ENVIRONMENTAL ASSESSMENT

XCEL ENERGY MONTICELLO NUCLEAR GENERATING PLANT UPRATE
MONTICELLO, MINNESOTA
PUC DOCKET NO. E002/CN-08-185
PUC DOCKET NO. E002/GS-07-1567

Prepared by:
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Abstract

The Project. Xcel Energy proposes to uprate the electrical generating capacity of the Monticello Nuclear Generating Plant (MNGP) from 585 megawatts electric to 656 megawatts electric (MWe). The uprate will occur in two phases – the first completed by 2009, the second by 2011. The 71 MWe uprate will be achieved by increasing the steam output of the nuclear reactor and capturing this additional output with improved electrical generation equipment and systems. Steam output will be increased through an increase in the number of new fuel assemblies replaced in the reactor core at each refueling.

The MNGP utilizes a boiling water reactor (BWR). In a boiling water reactor, a nuclear reaction in the reactor core generates heat, which boils water to produce steam inside the reactor vessel, which in turn is directed to turbine generators to produce electrical power. The steam is cooled in a condenser and returned to the reactor vessel to be boiled again. The cooling water is force-circulated by electrically powered feedwater pumps. Emergency cooling water is supplied by other pumps, which can be powered by onsite diesel generators.

Certificate of Need. This project requires a Certificate of Need (CON) from the public Utilities Commission (Commission) pursuant to sections 216C.05 to 216C.30. Xcel Energy filed an application for a CON with the Commission for the project on February 14, 2008, in accordance with Minnesota Rules Chapter 7829 and 7849. On April 10, 2008, the Commission accepted the application as complete (April 18, 2008 order).

The docket number for the certificate of need is E002/CN-08-185.

The Department of Commerce (Department) Office of Energy Security (OES) Energy Facility Permitting (EFP) staff prepares an Environmental Report (ER) on proposed large electric power generating plants that come before the PUC for a determination of need (Minn. Rules 7849.7100). The ER must contain information on the human and environmental impacts of the proposed project associated with the size, type, and timing of the project, system configurations, and voltage. The environmental report must also contain information on alternatives to the proposed project and address mitigating measures for anticipated adverse impacts.

ABSTRACT

Site Permit. The proposed uprate of the electrical generating capacity of the MNGP from 585 MW electric to 656 MW electric falls within the definition of a Large Electric Power Generating Plant in the Power Plant Siting Act and, thus, requires a Site Permit from the Commission prior to construction. The Chapter 7849 rules provide for three different procedures for obtaining a site permit: full review, alternative review, and local review.

Xcel Energy filed the LEPGP Site permit application on May 2, 2008. On May 8, 2008, the Commission accepted the application as complete (May 12, 2008 order).

The proposed MNGP power uprate qualifies for the alternative environmental review process (Minn. Rule 7849.5500) and Xcel Energy has applied for a site permit following the alternative review process.

The application is being reviewed under the Alternative Review Process of the Power Plant Siting Act (Minnesota Statutes 216E.001 to 216E.18). Under the Alternative Review Process, an applicant is not required to propose any alternative sites or routes, but must include in the application the same information required under the full process (Minn. Rule 7849.5220). The OES Energy Facility Permitting (EFP) staff holds a public information/scoping meeting, develops a scoping decision recommendation and prepares a document called an Environmental Assessment. The review process begins with the determination by the Commission that the application is complete. The Commission has six months to reach a decision under the Alternative Process from the time the application is accepted. The Commission must issue a certificate of need prior to issuing a site permit.

Environmental Assessment. Minnesota Rule 7849.7100 provides that in the event an applicant for a certificate of need for a LEPGP or a HVTL applies to the Commission for a site permit or route permit prior to the time the OES completes the environmental report OES may elect to prepare an environmental assessment (EA) in lieu of the required environmental report. If combining the processes would delay completion of the environmental review, the applicant and the Commission must agree to the combination. If the documents are combined, as they have been in these proceedings, OES includes in the EA the analysis of alternatives required by part 7849.7060, but is not required to prepare an environmental report under part 7849.7030.

Public Hearing. Minnesota Statutes § 216B.243, Subd. 4 require a public hearing be held for the CON to obtain public comments on the necessity of the project. In its April 18, 2008, order, the Commission referred the Certificate of Need docket (PUC Docket No. E002/CN-08-185) to the Office of Administrative Hearings to conduct a contested case proceeding (Minnesota Rules Chapter 1405). Thus, the hearing for the certificate of need will be a contested case hearing presided over by an ALJ. The ALJ will issue a report containing findings, conclusions, and a recommendation on whether the Commission should issue a certificate of need for the proposed project.

The public hearing required in the siting docket (PUC Docket No. E002/GS-07-1567) is governed by Minn. Rule 7849.5710, Subp. 2. This rule specifies a non-contested, less formal process.

Because the site permit application was filed so early in the CON process, efficiencies will be gained by coordinating the “public hearing” portion of the CON contested case proceeding with the public hearing required in the Alternative Review process. The “evidentiary hearing” portion of the CON contested case hearings would not be affected; it would be held separately.

Major Decisions. The first decision that will be made in this matter is a decision by the Public Utilities Commission whether there is a need for additional electric power. In the course of deciding whether additional electric power is needed, the Public Utilities Commission must also determine the size and type of any new facility to be constructed to meet the need that is found.

Xcel has proposed to meet the stated need in this case through an increase in capacity at the MNGP to of 71 MWe by increasing the amount of steam produced in the reactor. Higher steam flow from the reactor is achieved by operating the reactor at a higher thermal power level. The higher thermal output is obtained by increasing the number of new fuel assemblies in the reactor core at each refueling.

