water temperatures downstream are not high enough to harm aquatic species or impede fish migration even in summer months. Temperature monitoring of outfall SD001 (discharge canal) is continuous, and NSP has consistently operated MNGP in conformance with the permit's thermal discharge requirements.

The temperature increase across the intake and plant discharge is highest in fall and winter, when once-through cooling is employed. The temperature increase is lowest in summer and during periods of low river flow, when NPDES permit limits associated with upstream average river temperature necessitate cooling tower use. During open cycle operation at rated circulating water system flow, it is conservatively estimated that extended power uprate will result in an increase in temperature of water entering the discharge canal by approximately 4.5°F. During other modes of operation, the water temperature increase will be less due to tempering from partial or full cooling tower operation. The calculated temperature increase of 4.5°F at the discharge canal inlet would be experienced during those months where cooling tower operation is not required to meet NPDES permit temperature requirements. This resultant discharge canal temperature increase is well bounded by seasonal variations. During combinations of high river temperature and high atmospheric temperatures, discharge canal temperatures have approached the NPDES permit limits with cooling tower operation. During such periods NSP has reduced power at MNGP to maintain compliance with the NPDES permit. This practice will continue under extended power uprate conditions.

A 4.5°F inlet temperature increase would not involve any significant increase in harmful thermophilic organisms in the discharge canal. MNGP daily average discharge canal temperatures range from 66 to 95°F when the plant is operating and rarely average more than 90°F over a month. Thermophilic bacteria generally occur at temperatures of 25 to 80°C (77-176°F), with maximum growth at 50 to 60°C (122-140°F). Pathogenic forms have evolved to survive in the digestive tract of mammals and, accordingly, have optimum temperatures of around 37°C (99°F).

Similarly, pathogenic protozoans such as *Naegleria fowleri* have maximum growth and reproduction at temperatures ranging from 35 to 45°C (95-113°F) and are rarely found in water cooler than 35°C (95°F).

Because of NPDES permit requirements, MNGP discharge canal temperatures are below those optimal for growth and reproduction of pathogenic microorganisms because of NPDES permit requirements, but could permit limited survival of these organisms in summer months. The heated effluent flows over a weir at the end of the discharge canal which promotes atmospheric mixing and cooling before entry into the Mississippi River. Temperatures in the Mississippi River immediately downstream of MNGP are consistently several degrees cooler than those in the discharge canal and under normal extended power uprate conditions would not accelerate the propagation of these pathogenic organisms. Another factor limiting concentrations of pathogenic microorganisms in the MNGP discharge is the absence of a seed source or inoculant. Wastewater, whether municipal sewage, industrial wastewater, or agricultural runoff, is usually the source of pathogens in natural waters. Since October 1983, MNGP has pumped its sanitary wastes to the City of Monticello's wastewater treatment plant. Consequently, the extended power uprate does not involve significant discharges of pathogenic microorganisms to the discharge canal and the Mississippi River. Pathogenic organisms in the Mississippi River downstream of MNGP would typically come from upstream anthropogenic sources or animal wastes.

MNGP operation at the extended power uprate power level is not expected to stimulate growth and reproduction of pathogenic microorganisms in the Mississippi River downstream of the plant. Under certain circumstances these organisms may be present in the discharge canal but not in sufficient concentrations to pose a threat to downstream water users. It should be noted that many of these pathogenic microorganisms (e.g., *Pseudomonas*, *Salmonella*, and *Shigella*) are ubiquitous in nature, occurring in the digestive tracts of wild mammals and birds, but are usually only a problem when the host is immunologically compromised.

Given the above, the slight increases in circulating water outlet temperature due to extended power uprate will not involve any changes to NMC's compliance with the present discharge temperature limits established by the Minnesota Pollution Control Agency (MPCA) and will not result in any significant impacts to the environment.

6.2.5 Water Quality

The Mississippi River at the point of discharge for MNGP is classified as Class 2Bd by the State of Minnesota. Class 2Bd water quality is sufficient to allow for water sports, fishing, and aquatic recreation.

Based on 20 years of water quality monitoring at MNGP, the Company submitted a report for review by the MPCA in 1987. In 1988, the MPCA determined that MNGP operation had not adversely affected the water quality of the Mississippi River downstream of the plant and allowed the Company to reduce the monitoring program. There is no indication that chemical discharges from MNGP have caused any detrimental effects to the aquatic biota. The MPCA determined that water temperature was the only physicochemical parameter significantly affected by plant operation.

Effluent limitations and monitoring requirements for the plant discharges are an integral part of the NPDES permit. Each outfall identified in the permit requires continuous flowrate monitoring. Modifications of the non-radiological drain systems or the retention basin system are not required due to extended power uprate, and biocide/chemical discharges will be consistent with existing permit limits. Extended power uprate will not introduce any new contaminants or pollutants and will not significantly increase the amount of those potential contaminants presently allowed for release by the MPCA other than noted below.

NMC has determined that approximately 20 additional days of cooling tower operation may be required to support extended power uprate. This is due to the present MPCA permit limit of 95 deg F for the Daily Maximum plant cooling water discharge temperature between April and October. Bromine and sodium hypochlorite are injected into plant water systems at various concentrations to minimize microbiological fouling. The additional 20 days of operation may require a very slight increase in normal bromine and sodium hypochlorite injection. The discharge of any additional residual halogens attributable to the extra 20 days of cooling tower operation is expected to be insignificant, and effluent concentrations would continue to be well below the NPDES daily discharge limits.

6.2.6 Mississippi River Thermal Plume

The results of the Section 316(a) demonstration (Ref. 6) for MNGP determined that MNGP operation has had subtle alterations in the structure of some aquatic communities, but these impacts have been limited to a small area directly downstream of the plant. Biological diversity has not suffered and may have been enhanced by thermal inputs during certain times of the year. Based on available information, the minor increase in thermal output to the river due to extended power uprate is not expected to result in any impacts on aquatic biota that are different in kind or greater in magnitude than those identified over the past years of plant operation and will not alter the previous 316(a) demonstration.

In addition to the 316(a) demonstration, the Company conducted thermal plume studies following the construction of the discharge canal weir. These studies showed that even in the worst case year the thermal plume disperses rapidly, is largely restricted to the near side of the river and is not a barrier to fish movement. In addition, depending on the ambient conditions and the distance downstream from the plant, roughly 30 to 70 percent of the river is unaffected by the heated discharge. Extended power uprate does not alter the water volume requirements for the heat dissipation system, the physical construction of the discharge canal terminus, or the temperature limits established by the NPDES permit. Therefore, extended power uprate conditions do not change the findings of the thermal gradient and plume studies.

6.2.7 Cold Shock

MNGP is equipped with once-through cooling system coupled with cooling towers that can operate in various modes to meet permit requirements for water appropriations and thermal discharge. The use of the system in a once-through capacity requires evaluation of the effects of the heated discharge on biological resources of the Mississippi River.

Cooling water is withdrawn from the Mississippi River using two, 140,000 gallons per minute (gpm) circulating water pumps. The water is circulated through the condenser and then routed, along with service water, to the discharge structure. During open cycle operation, i.e., when ambient river water temperature is less than 68 degrees Fahrenheit (°F) (and river flow is adequate), the condenser effluent is routed to an open canal and discharged directly to the river. Open-cycle operation is typical from about mid-September to mid-May. When river water temperatures exceed 68°F and river flow is adequate, condenser effluent from the discharge structure is pumped into two, induced-draft cooling towers, and then to the river via the discharge canal. Under high temperature and/or low flow conditions, MNGP can also be operated in a partial recycle mode or closed-cycle mode. These alternative operating modes are used to comply with MNDNR water appropriation restrictions and MPCA thermal discharge limits established in the NPDES permit.

The 316(a) demonstration for MNGP (Ref. 6) summarized the extent and behavior of the thermal discharge plume under various conditions. The author's observations were based on 34 plume-mapping surveys conducted between 1971 and 1973. Compliance with State water quality standards and draft NPDES permit conditions was not always achieved, and compliance was dependent primarily on plant operating mode and river flow. Particularly under extreme summer low flows, compliance was not possible with or without cooling towers. Occasional non-compliance was documented during the fall through spring period. Notwithstanding some periods of non-compliance with draft NPDES permit conditions and water quality standards, the 316(a) demonstration (Ref. 6) concluded, based on a review of pertinent ecological studies, that there had been no "indication of prior appreciable harm to the biota of the Mississippi River within the area of influence of MNGP." This evaluation included all major biotic groups including phytoplankton, periphyton, macrophytes, zooplankton, benthic macroinvertebrates, and fish. The Company notes that when river conditions (i.e., flow and temperature) limit the ability for MNGP thermal discharge to meet the State water quality standards, plant procedures call for a reduction in power output to maintain current NPDES permit compliance.

One aspect of the thermal plume evaluation discussed in the 316(a) demonstration was the attraction of fish to the discharge canal in winter, and their vulnerability to cold shock mortality in the event of a plant shutdown. This may occur when fish enter the warm effluent during fall/winter and become acclimated, and then are subjected to a near instantaneous drop to ambient temperature when the plant shuts down. There were eight winter shutdown events between 1975 and 1979 resulting in the cold shock death of numerous fish. Concerns about this phenomenon resulted in the construction of a fish barrier-weir at the mouth of the discharge canal in 1980. This weir prevents fish from entering the warmest part of the discharge, and has reduced the frequency and severity of cold shock kills. Since 1980, there have been 13 events with a total loss of 5,399 fish. In 2007, there were two events that resulted in fish kills. There were 3,559 fish killed related to the plant scram on January 10, 2007 and there were 27 fish killed as the plant dropped power for the refueling outage. Even before installation of the fish barrier-weir, the 316(a) demonstration (Ref. 6) concluded that cold shock mortality did not appear to adversely affect the fish community near the MNGP.