The Department has addressed a number of other ways that Xcel could meet the need for additional power. These include purchasing the power from someone else, using other fuels besides nuclear, upgrading other existing facilities, and building a new transmission line. With regard to each alternative, the Department has described the alternative, discussed the feasibility and availability of each alternative, and addressed the potential environmental impacts associated with each alternative.

If the Commission determines that there is a need for the requested additional power and that increasing the power capacity of an existing nuclear facility is in the best interest of the ratepayers to meet this need, it will issue a certificate of need for that particular size and type of project.

The second decision the Commission must make, will then be if the proposed MNGP site is an appropriate location for this type of project.

The only site under review in this proceeding is the MNGP. If the Commission issues a certificate of need for the Uprate, the MNGP will be the location. If the Commission finds that some other facility (i.e., type) is more appropriate, Xcel will have to start the permitting process over with an application for this other type of facility.

The Commission may include conditions in any Site Permit it issues for the MNGP Uprate project, if certain conditions are deemed necessary and appropriate. Additionally, any other permits or modifications to existing permits, that Xcel is required to obtain (e.g., water discharge, water appropriations, air emissions discharge, etc.) will include pertinent conditions designed to minimize the environmental impacts of the facility. But no other location for this type of facility is under consideration at this time.

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1.0 INTRODUCTION

Xcel Energy filed a Certificate of Need (CON) application with the Minnesota Public Utilities Commission (Commission) on February 14, 2008, for the Monticello Nuclear Generating Plant (MNGP) Uprate project. The PUC Docket No. for that proceeding is E-002/CN-08-185. On April 10, 2008, the PUC found the Xcel Energy CON application to be substantially complete.

The Department of Commerce (Department) Office of Energy Security (OES) Energy Facility Permitting (EFP) staff prepares an Environmental Report (ER) on proposed large electric power generating plants that come before the PUC for a determination of need (Minn. Rules 7849.7100).

On May 2, 2008, Xcel Energy filed a Site Permit application with the Commission for the MNGP Uprate project. The PUC Docket No. for that proceeding is E002/GS-07-1567. On May 8, 2008, the Commission accepted Xcel Energy's Site Permit application as complete. The application is being reviewed under the Alternative Review Process of the Power Plant Siting Act (Minnesota Statutes 216E.001 to 216E.18).

The OES prepares an environmental assessment on each proposed large electric power generating plant (LEPGP) being reviewed under the alternative permitting process (Minn. Rules 7849.5700).

In accordance with the Rules (Minn. Rules 7849.7100), the OES has elected to combine the environmental review documents for both the CON and the Site Permitting dockets into a single environmental assessment (EA).

Chapters 1 and 3 provide specific information about this document and the proposed project. Chapter 2 provides information on the regulatory process for both the Certificate of Need and the Site Permit processes. Chapters 4 describe and analyzes the alternatives to the proposed project that attempt to reduce, mitigate or eliminate the need for the proposed MNGP Uprate. This analysis of alternatives is required by Minnesota Rule 7849.0230 and 4410.7035 for the CON application. Chapter 5 addresses the human and environmental impacts, mitigative measures that can be implemented and the unavoidable impacts of the proposed project.

1.1 SOURCES OF INFORMATION

Much of the information contained within this document was provided by the applicant or the applicant's representatives in the form of: (1) the Application for Certificate of Need for the MNGP Uprate Project; (2) the Application for a Site Permit, MNGP Uprate Project; and (3) Correspondence with Xcel Energy. Additional information was obtained through governmental agencies and published data.

Additional sources of information are listed below:

- Minnesota Pollution Control Agency (http://www.pca.state.mn.us/)
- Minnesota Department of Natural Resources (http://www.dnr.state.mn.us/index.html)
- Minnesota Department of Health (http://www.health.state.mn.us/)
- U. S. Environmental Protection Agency (http://www.epa.gov/)
- Electric Power Research Institute (http://www.epri.com/default.asp)
- Nuclear Energy Institute (http://www.nei.org/resourcesandstats/nuclear_statistics/usnuclearpowerplants/)
- United States Nuclear Regulatory Commission, Power Uprates (http://www.nrc.gov/reactors/operating/licensing/power-uprates.html)
- Minnesota Geological Survey (http://www.geo.umn.edu/mgs/)
- Federal Emergency Management Agency (http://www.fema.gov/)
- U. S. Department of Energy, Energy Information Administration (http://eia.doe.gov/)
- Xcel Energy CON Application for the Blue Lake Generating Plant Expansion Project, January 16, 2004.
- Xcel Energy 2007 Minnesota Resource Plan, December 14, 2007 (http://www.xcelenergy.com/XLWEB/CDA/0,3080,1-1-1_41994_43524-2835-0_0_0-0,00.html).

Copies of Xcel Energy's CON and LEPGP Site Permit applications can be viewed and copied at the EFP web site at http://energyfacilities.puc.state.mn.us/Docket.html?Id=19542.

2.0 REGULATORY FRAMEWORK

2.1 NUCLEAR REGULATORY COMMISSION

When the Nuclear Regulatory Commission (NRC) issues a license for a commercial nuclear power plant, the agency sets limits on the maximum heat output, or power level, for the reactor core. This power level plays an important role in many of the analyses that demonstrate plant safety, so the NRC's permission is required before a plant can change its maximum power level. A "power uprate" only occurs after the NRC approves a commercial nuclear power plant's request to increase its power. The process for requesting and approving a change to a plant's power level is governed by 10 CFR 50.90-92.