Installation of the fish barrier-weir in 1980 was assumed to have altered the configuration of the thermal plume. Consequently, from 1982 through 1987, temperature surveys were conducted over a six-kilometer reach below MNGP and at upstream control areas on a seasonal basis. During the worst-case year of 1983, the plume reached approximately six kilometers downstream. Excess temperatures (above ambient) during winter in the main body of the plume ranged from 26°F just below the discharge to 12°F six kilometers downstream at the State Highway 25 Bridge. However, the main body of the plume was confined to the right (south) bank of the river and rarely spanned the entire river. Depending on conditions and location, from 30 to 70 percent of the river was always generally unaffected by the thermal plume.

One of the most valuable tools for assessing the effects of the MNGP thermal plume on the river is the fishery monitoring database compiled by NSP since the mid-1970s. This database contains a more than 30-year annual record of electrofishing and seining results both up- and downstream of the MNGP site. Electrofishing catches from 2004 through 2007 (Ref. 23) were dominated by shorthead redhorse, silver redhorse, common carp and smallmouth bass with lesser numbers of channel catfish, and other species. Minnows dominated the seine catches, primarily spotfin shiner and sand shiner. Changes noted in the fish community have been unrelated to the MNGP thermal discharge, such as the invasion of channel catfish in the late 1980s and subsequent growth of the population. Examination of the annual fish monitoring data confirms that a "balanced, indigenous community" of fish has been maintained in the river throughout the operational period of MNGP.

Cold shock can be caused by plant shutdown in the winter, and the probability of a plant shutdown is independent of extended power uprate. The projected increase in discharge canal inlet temperature of 4.5°F at extended power uprate conditions will 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 aquatic river species have been reduced by the construction of a weir at the end of the discharge canal. The weir and the traveling screens limit the amount of aquatic species in the discharge canal and reduce the effects of cold shock on aquatic species in the discharge canal. In addition, administrative procedures for controlled temperature reduction of the discharge canal are in place to minimize thermal shock to the aquatic biota. The consequences of a cold shock event have been reduced at present and these practices will be continued under extended power uprate operating conditions.

6.2.8 Impingement and Entrainment

MNGP uses a once-through cooling water system in combination with two mechanical draft cooling towers, enabling the plant to operate in various modes. Operating experience indicates that historically MNGP operates in open or helper cycle approximately 98 percent of the time.

Section 316(b) of the Clean Water Act requires any standard established pursuant to 301 or 306 shall require the location, design, construction, and capacity of cooling water intake structures to reflect the best technology available for minimizing adverse environmental impacts [33 USC 1326 (b)]. Entrainment of fish and shellfish in the early life stages through the condenser cooling system is

one of the potential adverse environmental impacts that can be minimized by the use of the best available technology.

A 316(b) demonstration was developed and submitted to the MPCA (Ref. 4). The demonstration was ultimately accepted and approved by the MPCA in September 1979, with the conclusion that entrainment at MNGP "... offers no substantial detriment to the fisheries population." Electrofishing surveys to assess relative abundance and seasonal distribution of fish in response to MNGP's thermal discharge have been conducted from 1976 to the present. Areas of the River sampled extended about 1.5 kilometers both up and downstream from the discharge structure, with the thermal plume generally covering less than one-half of the downstream flow of the study area. Results show similar, persistent, and stable species assemblages both up and downstream of the discharge (Ref. 23). Based on these studies and the fact that water appropriation will not increase under EPU, NMC concludes that impacts to fish populations as a result of entrainment is not altered under EPU conditions.

Upon review of the 316(b) demonstration, the MPCA concurred that impingement at MNGP "... offer no substantial detriment to the fisheries population". Based upon the same studies discussed above for entrainment, and the fact that water appropriation will not increase under EPU, NMC concludes that impacts to fish populations as a result of impingement is not impacted by operation at extended power uprate conditions.

The current MNGP NPDES Permit addresses 316(b) compliance. It states that MNGP "shall operate the intake structures consistent with Section 316(b) of the Clean Water Act and consistent with the MPCA-approved 1978 report "Section 316(b) demonstration for the Monticello Nuclear Generating Plant..." The reissued permit has a requirement that MNGP submit the results of an impingement mortality and entrainment sampling effort to the MPCA within one year of permit reissuance. The NPDES Permit further states that "If MPCA review of the evaluation data leads to the conclusion that the facility needs to install technology or modify operations to reduce impingement mortality and/or entrainment the permit may be reopened to include a compliance schedule developed using best professional judgment."

Extended power uprate does not effect the impingement and entrainment of organisms and will not cause effects that have not been previously evaluated. The circulating water and service water system flow rates are not being changed for EPU. Therefore, no increase in entrainment of organisms or impingement of fish is anticipated at extended power uprate conditions above that for present operating conditions. Since initial operation, the Company has modified the MNGP intake structure to reduce impingement impacts. These modifications include a dedicated sluiceway for the traveling screen backwash system to allow aquatic species impinged on the screens to be returned to the river during backwash cycles to minimize impingement mortality. The practice of backwashing of the traveling screens to the river when river temperature is above 50°F has also reduced the potential for organism impingement mortality.

The NRC Staff estimated that operation of MNGP at average river flows and intake flows of 640 cfs may entail a possible mortality rate of up to 15 percent of passing drift organisms through entrainment (Summary and Conclusions, Ref. 2). Studies at MNGP, conducted during low flow conditions before the modifications above were

implemented, indicate an entrainment rate of 19 percent of the total drift organisms. Because of the study year bias due to low flow conditions, the NRC Staff's estimate on mortality is consistent with plant operating data. Because there will be no increase in river water appropriation, extended power uprate has no effect on the entrainment rate associated with present operating conditions.

7.0 RADIOLOGICAL ENVIRONMENTAL IMPACT

7.1 Radioactive Waste Streams

The radioactive waste systems at MNGP 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 (Section 9 of Ref. 7). These limits and objectives will continue to be adhered to under extended power uprate.

In addition, operation at extended power uprate conditions does not result in any changes in the operation or design of equipment in the solid waste, liquid waste, or gaseous waste systems. The safety and reliability of these systems is unaffected by extended power uprate. Extended power uprate does not affect the environmental monitoring of any of these waste streams, and the radiological monitoring requirements of the MNGP Technical Specifications will not be affected. Extended power uprate does not introduce any new or different radiological release pathways and does not increase the probability of an operator error or equipment malfunction that would result in an uncontrolled radioactive release. The specific effects of extended power uprate on each of the radioactive waste systems are evaluated below.

7.1.1 Solid Waste

NMC continually tracks the volume of solid radwaste generated at MNGP. Significant volume reductions have occurred over the years. In the 1994-95 timeframe, approximately 50 cubic meters/year was shipped. For calendar years 2001 through 2006, the average volume of solid radwaste (spent resin, filter sludge, evaporator bottoms, etc.) shipped per year was less than 20 cubic meters. The increased volume of resins due to power uprate (estimated at approximately 3 cubic meters/year) could be accommodated in one additional truck shipment per year.

The bulk volume of total solid radwaste shipped from MNGP (in addition to the spent resin, filter sludge, evaporator bottoms, etc.) consists of dry compacted waste, contaminated equipment, etc. This portion of the solid radwaste volume is not directly impacted by power uprate on an ongoing basis but is a factor of the amount and types of housekeeping, maintenance and modification activities performed in the plant. There will likely be a temporary increase in these volumes due to the modifications and equipment replacements in support of power uprate. However, MNGP procedures and practices remain committed to a goal of minimizing the volume of solid radwaste that is created and ultimately requires shipment.

Equipment wastes from operational and maintenance activities, chemical wastes, and reactor system wastes also contribute to solid waste generation. Power uprate does not significantly affect the production or type of equipment and

chemical wastes. The effect of power uprate on process wastes and reactor system wastes is evaluated below.

A. Process Wastes

Power uprate conditions will involve small increases in the process wastes generated from operation of the Reactor Water Cleanup (RWCU) filter/demineralizers and the condensate demineralizers.

The changeout limits for the RWCU filter/demineralizers are based on differential pressure and effluent chemistry. It is expected that more frequent RWCU backwashes will occur at power uprate conditions due to chemistry limits. Power uprate will not involve changes in RWCU flow rate or filter performance. NMC determined that the increase in backwashes for RWCU would likely be less than or equal to 5 total backwashes per year.

The changeout limits for condensate demineralizer operation are based on differential pressure and conductivity. The principal power uprate effect on the Condensate Demineralizer System is increased condensate flow. A consequent result of increased condensate flow is that the vessel differential pressure changeout limit will be reached more frequently. Without modification, it is expected that the spent resin generation from condensate demineralizers will increase. It is estimated that the Condensate Demineralizers will require approximately 15 additional backwashes per year.

The slight increases in solid wastes from the processes above (estimated at approximately 3 cubic meters/year) will not result in waste volumes substantially above present levels.

B. Reactor System Wastes

Reactor system wastes will increase slightly due to operation at power uprate conditions. These wastes are currently stored in the spent fuel pool and are not shipped offsite. An Independent Spent Fuel Storage Installation (ISFSI) operation has been constructed onsite at MNGP and spent fuel is scheduled to be stored there in 2008. It is estimated that the number of irradiated fuel assemblies discharged from the reactor will increase from a nominal 150 assemblies/cycle to approximately 170 assemblies/cycle under power uprate conditions. These additional assemblies will be stored in the existing spent fuel pool and ISFSI facility and therefore the environmental impact will be insignificant.

The volume and activity of waste generated from spent control blades and in-core ion chambers may increase slightly under the higher flux conditions associated with power uprate conditions.

The annual environmental impact of low and high level solid wastes has been generically evaluated by the NRC Staff for a 1000 MWe reference reactor. The estimated activity content of these wastes is given by Table S-3 in 10 CFR 51.52. The evaluation with respect to this table is included in Section 8.1 of this report.

Given the arguments above, the environmental impact due to generation of solid radwaste from power uprate conditions is insignificant.

7.1.2 Liquid Radwaste

Although the Company is authorized to discharge liquid radwaste at MNGP per the FES and the Technical Specifications, the Company has administratively operated Monticello as a zero radioactive liquid release plant since 1972. No change is expected in the zero release policy as a result of power uprate.

The annual liquid volume processed by the Liquid Radwaste System is estimated to increase from approximately 11,000 gals/day to 11,250 gals/day partially due to the increased frequency of RWCU filter/demineralizer and Condensate Demineralizer backwashes as a result of power uprate. This increased frequency is estimated to add approximately 91,000 gallons/year, or about 250 gals/day. This increase is less than two percent of overall system capacity and brings the total useage to about 55 percent of system capacity. In addition, because of the zero liquid radwaste discharge at MNGP, this slight increase in input to the liquid radwaste system will be recycled, not discharged, and therefore will not produce any environmental impact.

Power uprate conditions will not result in significant increases in the volume of fluid from other sources to the Liquid Radwaste System. The reactor will continue to be operated within its present pressure control band. Valve packing leakage volume into the liquid radwaste system is not expected to increase. There will be no changes in reactor recirculation pump seal flow or any other normal equipment drain path. In addition, there will be no impact to the Dirty Radwaste, Chemical Waste, or Laundry Waste subsystems of the Liquid Radwaste System as a result of power uprate since the operating modes and the inputs to these subsystems are independent of power uprate.

With the current low waste generation rate at MNGP and the insignificant effect of power uprate on liquid radwaste generation, it is reasonable to conclude that power uprate will not increase liquid radwastes above presently allowed limits. In addition, power uprate will not affect compliance with the limits of 10 CFR 20 or the guidelines of Appendix I to 10 CFR 50 for liquid effluents at MNGP.

7.1.3 Gaseous Wastes

During normal operation, radioactive gaseous effluents are released through the Reactor Building Ventilation System and the Offgas System pathways. These effluents include small quantities of noble gases, halogens, particulates, and tritium. The dose to individuals from normal gaseous effluent releases at MNGP at the current licensed thermal power level are well within the guidelines of 10 CFR 50 Appendix I and the limits of 10 CFR 20 for all airborne radioactive nuclides. The effluent radioactivity, in curies, of noble gases, iodine, and particulates discharged from MNGP has been reduced steadily and is significantly below discharges during initial operating conditions. Power uprate is expected to increase the production and activity of gaseous effluents approximately 13 percent. This increase is well within regulatory limits.

The gaseous radioactivity of the reactor coolant system is, in part, a function of the extent of fuel defects; the causes of which are independent of power uprate.

MNGP has had a good history with respect to nuclear fuel performance. During the past 30 years of plant operation only two fuel rod defects have occurred. One defect was identified in 1989 and was attributed to a manufacturing problem. The other defect was recently detected in late 2007 and is being managed through applicable core management and power suppression techniques. It is anticipated that this defect will be removed no later than the 2009 refueling outage.

Table 7.1.3-1 presents the gaseous releases from MNGP for the years 2001 through 2006. Table 7.1.3-2 presents the resulting radiation dose assessments for the same time period.

ENCLOSURE 4

Table 7.1.3-1

Radioactive Effluent Releases from 2001 through 2006

Source: Annual Radioactive Effluent Release Reports for MNGP		Gaseous Effluents				Iodines, Particulates, and Tritium	Liquid Effluents	
		Total Release	Release Rate	Percent Tech Spec Reporting Level		Percent Tech Spec Reporting Level	Percent Tech Spec Reporting Level	
				Gamma	Beta		Whole Body	Organ
Quarter	Year	Ci	micro-Ci/sec	%	%	%	%	%
1Q	2001	2.98E+01	3.84E+00	2.83E-02	1.57E-02	6.14E-02	0.00E+00	0.00E+00
2Q	2001	5.67E+01	7.21E+00	2.71E-02	1.27E-02	7.41E-02	2.13E-04	9.76E-05
3Q	2001	4.09E+01	5.15E+00	9.21E-03	2.83E-03	9.25E-02	0.00E+00	0.00E+00
4Q	2001	1.14E+02	1.43E+01	6.06E-02	7.32E-03	4.90E-02	1.50E-05	1.09E-05
1Q	2002	1.06E+02	1.36E+01	3.76E-02	8.30E-03	6.26E-02	0.00E+00	0.00E+00
2Q	2002	4.78E+01	6.07E+00	1.53E-02	3.58E-03	9.17E-02	0.00E+00	0.00E+00
3Q	2002	3.77E+01	4.74E+00	1.11E-02	2.79E-03	9.49E-02	0.00E+00	0.00E+00
4Q	2002	3.54E+01	4.45E+00	9.63E-03	2.28E-03	6.84E-02	0.00E+00	0.00E+00
1Q	2003	4.93E+01	6.34E+00	4.01E-02	2.62E-02	8.82E-02	0.00E+00	0.00E+00
2Q	2003	3.10E+02	3.94E+01	1.93E-01	2.22E-02	1.03E-01	1.08E-04	3.90E-05
3Q	2003	1.04E+03	1.31E+02	7.00E-01	5.55E-02	7.14E-02	0.00E+00	0.00E+00
4Q	2003	8.87E+02	1.12E+02	6.04E-01	6.18E-02	5.39E-02	0.00E+00	0.00E+00
1Q	2004	8.44E+02	1.08E+02	5.62E-01	5.20E-02	5.68E-02	0.00E+00	0.00E+00
2Q	2004	4.54E+02	5.77E+01	2.92E-01	3.51E-02	6.41E-02	0.00E+00	0.00E+00

Table 7.1.3-1 (Continued)

Radioactive Effluent Releases from 2001 through 2006

Source: Annual Radioactive Effluent Release Reports for MNGP		Gaseous Effluents				Iodines, Particulates, and Tritium	Liquid Effluents	
		Total Release	Release Rate	Percent Tech Spec Reporting Level		Percent Tech Spec Reporting Level	Percent Tech Spec Reporting Level	
				Gamma	Beta		Whole Body	Organ
Quarter	Year	Ci	micro-Ci/sec	%	%	%	%	%
3Q	2004	3.54E+01	4.46E+00	1.68E-02	4.90E-03	6.60E-02	0.00E+00	0.00E+00
4Q	2004	3.72E+01	4.68E+00	1.71E-02	8.32E-03	9.54E-02	1.29E-08	3.88E-09
1Q	2005	3.34E+01	4.21E+00	1.96E-02	8.45E-03	2.28E-02	0.00E+00	0.00E+00
2Q	2005	4.21E+01	3.69E+00	2.05E-02	9.03E-03	1.04E-02	0.00E+00	0.00E+00
3Q	2005	3.85E+01	4.95E+00	2.32E-02	9.59E-03	7.70E-02	0.00E+00	0.00E+00
4Q	2005	2.46E+01	3.13E+00	1.20E-02	2.84E-03	2.38E-02	0.00E+00	0.00E+00
1Q	2006	2.60E+01	3.35E+00	9.04E-03	1.64E-03	1.01E-02	0.00E+00	0.00E+00
2Q	2006	3.34E+01	4.25E+00	9.85E-03	1.68E-03	1.21E-02	0.00E+00	0.00E+00
3Q	2006	3.48E+01	4.37E+00	9.99E-03	1.89E-03	1.31E-02	0.00E+00	0.00E+00
4Q	2006	3.70E+01	4.66E+00	1.15E-02	3.97E-03	1.60E-02	0.00E+00	0.00E+00
Averages		1.83E+02	2.31E+01	1.14E-01	1.50E-02	5.74E-02	1.40E-05	6.15E-06
Tech Spec Reporting Limits				5.00E+00 mrad/qtr	1.00E+01 mrad/qtr	7.50E+00 mrem/qtr to any organ	1.50E+00 mrem/qtr	5.00E+00 mrem/qtr to any organ

Table 7.1.3-2

Radiation Dose Assessments from 2001 through 2006

Source: Annual Radioactive Effluent Release Reports for MNGP	10 CFR 50 Appendix I Limits								10 CFR 20		
	10	20	15	5	15	15	3	10	100		
	Gaseous Releases						Liquid Releases		Gaseous Releases		
	Max Site Boundary Gamma		Organ	Maximum Dose to Most Likely Exposed Member of General Public			Max Offsite Dose		Max Dose to Individuals due to Activities Inside Site Boundary		
	Gamma	Beta		Whole Body	Skin	Thyroid	Whole Body	Organ	Whole Body	Thyroid	Max Organ (Skin)
	mrad/yr	mrad/yr	mrem/yr	mrem/yr	mrem/yr	mrem/yr	mrem	mrem	mrem	mrem	mrem
2001	3.00E-03	4.00E-03	1.10E-02	6.00E-03	7.00E-03	1.10E-02	1.61E-05	1.72E-04	1.20E-02	1.40E-02	1.50E-02
2002	1.00E-03	2.00E-03	1.40E-02	6.00E-03	8.00E-03	1.40E-02	0.00E+00	0.00E+00	1.40E-02	1.80E-02	1.60E-02
2003	2.20E-02	1.70E-02	4.70E-02	3.90E-02	7.30E-02	4.70E-02	2.45E-07	5.55E-07	2.00E-02	3.00E-02	3.00E-02
2004	1.30E-02	1.00E-02	3.70E-02	2.20E-02	3.70E-02	3.70E-02	1.94E-10	1.94E-10	9.00E-03	1.10E-02	9.00E-03
2005	3.00E-03	3.00E-03	2.50E-02	1.60E-02	2.50E-02	2.50E-02	0.00E+00	0.00E+00	1.50E-02	1.60E-02	1.90E-02
2006	1.00E-03	1.00E-03	1.40E-02	8.00E-03	6.00E-03	9.00E-03	0.00E+00	0.00E+00	8.00E-03	8.00E-03	1.00E-02
Averages	7.17E-03	6.17E-03	2.47E-02	1.62E-02	2.60E-02	2.38E-02	2.72E-06	2.88E-05	1.30E-02	1.62E-02	1.65E-02

Given the above, it is reasonable to conclude that the effect of power uprate (approximate 13 percent increase) on gaseous radioactive effluents is negligible, and that continued compliance with the release limits of 10 CFR 20 and the design objectives of Appendix I to 10 CFR 50 is maintained with significant margin.