As of January 2008, the NRC has approved 116 uprates, resulting in a gain of approximately 15,600 MWt (megawatts thermal) or 5,200 MWe (megawatts electric) at existing plants. Collectively, these uprates have added generating capacity at existing plants that is equivalent to more than five new reactors.

The design of every U.S. commercial reactor has excess capacity needed to potentially allow for an uprate, which can fall into one of three categories:

- **Measurement uncertainty recapture power uprates** are power increases less than 2 percent of the licensed power level, and are achieved by implementing enhanced techniques for calculating reactor power. This involves the use of state-of-the-art devices to more precisely measure feedwater flow which is used to calculate reactor power. More precise measurements reduce the degree of uncertainty in the power level which is used by analysts to predict the ability of the reactor to be safely shut down under possible accident conditions.
- **Stretch power uprates** are typically between 2 percent and 7 percent, with the actual increase in power depending on a plant design's specific operating margin. Stretch power uprates usually involve changes to instrumentation settings but do not involve major plant modifications.
- **Extended power uprates** are greater than stretch power uprates and have been approved for increases as high as 20 percent. Extended power uprates usually require significant modifications to major pieces of non-nuclear equipment such as high-pressure turbines, condensate pumps and motors, main generators, and/or transformers.

The Xcel Energy's proposed power uprate to the MNGP is an extended power uprate. An application is before the NRC at this time.

2.2 STATE REGULATORY PROCESS and PROCEDURES

Determination of Need

This project also required a Certificate of Need (CON) from the Commission pursuant to Minn. Stat. 216C.05 to 216C.30. Xcel Energy filed an application for a CON with the Commission for the project on February 14, 2008, in accordance with Minnesota Rules Chapters 7829 and 7849. On April 10, 2008, the Commission accepted the application as complete (April 18, 2008 order).

The docket number for the certificate of need is E002/CN-08-185.

The Department of Commerce Office of Energy Security (OES) prepares an Environmental Report (ER) on proposed large electric power generating plants that come before the PUC for a determination of need (Minn. Rules 7849.7100). The ER must contain information on the human and environmental impacts of the proposed project associated with the size, type, and timing of the project, system configurations, and voltage. The environmental report must also contain information on alternatives to the proposed project and address mitigating measures for anticipated adverse impacts.

Minnesota Rule 7849.7100 provides that in the event an applicant for a certificate of need for a LEPGP or a HVTL applies to the Commission for a site permit or route permit prior to the time the OES completes the environmental report OES may elect to prepare an environmental assessment (EA) in lieu of the required environmental report. If combining the processes would delay completion of the environmental review, the applicant and the Commission must agree to the combination. If the documents are combined, OES includes in the EA the analysis of alternatives required by part 7849.7060, but is not required to prepare an environmental report under part 7849.7030.

Once the record is complete, the docket will come before the Commission for the determination of a final decision on the need. If the Commission determines that there is a need for the requested additional power and that increasing the power capacity of an existing nuclear facility is in the best interest of the ratepayers to meet this need, it will issue a certificate of need for that particular size and type of project.

LEPGP Site Permit

The proposed uprate of the electrical generating capacity of the MNGP from 585 MW electric to 656 MW electric falls within the definition of a Large Electric Power Generating Plant in the Power Plant Siting Act and, thus, requires a Site Permit from the Commission prior to construction. The Chapter 7849 rules provide for three different procedures for obtaining a site permit: full review, alternative review, and local review.

The proposed MNGP power uprate qualifies for the alternative environmental review process (Minn. Rule 7849.5500) and Xcel Energy has applied for a site permit following the alternative review process.

The application is being reviewed under the Alternative Review Process of the Power Plant Siting Act (Minnesota Statutes 216E.001 to 216E.18). Under the Alternative Review Process, an applicant is not required to propose any alternative sites or routes, but must include in the application the same information required under the full process (Minn. Rule 7849.5220). The OES Energy Facility Permitting (EFP) staff holds a public information/scoping meeting, develops a scoping decision recommendation and prepares a document called an Environmental Assessment. The review process begins with the determination by the Commission that the application is complete. The Commission has six months to reach a decision under the Alternative Process from the time the application is accepted. The commission must issue a certificate of need prior to issuing a site permit.

Upon completion of the EA, a public hearing must be held pursuant to Minnesota Statute 216E.04, subd. 6 and Minnesota Rule 7849.5710. The hearing examiner is appointed to conduct the hearing, but the examiner need not be an Administrative Law Judge (ALJ). Members of the public have an opportunity to speak at the hearings, present evidence, ask questions, and submit comments. The Alternative Review Process does not include a contested case hearing proceeding.

On May 29, 2008, a public meeting was held by the Department OES staff at a facility in Monticello concerning both the CON and the Site Permit dockets. The purpose of the meeting was to discuss the project with interested persons and to solicit input into the scope of the EA. The public also had an opportunity to ask questions during informal discussions with company representatives. Seven members of the public attended the public meeting; two of whom took the opportunity to speak, both in support of the proposed project. The public was given until 5:00 pm June 9, 2008, to submit written comments. One comment letter was submitted; this letter expressed concerns over the safe operation of the plant, the handling and storage of radioactive wastes, and encouraged the use of alternatives such as wind, solar and hydro power sources.

After consideration of the public comments, the Commissioner of the Department issued a Scoping Order on June 10, 2008 (**Appendix A**).

Once the record is complete, the docket will come before the Commission for the determination of a final decision on siting; in this case the Commission must determine whether the proposed MNGP site is an appropriate location for this type of project.