7.2 Radiation Levels and Offsite Dose

7.2.1 Operating and Shutdown In-Plant Radiation

The cycle annual average dose at Monticello has decreased at an approximate rate of 10 percent from cycle 18 to cycle 23. Extended power uprate will involve an increase in radiation levels.

MNGP was conservatively designed with respect to shielding and radiation sources. In the shielding analysis, the analytical assumptions for reactor water fission product concentrations and corrosion products are 8 μCi/cc and 0.07 μCi/cc respectively. The plant's administrative limit on total reactor water gamma activity for corrosion products is 0.5 μCi/ml. The gross alpha activity limit is 1E-6 μCi/ml. With expected operating increases in operating activity proportional to the proposed power increase, the design shielding assumptions remain bounding with significant margin at extended power uprate conditions.

Table 7.2.1-1, below, summarizes the exposure history for MNGP from 1990 through 2006.

Table 7.2.1-1

Exposure History (in REM) from 2006 MNGP ALARA Report

	Operation	Refueling Outage	Total
1990	94	0	94
1991	94	371	465
1992	114	0	114
1993	66	429	496
1994	78	321	395
1995	44	0	44
1996	71	169	240
1997	106	0	106
1998	47	162	209
1999	70	0	70
2000	40	176	216
2001	55	166	221
2002	40	0	40
2003	49	120	169
2004	35	0	35
2005	26	149	175
2006	33	0	33

In general, radiation levels and dose rates are estimated to increase in proportion to the increase in power level (i.e., approximately 13%). Dose reduction programs will continue to address the increases in individual doses due to extended power uprate. The plant radiation protection program will be used to maintain individual doses consistent with ALARA policies and well below the established limits of 10 CFR 20. 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. Administrative dose limits are not routinely exceeded under present power conditions.

7.2.2 Offsite Doses at Extended Power Uprate Conditions

For extended power uprate, normal operational gaseous activity levels may increase slightly. 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. Doses from liquid effluents are currently zero and are expected to remain zero under extended power uprate conditions.

The Monticello Technical Specifications implement the guidelines of 10 CFR 50 Appendix I which are well within the 10 CFR 20 limits.

Table 7.1.3-2, previous, contains the results of the dose assessment for 2001-2006. An increase of approximately 13 percent for extended power uprate operation remains a very small fraction of the reporting limits.

Table 7.2.2-1 and Figure 7.2.2-1 present the ambient gamma radiation data for MNGP for the years 1991-2006. The conclusion from that data is that no plant effect on ambient gamma radiation is indicated.

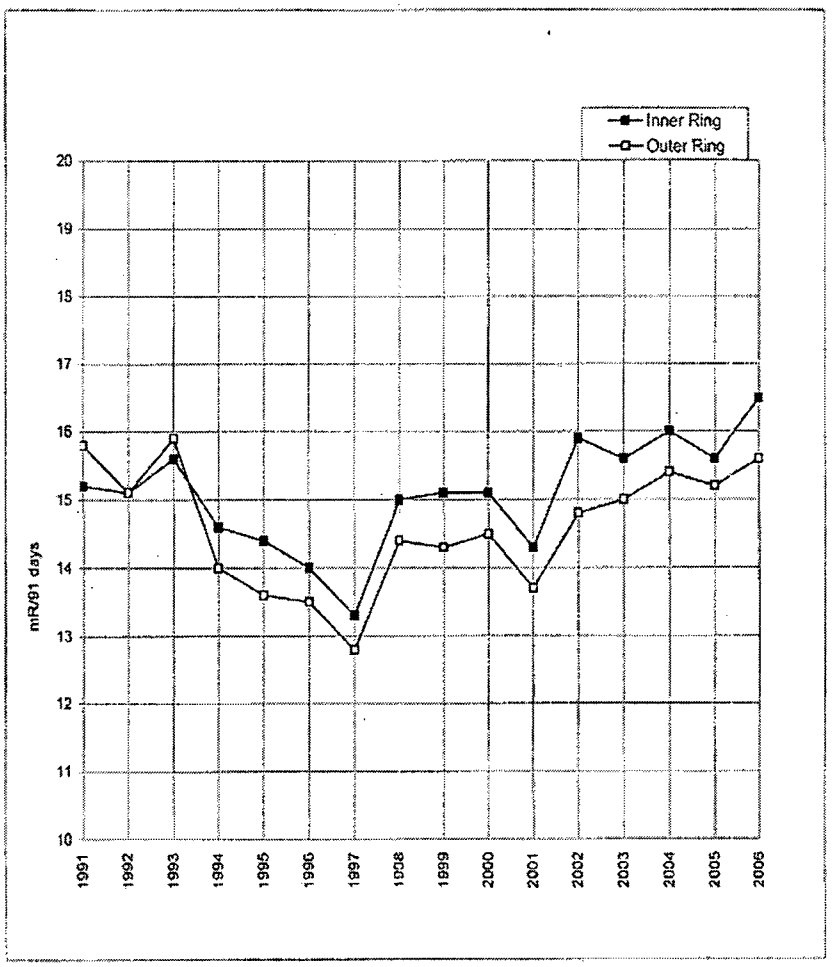
Table 7.2.2-1

Ambient Gamma Radiation as Measured by Thermoluminescent Dosimetry, Average Quarterly Dose Rates, Inner vs. Outer Ring Locations

Year	Inner Ring	Outer Ring
	Dose rate (mRem/qtr)	
1991	15.2	15.8
1992	15.1	15.1
1993	15.6	15.9
1994	14.6	14
1995	14.4	13.6
1996	14	13.5
1997	13.3	12.8
1998	15	14.4
1999	15.1	14.3
2000	15.1	14.5
2001	14.3	13.7
2002	15.9	14.8
2003	15.6	15
2004	16	15.4
2005	15.6	15.2
2006	16.5	15.6
Average	15.5125	14.8125

Figure 7.2.2-1

Ambient Gamma Radiation as Measured by Thermoluminescent Dosimetry, Average Quarterly Dose Rates, Inner vs. Outer Ring Locations



7.2.3 Ground Water Monitoring Program

NMC implemented a ground water monitoring program as part of the Radiological Environmental Monitoring Program (REMP). Eight on-site monitoring wells are routinely sampled and analyzed to ensure that radioactive contamination is not impacting ground water. Reactor-produced contamination has not been identified in any ground water samples. Operation at EPU power levels is not expected to impact these results.

7.2.4 Radiation Levels and Offsite Doses - Conclusion

Extended power uprate does not involve significant increases in offsite dose from noble gases, airborne particulates, iodine, or tritium. Radioactive liquid effluents are not routinely discharged from MNGP. In addition, radiation from shine from extended power uprate conditions will have only a minimal impact on measured dose rates offsite.

Extended power uprate does not create any new or different sources of offsite dose from MNGP operation, and extended power uprate does not involve significant increases in present radiation levels. Therefore, it is reasonable to conclude that under extended power uprate conditions, offsite dose will remain well within regulatory criteria with no significant environmental impact.

7.3 Radiological Consequences of Accidents

Section VI of the Final Environmental Statement (FES) identifies nine classes of postulated accidents at MNGP that were evaluated by the NRC Staff to determine the associated environmental impact. "Accidents," in this context, includes those accidents evaluated for environmental consequences by the NRC Staff in addition to design basis accidents contained in the MNGP Final Safety Analysis Report (FSAR).

The NRC Staff used information provided by the Company in Section 10 and Appendix C of the MNGP Environmental Report (Ref. 1) to determine the associated environmental impacts. According to Section 3 of Ref. 1, the radiological effects determination is conducted utilizing reasonable assumptions, justifiable calculation models and techniques, and realistic assessments of environmental effects. The following discussion addresses the impact of extended power uprate on the assumptions and conclusions for the environmental accident classes. Comparisons are made, where applicable, with the accident analyses previously submitted by the Company in the MNGP Environmental Report. Note that MNGP has implemented the full-scope alternative source term methodology (Ref. 24). As such, comparisons are made for the events within the scope of that methodology.

7.3.1 Class 1 - Small Leaks Inside Containment

In accordance with AEC guidance for environmental reports at the time, Class 1 accidents were not considered within the scope. These accidents are initiated by small spills and leaks below the Technical Specification limits inside the primary containment or secondary containment. These leaks are bounded by those analyzed under Class 8 - LOCA Inside or Outside Containment. The NRC Staff considered that an incident of this type would cause releases that are commensurate with routine effluents (Section VI of Ref. 2). EPU evaluations regarding reactor coolant radiation sources indicate that total activity levels are less than 20 percent of the MNGP design basis for reactor water fission products and less than 50 percent of the MNGP design basis for activated corrosion products.

7.3.2 Class 2 - Miscellaneous Small Leaks Outside Containment

The postulated Class 2 accident is a continuous steam leak equivalent to a 7 gpm leak on the turbine building floor that releases through the turbine building roof vent. Extended power uprate does not increase the probability of occurrence or severity of this event. The turbine building vents were permanently secured subsequent to initial operation, and turbine exhaust air is processed through the reactor building ventilation system.