The Commission may include conditions in any Site Permit it issues for the MNGP Uprate project, if certain conditions are deemed necessary and appropriate. Additionally, any other permits or modifications to existing permits, that Xcel is required to obtain (e.g., water discharge, water appropriations, air emissions discharge, etc.) will include pertinent conditions designed to minimize the environmental impacts of the facility.

An example of a large electric power generating plant site permit is shown in **Appendix B**.

3.0 PROJECT DESCRIPTION

The MNGP utilizes a boiling water reactor (BWR). In a boiling water reactor, a nuclear reaction in the reactor core generates heat, which boils water to produce steam inside the reactor vessel, which in turn is directed to turbine generators to produce electrical power. The steam is cooled in a condenser and returned to the reactor vessel to be boiled again. The cooling water is force-circulated by electrically powered feedwater pumps. Emergency cooling water is supplied by other pumps, which can be powered by onsite diesel generators.

Xcel Energy proposes to uprate the electrical generating capacity of MNGP from 585 megawatts electric to 656 megawatts electric (MWe). The uprate will occur in two phases, the first completed by 2009 and the second by 2011. The 71 MWe uprate will be achieved by increasing the steam output of the nuclear reactor and capturing this additional output with improved electrical generation equipment and systems. Steam output will be increased through an increase in the number of new fuel assemblies replaced in the reactor core at each refueling.

The MNGP is located within the city limits of Monticello, Minnesota, in Wright County, on the western bank of the Mississippi River, in Section 32, T–122N, R–25W, at 45° 20’ N latitude and 93° 50’ W longitude, approximately 50 miles northwest of Minneapolis/St. Paul (**Figure 3-1**).

The plant site consists of approximately 2,150 acres of land owned by Northern States Power. A portion of the property extends across the Mississippi river into Sherburne County; the physical plant is on the western bank in Wright County. **Figure 3-2** shows the plant site boundaries.

The MNGP received its initial operating license from the NRC in September 1970. The initial license was for a period of 40 years and was scheduled to expire in 2010. The initial license has subsequently been renewed with the NRC for an additional 20 years. The renewed license expires in September 2030.

The implementation of the power uprate is proposed to take place during each of the next two routine refueling outages (2009 and 2011). The modifications completed during the 2009 refueling outage would increase output by approximately 15 MW, and the modifications completed during the 2011 refueling outage would increase output by approximately 56 MW.

3.1 PURPOSE AND NEED

In response to Xcel Energy’s 2004 Resource Plan, the Commission approved Xcel Energy’s request to pursue a package of uprates, including the Monticello project, as part of an effort to meet an identified base load need (energy and capacity) projected in the 2004 Resource Plan.

Following the passage of the major energy policy initiatives of the 2007 legislative session, the Commission granted Xcel Energy’s request to defer implementation of the Monticello project (and others) pending the reevaluation of future needs in an expedited 2007 Resource Plan.

As stated in Xcel Energy's 2007 Resource Plan filed on December 14, 2007, even after planned implementation of the 2007 legislative energy initiatives, Xcel Energy's capacity needs continue to grow at over 1 percent per year. This continued growth creates a 126 MW capacity deficit starting in 2010 that ultimately grows to over 2,800 MW by 2022.

Incorporation of the Renewable Energy Standard (RES) adds a significant amount of wind energy to Xcel Energy's system, but it does not meet the needed capacity of the system. Xcel Energy believes that the addition of the MNGP uprate project is the most cost-effective and the most emission friendly resource available to add the needed capacity.

3.2 DESCRIPTION of POWER GENERATING EQUIPMENT and PROCESSES

The MNGP is a boiling water reactor. In a boiling water reactor, a nuclear reaction in the reactor core generates heat, which boils water to produce steam inside the reactor vessel, which in turn is directed to turbine generators to produce electrical power (**Figure 3-3**). The steam is cooled in a condenser and returned to the reactor vessel to be boiled again. The cooling water is force-circulated by electrically powered feedwater pumps. Emergency cooling water is supplied by other pumps, which can be powered by onsite diesel generators

Nuclear fuel is fabricated by General Electric (GE) and transported to the plant by truck. GE was the original plant designer and has supplied the plant with almost all of its fuel.

A fuel assembly consists of a fuel bundle and a channel that surrounds it. Fuel rods are spaced in a square array secured by means of stainless steel upper and lower tie plates. Each fuel assembly is 5.28 by 5.28 inches wide and up to 172 inches long. **Figure 3-4** shows a representation of a typical fuel assembly used at the MNGP.

Each fuel rod within the assembly consists of high-density ceramic uranium dioxide fuel pellets, each about the size of a thimble, stacked in a tube made of a special alloy of steel called Zircaloy. The air in the filled tube is evacuated, helium (an inert gas) is backfilled, and the fuel rod is sealed by welding Zircaloy plugs in each end. Each fuel assembly consists of standard fuel rods, part length fuel rods and tie rods. Standard rods contain the nuclear fuel, and part length rods are fuel rods that extend to an intermediate point in the assembly. Tie rods are included to provide support to the assembly.

Fuel assemblies also contain water rods. Water rods are hollow Zircaloy tubes with several holes located at each end to facilitate water flow through the assembly. Fuel assemblies also contain spacers, springs and other components. A Zircaloy channel encloses the fuel bundle. The channel provides guidance and a bearing surface for the control rod, permits control of coolant flow, and provides mechanical support and protection during fuel handling operations.