At extended power uprate conditions, the activity concentration of the reactor coolant will not increase above the assumptions used by the NRC Staff in the original analyses. These analyses assumed a coolant activity inventory of 0.2 μCi/cc to determine radiological effects (Section 10.b(2)(b) of Ref. 1). EPU evaluations regarding reactor coolant radiation sources indicate that total activity levels are less than 20 percent of the MNGP design basis for reactor water fission products and less than 50 percent of the MNGP design basis for activated corrosion products. Specifically, total fission product activity concentration in reactor water is 0.13 μCi/cc and the total non-coolant activation product activity concentration in reactor water is 0.029 μCi/cc at EPU conditions. Consequently, the dose conclusions of Table VI-2 of the FES for Class 2 accidents remain bounding for extended power uprate, and the radiological consequences of these accidents are not increased.

7.3.3 Class 3 - Radwaste System Failures

Class 3 accidents are included in Table VI-2 of the FES. Class 3.1 radwaste system failures are due to a single operator error or single equipment malfunction (Section 2.2 of Appendix C to Ref. 1). The Company selected two events to represent Class 3.1. These are 1) a liquid radwaste discharge-operator error, and 2) a gaseous waste discharge drain line failure. These accidents were chosen because these particular events were considered most probable (Section 7.0 of Appendix C to Ref. 1).

The NRC Staff included a Release of Waste Gas Storage Tank Contents Accident (Class 3.2) and a Release of Liquid Radwaste Storage Tank (Class 3.3) in Class 3. The Company analyzed these events as Class 8 accidents because of low probability (Sections 12.4 and Sections 12.5 of Appendix C to Ref. 1 respectively). These accidents will be addressed as Class 3 accidents herein to conform to the NRC Staff's determination.

ENCLOSURE 4

A. Class 3.1 Equipment Leakage or Malfunction

1. Liquid Radwaste Discharge

Section 7.1 of Appendix C to the Environmental Report (Ref. 1) describes the assumptions used in postulating this event. The release is the result of an inadvertent pumping of the floor drain sample tank containing 0.7 Ci to the discharge canal for 20 minutes. The event is initiated by one of the following three single operator errors.

The operator commences pumping without taking a batch sample.

A batch sample is incorrectly analyzed prior to discharge.

The operator pumps the wrong tank.

From the above, it can be deduced that this accident was postulated because liquid radwaste discharges were expected to be performed routinely. However, evolutionary changes to the liquid radwaste system and changes in NSP's liquid radwaste discharge policies make this event extremely unlikely for current power and extended power uprate operating conditions. Liquid radwaste discharge is not routinely performed at MNGP. The plant is administratively operated as a zero radioactive liquid discharge plant. Operators have not discharged liquid radwaste to the canal for 35 years. Inadvertent pumping of liquid radwaste would require an implausible sequence of events involving multiple operator errors and malicious disregard for a variety of administrative controls. A procedure to pump liquid radwaste to the discharge canal, which does not currently exist and would likely be created for a one-time occurrence, would have to be developed and approved by a variety of environmental authorities. Operators are not authorized to perform evolutions without a valid procedure. The liquid radwaste discharge valve in the plant is a manual valve that is maintained shut. A sign at the valve warns the operator that management permission is required for operation. Additional manual valves in the discharge line are shut.

The above accident is initiated by an operator error. The offsite dose consequences of a liquid radwaste equipment failure or operator error are bounded by a tank release. The radiological consequences of discharging the entire contents of the floor drain sample tank have been analyzed and found to be well within the limits of 10 CFR 50 Appendix I. See Section 7.3.3.C below.

Given the above, the probability of this postulated environmental accident under extended power uprate conditions is significantly less than that assumed at initial licensing and would require multiple operator errors to occur.

2. Gaseous Radwaste Discharge

Section 7.2 of Appendix C to the Environmental Report (Ref. 1) describes the assumptions used in postulating this event. The release is the result of a loss of a drain line water seal. A modification to the Offgas System removed these water seals such that gaseous effluents are hard-piped and positively contained within closed drain tanks. Consequently, the probability of a malfunction of this type is significantly reduced at present and extended power uprate conditions because a release of this type would require a passive Offgas System pressure boundary failure instead of a single equipment failure.

Because of modifications made to the MNGP Offgas System since initial operation, it is difficult to directly analyze this postulated accident under extended power uprate conditions. These changes were described to the NRC Staff by several letters. See Section 2.1.1 of Ref. 13. For an updated system description, see Section 9.3 of the MNGP USAR (Ref. 7).

To the extent that a comparison can be made, the activity concentrations at extended power uprate are well bounded by the assumptions used in the original analyses. The original analyses assumed a normal offgas release rate of 25,000 μCi/sec whereas the EPU evaluation is indicating an average gaseous effluent release rate for the years 2001-2006 of 23.1 μCi/sec (which can be expected to increase proportionally to the EPU power increase, i.e., approximately 13 percent). Consequently, the dose conclusions of Table VI-2 of the FES for equipment failures remain bounding for extended power uprate, and the radiological consequences of this accident are not increased.

Gaseous waste discharges due to operator errors were not specifically analyzed by the Company in the original Environmental Report. Two MNGP technical specification limits incorporated after the issuance of the Final Environmental Statement address this issue. The offgas storage tank gross activity limit of 22,000 Ci (Xe-133 equivalent, MNGP Technical Specification 5.5.7) is based on limiting the offsite dose following an operator error that results in an inadvertent release of one decay tank after 12 hours of decay. A typical value for this parameter at current power levels is about eight (8) Ci. Extended power uprate will not involve significant increases in storage tank activity, and a large margin to the limit will be maintained. A separate technical specification limits the maximum activity at the steam jet air ejector (≤ 260 mCi/sec at 30 minutes, Technical Specification 3.7.6) to limit dose within regulatory criteria due to exposures from inadvertent discharges. From the discussion in the preceding paragraphs it is apparent that operation at extended power uprate will not involve significant increases in offgas activity above present levels, and significant margin to this limit will be maintained.

Gaseous waste accidents initiated by single operator errors or equipment failures are bounded by the multiple tank release analysis. See Section B below.

B. Class 3.2 Release of Waste Gas Storage Contents

Section 12.5 of Appendix C to Ref. 1 describes this accident. The accident is the result of a hydrogen ignition in the holdup volume. The probability of this accident is significantly less likely since NSP has installed offgas recombiners in the Air Ejector Offgas System. See Section 9.3.3.4, Hydrogen Explosion, of the MNGP USAR (Ref. 7) for a description and analysis.

The hydrogen handling design of the augmented offgas system has been reviewed and approved by the NRC Staff (Ref. 15). The offgas system is designed to withstand the pressure from a hydrogen detonation. Loss of dilution steam results in a recombiner train shutdown. In addition, hydrogen is monitored, and automatic shutdowns occur well before potentially explosive hydrogen concentrations are reached. An explosion in the recombiner could cause a release via the recombiner's hydrogen analyzer equipment. This release has been analyzed and was found to be within limits. The analyzer release is bounded by the multiple tank failure accident described below.

The Offgas System has been designed to prevent an explosive mixture from propagating beyond the recombiner system. In 1973, the NRC Staff evaluated the effects of an offgas tank failure for the augmented offgas system. By Section 6.1 of the safety evaluation for the full term operating license (Ref. 13), the NRC Staff analyzed the radiological consequences of a simultaneous failure of five offgas storage tanks. The offgas release rate was assumed to be equivalent to the prevailing Technical Specification limits. The NRC Staff concluded that the dose at the site boundary was well within the values given in 10 CFR 100. This conclusion remains valid under extended power uprate conditions. Extended power uprate will not increase the probability of this accident and will not involve operation above the release rates assumed by the NRC Staff, and consequently, the previously analyzed dose rates continue to bound operation at extended power uprate conditions.

C. Class 3.3 Release of Liquid Waste Storage Tank Contents

This accident involves a catastrophic failure of a low level radwaste tank which included a simultaneous failure of the tank's containment basin (Section 12.4 of Appendix C to Ref. 1). The activity was released to the discharge canal. The analysis assumed a total radwaste tank activity content based on the prevailing technical specification limits.

Technical specification inventory limits are provided for undiked temporary radwaste tanks. The technical specification limit for undiked temporary tanks is 10 Ci, excluding tritium and dissolved or entrained noble gases. Extended power uprate will not, of itself, involve storage of low level radwaste outside

of the radwaste building. If storage does occur, the temporary tank radioactivity limit of Technical Specification 5.5.7 will not be exceeded.

Concerning installed radwaste tanks, the Company analyzed radwaste tank discharges by its Appendix I filing (Section 1.1 of Ref. 16). In this analysis it was assumed that the entire contents of the floor drain sample tank after treatment was discharged to the Circulating Water System with no credit for Mississippi River dilution. Conservative discharges of chemical wastes and laundry wastes were also assumed. Exposures were calculated using the guidance of Regulatory Guide 1.109. The resultant doses were well below the 10 CFR 50 Appendix I limits. Extended power uprate will not have a material impact on the effectiveness of the liquid waste processing system or on the generation and activity level of liquid wastes at MNGP. Consequently, the results of the Appendix I radwaste tank discharge analysis are bounding for extended power uprate conditions.

7.3.4 Class 4 - Events that Release Radioactivity into Primary System

According to Section 2.2 of Appendix C to the Environmental Report (Ref. 1), no Class 4 events were identified for MNGP. Table VI-2 of the FES includes dose estimates for Class 4 events. The assumptions for these dose estimates could not be located. It is reasonable to conclude, however, that these estimates will remain bounding for extended power uprate. According to Table VI-2, Class 4 events include releases due to fuel cladding defects and releases from fuel failures induced from transients. Fuel cladding defects have been significantly reduced since initial operation due to industry improvements. In addition, operational limits are calculated at MNGP for each cycle to prevent transients from inducing fuel damage. These limits involve significant margin to fuel failure. These calculations will continue to be performed, and the appropriate limits will continue to be imposed under extended power uprate conditions.