The plant's reactor core is comprised of 484 fuel assemblies, arranged in 121 cells. Each cell contains 4 fuel bundles or assemblies and a control blade. Approximately every two years, the plant is shut down to refuel the reactor. Between refueling outages, the plant typically operates at full output around the clock.

At current power level of 1775 MWt (585 MWe) approximately 150 of the 484 fuel bundles are replaced during refueling. Projections under power uprate conditions of 2004 MWt will require on average approximately 173 of the 484 fuel bundles to be replaced during refueling. Each individual nuclear fuel assembly provides heat for three fuel cycles or about a six-year period before its output declines to the point it is replaced to maintain the desired plant output level. These spent nuclear fuel assemblies are then removed from the reactor and stored in the spent fuel pool to cool and are ultimately placed in dry storage casks and moved to the Independent Spent Fuel Storage Installation (ISFSI).

3.3 DESCRIPTION of PROPOSED POWER UPRATE and PLANT MODIFICATIONS

The power uprate at the MNGP will be achieved by: 1) increasing the amount of steam produced in the reactor; and 2) improving the balance-of-plant equipment that converts the steam into electricity. To obtain the higher steam flow the reactor will be operated at a higher thermal power level. The additional heat is achieved primarily by increasing the number of new fuel assemblies replaced in the reactor core at each refueling. This is done without increasing the operating reactor pressure and without changes to the fuel design or fuel design limits.

The goal of the current power uprate project is to increase the thermal power to 120 percent of the original licensed thermal power (OLTP). This power uprate would increase reactor power from the current licensed thermal power level of 1775 MWt to 2004 MWt. The corresponding increase in net generator output is estimated at 71 MWe for a nominal net electrical output delivered to the grid of 656 MWe. The project would take place over two refueling outages and would require very few modifications to the reactor and the reactor support systems that produce steam.

The balance of plant systems that convert the steam produced in the reactor to electricity however will need significant modifications. These modifications would be made during the planned 2009 and 2011 refueling outages. Some of the more significant balance-of-plant changes will be the replacement or modifications to the high-pressure and low-pressure turbines; replacement of the condensate demineralizer and a number of condensate pumps and motors; replacement, or modification, of the steam dryer; replacement of a number of feedwater pump and motors and related equipment.

The current average annual heat rate for the MNGP requires 10.340 mbtu/MWh. The anticipated average annual heat rate following completion of the power uprate is 10.425 mbtu/MWh. A license amendment to the MNGP operating license addressing the safe operation at the higher thermal power level will be reviewed and approved by the NRC prior to increasing the thermal power level of the reactor.

The reactor output at the MNGP will increase as a result of increased thermal power (steam production) due to the increased number of new fuel assemblies replaced in the reactor core at each refueling and changes in the fuel loading pattern. However, no changes in the mechanical design of the fuel or fuel design limits are required to implement the uprate.

To take advantage of the increased steam output, a number of "balance-of-plant" improvements will be required to the systems that convert the steam produced in the reactor to generate additional electricity.

The major modifications include the following items; however, additional smaller scope modifications may be identified during the detailed engineering phase of the project.

Replacement of the High Pressure Turbine Section (2009). The entire rotating element and diaphragm assemblies of the high-pressure turbine will be replaced with higher capacity components to accommodate the increased steam flow rate.

Modification of the Low Pressure Turbine Sections (2009). Several of the low-pressure turbine stages will be modified to accommodate the increased steam flow rate. This includes replacing various stage diaphragms and casing bolting.

Condensate Demineralizer Replacement (2009). Additional condensate flow is required to support the power uprate. The existing demineralizer vessels will be replaced with larger ones.

Upgrades to Isophase Bus Duct Cooling System (2009). The isophase bus conducts the electrical output of the main generator to the main transformer. Heat loads in the isolated phase bus duct will increase with the higher power levels that will result from the uprate creating a need to increase the cooling capability of the isophase bus ducts.

Replacement of Condensate Pump and Motor (2011). Condensate pumps move water from the hot well of the condenser to the reactor feed water pumps. The reactor feed water pumps supply water to the reactor where it is heated to produce steam. In order to meet the increased demand for water to the reactor feed water pumps the condensate pumps will be replaced with different models to satisfy the increased flow and head requirements of the suction side of the reactor feed water pumps as a result of the extended power uprate.

Upgrade of Offsite Power Supplies to Power Larger Plant Loads (2011). In order to provide power for the new reactor feedwater pumps/motors and new condensate pumps/motors and improve the reliability of the onsite auxiliary electrical distribution system, a new 13.8 KV bus and new 1R and 2R transformers and distribution systems will be installed.

Replacement, or Modification, of the Steam Dryer (2011). The steam dryer is a component inside the reactor that removes water in liquid form from the steam before it goes to the turbine (water in liquid form could damage the turbine). Vibrations and the resulting stresses incurred by the steam dryer increase as a result of power uprate. Therefore, instrumentation was installed during the 2007 outage to assess the current loading on the steam dryer. The ability of the existing steam dryer to withstand the additional stresses that will result from the uprate will be analyzed and a decision to modify or replace the steam dryer will be made at a later date.

Rewind of the Main Generator Stator (2011). The existing main generator stator would be above mechanical and electrical design limits at the proposed power uprate levels. The stator will be rewound to satisfy the new design requirements at the uprated power conditions.

Replacement of Feed Water Pumps and Motors (2011). Reactor feed water pumps supply water to the reactor where it is heated to produce steam. In order to meet the increased demand for water to the reactor, more reactor feed water pump capacity is needed. In order to meet the increased demand for both steady-state and transient conditions, the feed water pumps and motors are being replaced with different models.