7.3.5 Class 5 - Events that Release Radioactivity into Secondary System

Class 5 accidents were intended to apply to Pressurized Water Reactors (PWRs). A justification for not including Class 5 accidents was presented in Section 9 of Appendix C of Reference 1. Extended power uprate does not impact this justification.

7.3.6 Class 6 - Refueling Accidents Inside Containment

Class 6 accidents include refueling and fuel handling accidents. The Company chose the design basis refueling accident and a spent fuel cask drop to represent this class. The refueling accident is specifically addressed in the design basis accident section below (Class 8). The following discussion addresses the spent fuel cask drop and fuel damage from heavy loads.

The spent fuel cask drop was analyzed in Section 10.2 of Appendix C to Ref. 1. A cask was assumed to drop from a crane while being lowered to a flatcar. Because of cask design integrity and fuel capability, no fuel damage was postulated. A 1000 Ci release was assumed in accordance with 10 CFR 71 criteria.

Since initial licensing the cask drop accident has been re-evaluated by the Company at the request of the NRC Staff, in part to support actual fuel shipments made from MNGP. These evaluations resulted in a variety of design and administrative improvements in cask handling. By its review of cask handling at MNGP in May 1977 (Ref. 9), the NRC Staff concluded that, "the licensee has proposed adequate measures to preclude the occurrence of a cask drop accident and to mitigate its effect in the very unlikely event that it should occur."

Subsequent to this action, the NRC Staff issued generic letters that requested that licensees determine the extent of compliance with NUREG-0612. The safety concerns of a heavy object drop at MNGP are mitigated by compliance with NUREG-0612. The crane system for lifting casks at MNGP is designed for single failures. Procedural controls and safe load paths are in place to prevent handling of heavy objects above the core and the fuel pool. By SER dated March 19, 1984 (Ref. 10), the NRC Staff concluded that the guidelines of Section 5.1.1 and 5.1.3 of NUREG-0612 had been satisfied. For additional information on cask movement and crane safety at MNGP, see the Company's response to NRC Bulletin 96-02, Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, Or Over Safety Related Equipment (Ref. 14).

Notwithstanding the Company's stated compliance with NUREG-0612, the severity of any heavy load drop involving fuel damage is less at extended power uprate conditions. The FES analysis was based on the fractional activity of 7x7 fuel assemblies. The Company has replaced all the 7x7 fuel at MNGP with 8x8, 9x9, or 10X10 fuel. The effect of this change in fuel design was to lower the fuel pin centerline temperature, which lowered the release of fission product gases from the fuel. This, in turn, lowered the available inventory of gases in the fuel pin cladding gap available for release to the environment. According to Section 14.7.6.3.1 of the MNGP USAR, the relative amount of activity released for 9X9 array fuel is 0.91 times the activity released for a core of 8X8 fuel. Similarly, the relative amount of activity released for 10X10 array fuel is 0.95 times the activity released for a core of 8X8 fuel. Therefore, for those accidents that assume fuel cladding failures caused by a heavy object drop, the radioactivity available for release and the subsequent magnitude of the release to the environment is still bounded by that previously analyzed in the FES.

7.3.7 Class 7 - Accidents to Spent Fuel Outside Containment

Extended power uprate does not significantly impact the probability or consequences of a transportation accident. NMC has evaluated the conditions and assumptions of Table S-4 of 10 CFR 51.52 for MNGP operation at extended power uprate conditions. These conditions and assumptions are applicable for MNGP operation under extended power uprate conditions. Table S-4 of 10 CFR 51.52 presents a generic evaluation of the environmental impact of fuel and waste transportation accidents. See Section 8.2 below for additional information.

7.3.8 Class 8 - Accident Initiation Events Considered in the Design Basis Evaluation in the SAR

The environmental impact analysis made in the FES for Class 8 accidents was based on information provided by the Company in its Environmental Report (Section II of Ref. 1). These accidents included the Recirculation Line Suction Break, the Main Steam Line Break, and the Control Rod Drop Accident. The radwaste tank failure and the offgas accident, which were originally analyzed as Class 8, are evaluated in Section 7.3.3 above. The design basis refueling accident, which was originally analyzed as Class 6, is included in the Class 8 evaluation.

The methodology used to determine the offsite doses for environmental impacts of Class 8 was based in part on subjective and realistic assumptions, and the FES results were expressed in estimated fractions of 10 CFR 20. It is difficult to recreate this methodology, and the value of recreating it is questionable in light of some non-conservatisms such as the assumed availability of offsite power and because of evolutionary changes in dose calculations. Therefore, for extended power uprate, a comparison is presented between the original full-scope implementation of the alternative source term methodology (Ref. 24) and the same methodology at EPU conditions.

Table 7.3.8-1 summarizes the accident analysis results (Note: The dose values for the 1880 MWth column are consistent with what was developed for the Alternate Source Term amendment, Ref. 24):

Table 7.3.8-1 Accident Analysis Results

Parameter	1880 MWth (Current Licensed Thermal Power Level Design Assumption Value)	2004 MWth (Extended Power Uprate Value)	Regulatory Limit (10 CFR 50.67) & (10 CFR 50, App. A, GDC 19)
Post-LOCA Accident Dose:			
EAB	1.31 Rem TEDE	1.46 Rem TEDE	25 Rem TEDE
LPZ	1.72 Rem TEDE	1.99 Rem TEDE	25 Rem TEDE
CR Operator	3.40 Rem TEDE	3.80 Rem TEDE	5 Rem TEDE
TSC Operator	0.77 Rem TEDE	0.83 Rem TEDE	5 Rem TEDE
FHA Accident Dose:			
EAB	1.61 Rem TEDE	1.74 Rem TEDE	6.25 Rem TEDE
LPZ	0.31 Rem TEDE	0.34 Rem TEDE	6.25 Rem TEDE
CR Operator	4.29 Rem TEDE	4.67 Rem TEDE	5 Rem TEDE
CRDA Accident Dose:			
EAB	1.73 Rem TEDE	1.96 Rem TEDE	6.25 Rem TEDE
LPZ	0.79 Rem TEDE	0.90 Rem TEDE	6.25 Rem TEDE
CR Operator	1.70 Rem TEDE	1.86 Rem TEDE	5 Rem TEDE
MSLBA Accident Dose: Pre-Incident Iodine Spike			
EAB	1.05 Rem TEDE	1.05 Rem TEDE	25 Rem TEDE
LPZ	0.20 Rem TEDE	0.20 Rem TEDE	25 Rem TEDE
CR Operator	3.25 Rem TEDE	3.25 Rem TEDE	5 Rem TEDE
MSLBA Accident Dose: Equilibrium Iodine Conc.			
EAB	0.11 Rem TEDE	0.11 Rem TEDE	2.5 Rem TEDE
LPZ	0.02 Rem TEDE	0.02 Rem TEDE	2.5 Rem TEDE
CR Operator	0.33 Rem TEDE	0.33 Rem TEDE	5 Rem TEDE

Given the above, the radiological consequences of design basis accidents under extended power uprate conditions are within the acceptance criteria of GDC 19 of Appendix A to 10 CFR 50, 10 CFR 50.67, and RG 1.183 and do not involve any significant impact to the human environment.

7.3.9 Class 9 - Severe Accidents

The environmental effects of severe accidents outside the design basis of protection and engineered safety systems were not evaluated in the MNGP FES. (See Section VI.A of Ref. 2.) The NRC Staff did not evaluate these sequences on the premise that sufficient design conservatism, quality assurance, testing, and multiple physical barriers were in place such that the probability of a severe environmental accident is small, and the environmental risk of a Class 9 accident was extremely low. Extended power uprate will not involve any changes to the NRC Staff's assumptions made in arriving at the above conclusion.

Notwithstanding the above, NMC conducted an evaluation (Ref. 31) to identify the risk implications due to EPU at MNGP. The scope included the complete risk contribution associated with the EPU. Risk impacts due to internal events were assessed using the MNGP Level 1 and Level 2 PRA Model of Record. External events were evaluated using the analyses of the MNGP Individual Plant Examination of External Events (IPEEE) submittal (Ref. 30). The results indicate that the risk impact due to EPU is low and acceptable. The risk impact is in the "very low" category (i.e., Region III of the Regulatory Guide 1.174 Guidelines) for core damage frequency (CDF) and large early release frequency (LERF).

7.4 Other Potential Environmental Accidents

Extended power uprate does not significantly change the inventory, storage, usage, or control requirements for chemicals, industrial gases, oil, oil products, or other hazardous substances. Extended power uprate will not require the introduction or use of any new hazardous substances. Extended power uprate will not result in a significant increase in the probability or consequences of an oil spill, chemical spill, industrial gas release, or other event involving a non-radioactive hazardous substance.

8.0 ENVIRONMENTAL EFFECTS OF URANIUM FUEL CYCLE ACTIVITIES AND FUEL AND RADIOACTIVE WASTE TRANSPORTATION

8.1 Compliance With 10 CFR 51.51, Uranium Fuel Cycle Environmental Data (Table S-3)

Table S-3 of 10 CFR 51.51 was adopted after MNGP received its operating license, therefore, the MNGP FES does not contain a uranium fuel cycle environmental analysis similar to Table S-3. The NRC Staff, however, included the Table S-3 fuel cycle environmental data in its review of the MNGP full term operating license (Enclosure 3 of Ref. 12) and the renewed operating license (Ref. 19). The NRC Staff concluded that the fuel cycle effects of Table S-3 combined with operation of MNGP did not significantly impact the environment. The impact of extended power uprate on the NRC Staff's previous evaluation is increased fuel burnup and U-235 enrichment.

The environmental effects of fuel cycle activities under extended power uprate conditions continue to be bounded by the NRC Staff's evaluation that incorporated Table S-3 into the MNGP licensing basis as described above. The evaluation assumed that the fuel cycle would support a reference reactor of 1000 MWe that operated at 80 percent capacity factor which results in an adjusted daily electricity production of 800 MWe during a reference reactor year (RRY). Under extended power uprate conditions the daily output at 100 percent capacity is less than 700 MWe and MNGP will not exceed the assumptions of the RRY used in the evaluation.

The data presented in Tables S-3 and S-4 are, in part, based on an average burnup assumption of 33,000 MWd/MtU and a U-235 enrichment assumption of 4 wt.percent. Fuel consumption is expected to increase under extended power uprate conditions such that the batch average burnup of the fuel assemblies will be in excess of 33,000 MWd/MtU but less than 60,000 MWd/MtU (MNGP EPU evaluation indicates a maximum assembly exposure of approximately 53,000 MWd/MtU). The U-235 enrichments levels will also increase to greater than 4 wt.percent but less than 5 wt.percent to support extended burnup. The NRC Staff has previously evaluated the environmental impact of increased burnup to 60,000 MWd/MtU with U-235 fuel enrichment to 5 wt.percent on the conclusions of Table S-3. See the GEIS for license renewal (Refs 5, 19 & 20). Although some radionuclide inventory levels and activity levels are projected to increase, the NRC Staff noted that little or no increase in the amount of radionuclides released to the environment during normal operation was expected. The NRC Staff determined that the incremental environmental effects of increased enrichment and burnup on transportation of fuel, spent fuel, and waste were not significant. In addition, the NRC Staff recognized the salient environmental benefits of extended burnup such as reduced occupational dose, reduced public dose, reduced fuel requirements per unit electricity, and reduced shipments. The NRC Staff concluded that the environmental impacts described by Table S-3 were bounding and were also applicable for burnup levels to 60,000 MWd/MtU and U-235 enrichment levels to 5 wt.percent.

Table S-3 does not include a determination of the environmental effects of the gaseous effluents of Rn-222 and Tc-99. By Enclosure 3 to the issuance of the MNGP full term operating license (Ref. 12) and the license renewal (Ref. 19), the NRC Staff evaluated these effluents and concluded that the environmental impact from radon releases was not significant. In addition, an industry study performed by the Atomic Industry Forum (Ref. 11) concluded that extending fuel burnup to 60,000 MWd/MtU and increasing U-235 enrichment to 5 wt.percent results in insignificant environmental consequences from Rn-222 and Tc-99.

8.2 Compliance With 10 CFR 51.52, Environmental Effects of Transportation of Fuel and Waste (Table S-4)

The environmental impacts of transporting fuel and waste were analyzed by the NRC Staff in the FES and the license renewal environmental impact statement (Ref. 19). 10 CFR 51.52, Table S-4 presents a generic assessment of the environmental impacts of transporting fuel and waste to and from a reference reactor. For extended power uprate operating conditions, this demonstration supersedes the previous Company submittals concerning environmental effects of transportation of fuel and waste including Sections 11.0 of 13.0 of Appendix C to the Environmental Report (Ref. 1).

Operation of MNGP under extended power uprate conditions meets all the conditions of part (a) of 10 CFR 51.52 with the exception of the enrichment and burnup conditions as described in the succeeding paragraphs. Each subsection of part (a) is addressed below for extended power uprate conditions. The enrichment assumptions of paragraph (a)(2) and the burnup assumptions of paragraph (a)(3) are addressed separately below.

(a)(1) The core thermal power under extended power uprate conditions is less than 3800 MW.

(a)(2) The reactor fuel is in the form of sintered uranium dioxide pellets, and the pellets are encapsulated in zircalloy rods.

(a)(3) No irradiated fuel assembly is shipped until at least 90 days after it is discharged from the reactor.

(a)(4) With the exception of irradiated fuel, all radioactive waste shipped from the reactor is packaged and in a solid form.

(a)(5) Unirradiated fuel is shipped by truck; irradiated fuel is shipped by truck, rail, or barge; and radioactive waste other than irradiated fuel is shipped from the reactor by truck or rail.

(a)(6) In accordance with paragraph (a)(6) of 10 CFR 51.52, the environmental impacts of transportation of fuel and waste to and from the reactor at extended power uprate conditions with respect to normal and accident conditions of transport are as set forth in Table S-4 with the exception of fuel enrichment and burnup assumptions. The values in the table represent the contribution of the transportation to the environmental costs of operating at extended power uprate conditions.

NMC complies with the conditions of Table S-4 for the MNGP extended power uprate except for the U-235 enrichment and fuel burnup assumptions. The conservatism and continued applicability of Table S-4, however, has been previously evaluated by the NRC Staff for enrichment to 5 wt. percent and for average burnup to 62,000 MWd/MtU (Ref. 19).

9.0 DECOMMISSIONING EFFECTS

Other than financial set asides, the environmental effects of decommissioning were not evaluated by the NRC Staff in the Monticello FES (Section XIII, Question 45, and Section VIII.C of Ref. 2). The AEC deferred this review until the submittal of a decommissioning plan. The Company's decommissioning plan for Monticello will be submitted in accordance with regulatory criteria. Extended power uprate does not involve any substantial increases in decommissioning cost estimates and does not affect the Company's ability to maintain sufficient financial reserves for decommissioning.

The potential impact of extended power uprate on decommissioning is due to increases in feedwater flow rate and increased neutron fluence. These effects could increase the amount of activated corrosion products and consequently increase post-shutdown radiation levels.

10.0 CONCLUSIONS

Extended power uprate does not involve any significant impacts to the environment. There are no new significant environmental hazards in addition to those previously evaluated. The environmental impacts and adverse effects identified by the NRC Staff for MNGP operation at 1670 MWth in the Summary and Conclusions Section of the Final Environmental Statement (Ref. 2) continue to bound plant operation at extended power uprate conditions. The proposed changes do not, individually or cumulatively, affect the human environment. There is no significant change in the types or amounts of plant effluents. Extended power uprate does not involve significant increases in individual or cumulative occupational radiation exposure.

The effect of extended power uprate on the environment does not prevent continued compliance with any MNGP environmental permit. None of the license conditions for environmental protection will be changed for extended power uprate. No effluent limits will be exceeded, and the present large margins to these limits will not be significantly changed. Extended power uprate does not involve an increase in the discharge of hazardous substances, contaminants, or pollutants and does not involve the use of any new hazardous substances, contaminants, or pollutants.

Extended power uprate does not involve any changes to air quality or water quality. It does not result in any changes to land usage and has an insignificant effect on groundwater and surface water usage. The amount of water withdrawn and consumed from the Mississippi River is not significantly increased above that previously evaluated. The slight increase in discharge canal temperature has an insignificant effect on river temperature and will not result in any changes to aquatic biota other than those previously evaluated. Extended power uprate will not involve new or different discharges of contaminants and does not involve changes to any bioaccumulation effects for aquatic organisms. Extended power uprate does not accelerate the introduction of any microbiological organisms into surface water pathways or significantly increase the population of any known pathogens.

Extended power uprate does not involve any changes to wildlife habitat and does not result in any significant changes to aquatic or terrestrial biota. There are no deleterious effects on the diversity of biological systems or the sustainability of species due to extended power uprate. Extended power uprate does not involve any additional changes to the stability and integrity of ecosystems. Extended power uprate does not affect the previous conclusions on impingement or entrainment. Extended power uprate does not affect NMC's compliance with Sections 316(a) or 316(b) of the Federal Water Pollution Control Act.

Extended power uprate does not significantly change any doses to the public from radiological effluents, and offsite doses will continue to be well within regulatory limits. By Section 2.1.3 of the Safety Evaluation for the MNGP full term operating license, the NRC Staff concluded that "the release of radioactive material in liquid and gaseous effluents from the Monticello Nuclear Generating Plant will meet the requirements of 10 CFR 50 for keeping such effluent levels to unrestricted areas as low as practicable and will result in doses that are a small percentage of the 10 CFR 20 limits." The NRC Staff based this conclusion on assumptions for effluent releases that bound releases expected for extended power uprate. Occupational dose will be maintained well within regulatory limits, and changes in radiation levels will not significantly increase the dose to the MNGP work force. For accident dose, the methodology for certain design basis accidents was updated. This methodology is consistent with previously approved NRC Staff methods, and the resultant

dose is well within the applicable regulatory limits. Extended power uprate does not involve significant increases in the probability or consequences of previously evaluated environmental accidents.

This environmental evaluation has demonstrated that in most cases extended power uprate does not involve any environmental impacts that are different from those previously evaluated for the present power level. Where environmental impacts which differ from those previously evaluated have been identified, these impacts have been shown to be insignificant and well within regulatory environmental acceptance criteria.

11.0 REFERENCES

1. Northern States Power Company, Environmental Report, Monticello Nuclear Generating Plant, November 5, 1971

2. Final Environmental Statement Related to Operation of Monticello Nuclear Generating Plant Northern States Power Company Docket No. 50-263, United States Atomic Energy Commission Directorate of Licensing, November 1972

3. Northern States Power Company Environmental Report Supplement 1, Monticello Nuclear Generating Plant, April 4, 1972

4. "Section 316(b) Demonstration for the Monticello Nuclear Generating Plant on the Mississippi River at Monticello, Minnesota," NUS Corporation, Ecological Sciences Division, Pittsburgh, Pennsylvania, 1978

5. NUREG-1437, Vol. I, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," U.S. NRC Office of Nuclear Regulatory Research, May 1996

6. "Effects of a Heated Discharge on the Ecology of the Mississippi River: 316(a) Type 1 Demonstration on the Monticello Nuclear Generating Plant, Monticello, Minnesota," NUS Corporation, Ecological Sciences Division, Pittsburgh, Pennsylvania, 1975

7. MNGP Updated Safety Analysis Report, Rev. 24

8. "EMF Electric and Magnetic Fields Associated with the Use of Electric Power," June 2002, Prepared by the National Institute of Environmental Health Sciences and National Institutes of Health, Sponsored by the NIEHS/DOE EMF Rapid Program.