Feedwater Heater Drain Cooler Capacity (2011). Feedwater heaters increase the temperature of the water that is being returned from the condenser to the reactor. With the increased flow of steam and water through the primary side of the feedwater heat exchangers, the capacity on the secondary sides of two of the heat exchangers need to be increased. Increasing the capacity is accomplished by increasing the outlet drain capacity on two of the feedwater heaters.

The power uprate will not require the construction or modification of any building footprint, access roads, parking areas, or lay down areas. To assure the reliability of the onsite auxiliary electrical distribution system, the uprate will require a new 13.8 kV bus and two new transformers at the plant.

3.4 SPENT FUEL PRODUCTION

Approximately every two years, the MNGP is shut down to refuel the reactor. Between refueling outages, the MNGP typically operates at full output around the clock. At the current power level of 1775 MWt, approximately 150 of the 484 fuel bundles are replaced during refueling. The increased power level to 2004 MWt proposed under the power uprate project would increase the fuel bundles being replaced during each refueling to approximately 173 of the 484. This would result in a total of approximately 230 additional fuel assemblies being produced over the remaining operating license period as a result of the power uprate.

Considering the space available in the spent fuel pool, three new dry storage casks may be necessary to support operations until 2030 due to the power uprate project. The three additional dry-storage casks do not become necessary until approximately the 2025. Xcel Energy is not requesting approval for the additional storage casks at this time.

3.5 FUEL SUPPLY

Availability of uranium to support the continued operation of the MNGP with power uprate is not an issue. The Organization for Economic Cooperation and Development (OECD) and the International Atomic Energy Agency (IAEA) in 2005 jointly produced a report on uranium resources.[1] The report states that uranium resources are adequate to meet the needs of both existing as well as new reactors anticipated in the next decade. The agencies base their conclusion on official projections from 43 uranium-producing countries, as well as independent studies by the agencies.

3.6 WATER USE

Groundwater use for the facility is permitted by the MDNR water appropriations permit number 67-0083. The permit pertains to two water wells, each equipped with a 100-gpm capacity pump that are connected together and are regulated under a single water appropriations permit with a withdrawal limit of 200 gpm.

From 1998 to 2006, actual usage averaged less than 38 gpm. The two permitted wells provide domestic potable water to the plant administration building, raw water to the reverse osmosis/make-up demineralizer system, and seal water to pumps at the plant intake structure.

There are four additional wells operated at the facility for potable and nonpotable uses similar to those above. However, these wells have usage below 10,000 gallons per day and are not required to have a water appropriation permit. The power uprate project would not affect the two well water permits.

Cooling water for the MNGP is primary drawn from the Mississippi River. Surface water use is permitted by the MDNR under a surface water appropriation permit. The permit allows withdrawal of up to 645 cfs (or 290,000 gpm) of water from the Mississippi River, with special operating conditions if the river flow is less than 860 cfs, and further restrictions if river flow is 240 cfs or less.

Surface water is used for plant condenser cooling and auxiliary water systems, such as service water cooling, intake screen wash, and fire protection. Under typical river conditions, the circulating water system removes heat from the MNGP condenser by the once-through circulating water system. If necessary to maintain discharge temperatures, or under certain discharge canal temperature, river temperature, and/or river flow conditions, the circulating water system can use two mechanical draft cooling towers in partial or complete recirculation of the cooling water to maintain compliance with permit limits. Less than 2 percent of the water withdrawn from the Mississippi River for cooling is lost to the atmosphere due to both open cycle evaporative losses and cooling tower evaporation and drift. Currently, total water consumption at the MNGP is estimated to be approximately 6,800 acreft/year (9.4 cfs) assuming

[1] http://www.nea.fr/html/general/press/2006/2006-02.html

130 days of cooling tower operation, 235 days of open-cycle operation and nominal values of cooling tower flow.

Following the uprate project, total water consumption at the MNGP is estimated to be 7,700 acre-ft/year (10.6 cfs); this assumes 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.

Using the maximum surface water appropriation limit of 645 cubic feet/second as the cooling tower flow value would result in an estimated total water consumption of 8,700 acre-ft/year (12 cfs). Thus, the uprate project will not involve any changes to the water appropriation requirements of the surface water permit.

3.7 WASTEWATER

The MNGP project will not result in any increase in wastewater discharges beyond those allowed under the current applicable permit. Wastewater discharges are regulated by the State of Minnesota. The National Pollution Discharge Elimination System (NPDES) permit is periodically reviewed and re-issued by the Minnesota Pollution Control Agency (MPCA). The NPDES permit for the MNGP, permit number MN0000868, expired on July 31, 2007. The MPCA issued a new NPDES permit on October 16, 2007. The NPDES permit authorizes discharges from five outfalls and requires monitoring at the river water intake. The outfalls and their effluent limits are listed in **Table 3-1**. The only outfall to be affected by the power uprate is outfall SD 001, which will see a slight increase in circulating water discharge temperature.

No changes to the permit requirements, other than administrative and descriptive changes, are necessary to implement power uprate. None of the limits listed in Table 3-1 will require modification.

The uprate project will result in slight increases in circulating water outlet temperature, but these increases will not exceed the limits currently established by the MPCA and will not result in any significant impacts to the environment.