9. Letter from D. K. Davis, NRC, to L. O. Mayer, NSP, May 19, 1977

10. Letter from D. B. Vassallo, NRC, to D. M. Musolf, NSP, "Control of Heavy Loads (Phase I)," March 19, 1984

11. "The Environmental Consequences of Higher Fuel Burn-up," AIF/NESP-032, Atomic Industrial Forum, June 1985

12. Letter from D. G. Eisenhut, NRC, to L. O. Mayer, NSP, Issuance of Full Term Operating License DPR-22, January 9, 1981

13. Safety Evaluation By The Directorate Of Licensing U.S. Atomic Energy Commission For Northern States Power Company Monticello Nuclear Generating Plant Unit No. 1 Full Term Operating License, February 5, 1973

14. Letter from W. J. Hill, NSP, to NRC Document Control Desk, "Response to NRC Bulletin 96-02 Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, Or Over Safety Related Equipment," May 8, 1996

15. Monticello Nuclear Generating Plant, "Answers to DRL Questions of June 3, 1971," October 1971

16. Letter from L. O. Mayer, to D. L. Ziemann, NRC, "Appendix I Filing Supplement 1," July 21, 1976

17. Letter from T. Kim, NRC, to R. Anderson, NSP, "Environmental Assessment and Final Finding of No Significant Impact – Monticello Nuclear Generating Plant," August 27, 1998

18. Letter from T. Kim, NRC, to R. Anderson, NSP, "Monticello Nuclear Generating Plant – Issuance of Amendment RE: Power Uprate Program," September 16, 1998

19 NUREG-1437, Supplement 26, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 26, Regarding Monticello Nuclear Generating Plant, Final Report," August 2006

20 NUREG-1437, Volume 1, Addendum 1, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," Final Report, August 1999

21 2007 Resource Plan, Xcel Energy, December 14, 2007, J. Poferl (Xcel Energy) to B. Haar (Minnesota Public Utilities Commission), Docket No. E002/RP-07-1572

22. Federal Register Notice, 7/9/07, Part III Department of the Interior, Fish and Wildlife Service, 50CFR Part 17, Volume 72, No. 130, 37346-37372)

23. MNGP Environmental Monitoring Program, 2006-2007 Report, prepared by Xcel Energy Environmental Services

24. Letter from P. Tam, NRC, to J. Conway, NMC, "Monticello Nuclear Generating Plant – Issuance of Amendment RE: Full-Scope Implementation of the Alternative Source Term Methodology (TAC NO. MC8971)," December 7, 2006 (ADAMS ML062850049)

25. Minnesota's Federally Listed Threatened, Endangered, Proposed, and Candidate Species' County Distribution, December 2007

26. Higgins' Eye (PearlyMussel) Information, http://ecos.fws.gov/docs/life_histories/F009.html

27. Applicant's Environmental Report – Operating License Renewal Stage, MNGP, NMC, March 2005

28. U.S. Fish and Wildlife Service, Threatened and Endangered Species System (TESS), Minnesota Federal Listed and Candidate species, online query February 14, 2008

29. Memorandum from T. Palmisano, NMC to D. Stinnett, U.S. Fish and Wildlife Service, March 2, 2005, Table 2 "Threatened and Endangered Species Occurring in the Vicinity of MNGP and the Associated Transmission Corridors"

30. MNGP, "Monticello Nuclear Plant Individual Plant Examination for External Events (IPEEE) Submittal," November 1995

ENCLOSURE 4

31. "Identification of Risk Implications Due to Extended Power Uprate at Monticello," ERIN Engineering and Research , Inc., March 2008, Final

ENCLOSURE 4

ATTACHMENT A

MONTICELLO NUCLEAR GENERATING PLANT—EXTENDED POWER UPRATE

ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT OPERATIONS/ PERMIT RENEWAL SCHEDULE

Agency	Authority	Requirement	Number	Expiration Date	Renewal Frequency
Minnesota Department of Natural Resources[a]	Minnesota Statutes Chapter 103G.271	Water Appropriations Permit	67-0083	NA	Does not expire
Minnesota Department of Natural Resources[a]	Minnesota Statutes Chapter 103G.271	Water Appropriations Permit	66-1172	NA	Does not expire
Minnesota Department of Natural Resources	Minnesota Statutes Chapter 97A.401	Division of Fish and Wildlife Special Permit	14658	12/31/08	Yearly renewal
Minnesota Department of Natural Resources	Minnesota Statutes Chapter 97A.401	Division of Ecological Services Special Permit REMP mussel collection	12683	12/31/08	5-year renewal
Minnesota Pollution Control Agency	Minnesota Statutes Chapters 115 and 116	National Pollutant Discharge Elimination System (NPDES) Permit	MN0000868	9/30/12	5-year renewal
Minnesota Pollution Control Agency	Minnesota Statutes Chapters 115 and 116	NPDES (General Stormwater Permit for Industrial Activity)	MN G610000	9/30/12	Incorporated in the NPDES Permit during 2007 renewal process
Minnesota Pollution Control Agency	Minnesota Rules Chapter 7045.0225	Hazardous Waste Generator License	MND000686139	06/30/08	Yearly renewal

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Agency	Authority	Requirement	Number	Expiration Date	Renewal Frequency
Minnesota Pollution Control Agency	Minnesota Rules Chapters 7007.0150	Air Emission Permit	17100019-003	08/16/05	5-year renewal (permit renewal submitted 2/17/05 and remains in-process)[1]
City of Monticello	City of Monticello Ordinance Title 14, Chapter 4	Sanitary Sewer Wastewater Discharge Agreement	001	NA	Does not expire
Minnesota Pollution Control Agency	Minnesota Statutes Chapters 115 and 116	NPDES (State Disposal System (SDS) Permit)	MN0058343	9/30/12	Incorporated in the NPDES Permit during 2007 renewal process
Minnesota Department of Natural Resources	Minnesota Statues Chapter 103G.315 Minnesota Rule Chapter 6115.0200	"Work In Waters" Permit (State Dredging Permit)	67-0743	NA[b]	Does not expire; maintenance provision #8 requires written approval for each project
State of Tennessee Department of Environment and Conservation	TDEC 1200-2-10-.30	Radioactive Shipment License	T-MN002-L08	12/31/08	Yearly renewal
South Carolina Department of Health and Environmental Control	South Carolina ADC 61-83	South Carolina Radioactive Waste Transport Permit	0026-22-06	12/31/08	Yearly renewal
Utah Department of Environmental Quality	Utah Code Annotated, Title 19 Chapter 3; UAC R313-21	Generator Site Access Permit	0209 001 562	09/10/08	Yearly renewal

[1] Minnesota Rule 7007.0450, Subpart 3, "Continuation of an expiring permit," defines the conditions under which an existing permit does not expire pending reissuance of the permit.

ENCLOSURE 4

Agency	Authority	Requirement	Number	Expiration Date	Renewal Frequency
U.S. Army Corps of Engineers	Section 10 of the Rivers and Harbors Act of 1899; Section 404 of the Clean Water Act	"Work In Waters Permit"	01-02982-GP-GAE; coverage under Department of Army General Permit GP-001-MN	NA[b]	Not applicable; secure determination with each project on the river bed
U.S. Department of Transportation	49 USC 5108 (49 CFR 107.601)	Certificate of Registration for Transportation of Hazardous Materials	062707550034P	6/30/08	Yearly renewal
U.S. Fish and Wildlife Service	16 USC 703-712 (50 CFR Part 13 and 50 CFR 21.27)	Special Purpose Permit	MB074020-0	03/31/09	Three-year permit renewal cycle
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011 et seq.), 10 CFR 50.10	Facility Operating License	Unit 1 – DPR-22	09/08/30	Forty-year original term; 20-year license renewal approved

a. Original permit issued by Minnesota Department of Conservation in 1970. The Department of Conservation was renamed Minnesota Department of Natural Resources in 1971.

b. Expiration date not applicable for the master permit. In addition, there are no actions currently authorized.

CFR = Code of Federal Regulations

NA = Not Applicable

TDEC = Tennessee Department of Environment and Conservation

U.S. = United States

USC = United States Code

Enclosure 6 to L-MT-08-018

GE Hitachi Affidavit

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, Tim E. Abney, state as follows:

(1) I am Vice President, Services Licensing, Regulatory Affairs, GE-Hitachi Nuclear Energy Americas LLC ("GEH"). I have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in GEH Licensing Topical Report NEDC-33322P, "Safety Analysis Report for Monticello Constant Pressure Power Uprate", Revision 0, Class III (GEH Proprietary Information), March 2008. GEH proprietary information text in NEDC-33322P Revision 0 is identified by a dark red dotted underline inside double square brackets [[This sentence is an example.{3}]]. Figures and large equation objects containing GEH proprietary information are identified with double square brackets before and after the object. In each case, the superscript notation {3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GEH relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. above.

(5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GEH, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or subject to the terms under which it was licensed to GEH. Access to such documents within GEH is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2) above is classified as proprietary because it contains detailed results and conclusions regarding supporting evaluations of the safety-significant changes necessary to demonstrate the regulatory acceptability of the "Safety Analysis Report for Monticello Constant Pressure Power Uprate" for a GEH Boiling Water Reactor ("BWR"). The analysis utilized analytical models and methods, including computer codes, which GEH has developed, obtained NRC approval of, and applied to perform evaluations of Constant Pressure Power Uprate analysis for a GEH BWR.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GEH asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply

the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 28th day of March 2008.

Tim E. Abney
Vice President, Services Licensing
Regulatory Affairs
GE-Hitachi Nuclear Energy Americas LLC