3.8 ELECTRICAL INTERCONNECTION

The Midwest Independent System Operator (MISO) has not yet definitively determined whether the transmission system will need to be upgraded to support the uprate. However, the most recent feasibility study of the transmission system indicates that transmission system improvements *may* be required to support the uprate. A feasibility study for the MNGP power uprate was performed by Xcel Energy in a manner consistent with the Mid-Continent Area Power Pool (MAPP) Design Review Standards (DRS) and MISO practices for interconnection and transmission studies. This feasibility study does not 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 from the project. For example, final results may change depending on which generation projects (and corresponding transmission improvements) listed in the MISO interconnection queue ahead of the MNGP uprate project actually progress to construction.

The power uprate will not require Xcel Energy to construct or modify any building footprint, access roads, parking areas, or lay down areas. To assure the reliability of the onsite auxiliary electrical distribution system, the uprate will require a new 13.8 kV bus and two new transformers at the plant.

3.9 OTHER PERMITS

As previously discuss, in order to increase the generating capacity of the MNGP, Xcel Energy must comply with three principal sets of requirements.

- A Certificate of Need authorizing the increase must be obtained from the Minnesota Public Utilities Commission (Minn. Stat. §216B.243, Minn. R. Part 7849);
- A site permit authorizing the increase must be obtained from the Minnesota Public utilities Commission or local unit of government (Minn. Stat. § 216E.03),6 and
- A license amendment from the United States Nuclear Regulatory Commission must be obtained authorizing the plant to operate

In addition to the State and Federal permits mentioned above, the project will require interconnection approval and an updated transmission service agreement with the MISO. On January 10, 2007, Xcel Energy filed the required Generation Interconnection Agreement with MISO to cover the 2009 expected capacity increase of 15 MW (Q:39099-01).

In September 2007, the Company also filed a transmission service request (TSR) with MISO to increase our network resources for up to 621 MW to accommodate the MW increase. On December 7, 2007, Xcel Energy filed a second-generation interconnection request to interconnect the 56 MW expected in 2011, and the necessary TSR for the additional 56 MW of network resources beginning in 2011.

Since the CON and LEPGP Site permit requests are to expand an existing plant, the plant already possesses a number of permits necessary to operate, such as Air Quality Permits, Water Appropriations, and Wastewater Discharge Permits. After reviewing the permit limits in relation to the planned uprate, it is not anticipated that any of the operating permits will require amendments due to the power uprate.

If a site permit is issued, no other zoning, building or land use rules by a regional, county or local government shall apply. See Minn. Stat. **§** 216E.10.

4.0 PROJECT ALTERNATIVES

Under Minn. Rules part 7849.7060, subpart 1, the Environmental Report must include certain items with regards to the alternatives that are considered. These items include a general description of the alternatives considered, an analysis of the potential human and environmental impacts of these alternatives and possible mitigative measures, and an analysis of the feasibility and availability of each alternative. In this case the scoping order identifies the following alternatives that will be analyzed in this document: the no build alternative, demand side management, purchase power, alternative fuels (fossil fuel technologies and renewable resource technologies), up-grading existing facilities, and new transmission. Each of these alternatives is addressed in turn below.

4.1 NO-BUILD ALTERNATIVE

The no-build alternative means that the MNGP power uprate project is not undertaken. Electric power will continue to be supplied in the manner and with the facilities that are presently in existence.

Impacts. Often, in conducting environmental review, the analysis of the no-build alternative involves a discussion of the environmental impacts of continuing the status quo. For example, with a proposed highway project, the no-build alternative would take into account the impacts associated with continuing to have traffic increase along existing roads and highways and for development to occur along these existing arteries.

When a certificate of need is required for a proposed project, however, the no-build alternative takes on a different aspect. If the Commission determines that the need for additional power has not been established, no certificate of need will be issued and nothing new will be constructed. Whatever impacts would result from the expansion of the MNGP will not occur.

If Xcel Energy establishes that there is a need for additional power, but no new facility is authorized, the potential impacts are twofold. One, there could be a shortage of electricity, with all the ramifications that result from a shortage of electricity on hot days in the summer. Two, the electricity will come from someplace else, with the impacts that result from the generation and transmission of electricity from these other sources. These impacts are explored below with the various alternatives.

One impact of not building the proposed facility is that anticipated wages and tax revenues to the local economy would be lost. In the Certificate of Need application, Section 7, Xcel Energy discusses the socioeconomic impacts associated with the proposed project. It is anticipated that the MNGP power uprate project will provide significant tax benefits - local, state and federal. It is estimated that the local property tax benefits due to the project will results in an additional $1.2 million annually and will result in a one-time payment of approximately $4.5 million in Minnesota state sales taxes for equipment. In addition, the project will result in increased state and federal income taxes being paid by Xcel Energy of an estimated $30.5 million over the life of the project.

Monticello does not emit significant levels of any of the criteria pollutants or green house gases that are emitted from coal or other fossil fuel burning plants. The MNGP project will result in over 6.2 million less tons of carbon being emitted to the atmosphere as compare to the next "best" alternative - a natural gas combustion turbine (CT).

Feasibility and Availability. The no-build alternative is not one that requires any analysis regarding its feasibility or availability. If the power uprate project were not to be undertaken, Xcel Energy would experience a deficit starting in 2010 that would grow to almost 2,900 MW by 2022. Xcel Energy believes that if the MNGP project or an alternative is not undertaken, that this would place Xcel Energy in opposition to their requirement to provide safe, adequate and reasonable electric service pursuant to Minn. Stat. § 216B.04.

4.2 DEMAND SIDE MANAGEMENT

Demand side management (DSM) is the practice of reducing customers' demand for energy through programs such as energy conservation and load management so that the need for additional generation capacity is eliminated or reduced. More detail on Xcel Energy's conservation and load management programs is available in Appendix C of Xcel Energy's Certificate of Need Application, dated February 14, 2008.

The Next Generation Energy Act of 2007 approximately doubled the DSM goals approved in Xcel Energy's 2004 Resource Plan. The Act sets a mandatory minimum savings goal from Conservation Improvement Programs, or "CIP", programs at 1.0 percent and an overall conservation goal of 1.5 percent.

Xcel Energy has stated that it is committed to achieving a 1.1 percent energy reduction as our CIP/DSM goal. Meeting this goal will be very challenging. Xcel Energy will likely launch new conservation programs as well as expand existing programs to meet the 1.1 percent target. Such aggressive expansion of DSM programs pushes the limits of achievable potential in the Xcel Energy service territory and creates significant uncertainty regarding the size and timing of actual savings. Until Xcel Energy implements their plan to meet the 1.1 percent target and gained some experience operating a significantly larger DSM portfolio, it is unreasonably risky to rely on increased DSM in order to replace the energy and capacity from the MNGP uprate project. If the DSM alternative was selected and the company failed to achieve the necessary savings, Xcel Energy would be forced to buy replacement capacity and energy from the market.

Impacts. Demand side management can minimize environmental effects by avoiding the construction and operation of new generating facilities. Those impacts that would result from the construction of the proposed facility, or from the supply of the additional power through other means, would be avoided if DSM were sufficient to reduce the need for additional power.

Feasibility and Availability. A determination of whether demand side management can reduce the anticipated need for additional power is what the Public Utilities Commission will determine in the certificate of need proceeding. A conclusion that DSM will eliminate the need for additional power is essentially a decision to deny the requested certificate of need.

The only information reviewed for this document regarding the feasibility of DSM is that information provided by Xcel Energy in its Certificate of Need Application, dated February 14, 2008. Xcel Energy concludes in its application that DSM is not a feasible alternative to the proposed project.

According to Xcel, the demand for electrical power will continue to grow at an average rate of 2.6 percent per year or an average of an additional 240 MW for the Xcel Energy service area each year. The methodology used to develop the forecast demand and other forecast details required by Minnesota Rules part 7849.0270 were described in Appendix B of the CON application.

Xcel Energy's current DSM program has achieved 50 to 100 MW of demand reduction per year. Xcel has in place over 800 megawatts of load management opportunities. Xcel Energy is in compliance with the demand side management (DSM) goals as ordered by the Commission in the 2000 Resource Planning process.

Xcel also notes that it has been experiencing some difficulty in maintaining its customer base for its load management programs. New customers are being signed up for these programs, but Xcel Energy has seen an increase in the dropout rate of current customers.

Additionally, the project proposed here is intended to address the peak demands for power in the hot summer months. DSM is designed to reduce the demand for power over long terms. Also, Xcel maintains that the additional power will be required in the summer of 2005. It is not practical to expect that the results of the program can be doubled or tripled in less than a year, the time remaining after the result of the Commission's Need decision

4.3 PURCHASE POWER

Purchased power is exactly what it says – the purchase of electricity from another entity. Utilities like Xcel Energy enter into power purchase agreements with other generators of electricity. A power purchase agreement is a contract between a wholesale supplier of electricity and an entity that sells the energy to retail consumers. Xcel Energy has a form power purchase agreement at the following webpage:

http://www.xcelenergy.com/docs/corpcomm/RDFpowerPurchAgrmt.pdf

In addition to generating electricity at its 22 major generating plants in Minnesota, Wisconsin, and South Dakota, Xcel Energy relies on both short-term and long-term power purchase agreements to satisfy the demand for electricity in its Minnesota service area and to meet the

Mid-Continent Area Power Pool (MAPP) capacity reserve requirements. (MAPP requires power suppliers to have sufficient accredited generation capacity to provide 15% reserves above the actual summer peak demand.) Short term power purchase agreements are normally for a two or three month period, often the summer peaking time. Long term agreements usually provide for the purchase of power over a ten or even twenty year period.

Xcel has traditionally made long-term purchases and generation capacity additions to meet a median (50^{th} percentile) demand forecast and then has augmented those resources with short term seasonal purchases to cover to the 80^{th} to 90^{th} percentile forecast.

Impacts. The environmental impacts associated with the purchase of electricity depend for the most part on how the electricity that is purchased was generated. Presently, Xcel purchases significant amounts of electricity in the summertime. This electricity comes from various sources, including some from coal-fired power plants and some from hydro facilities. It is difficult to discuss with any specificity what the comparable impacts are at this juncture.

Feasibility and Availability. The feasibility and availability of short term and long power purchase agreements are discussed separately below. The information is taken from Xcel Energy's certificate and Xcel Energy's 2007 Resource Plan.[2]

Short Term Power Purchase Agreements. At this time Xcel Energy believes it cannot rely on short-term seasonal power purchases from distant utilities to meet its reliability obligations. The main reason for this is the significant uncertainty about regional transmission capacity now and into the future. Historically, Xcel Energy has depended on short-term power purchases to cover about the last 5 to 10 percent of their projected capacity and energy needs. Notwithstanding the uncertainty of regional transmission concerns, Xcel Energy believes that this level of short-term power purchases can be achieved for the near future. The 2007 Resource Plan incorporated 750 MW of short-term purchases.

Long Term Power Purchase Agreements. Xcel Energy believes that it does not appear that the long-term market can meet the project's primary objectives because of transmission constraints and lack of unconstrained generation capacity available in the near-term.

4.4 ALTERNATIVE FUELS

One of the issues to be examined in the Environmental Assessment is the possibility of using a different energy source than the one proposed by the project proposer. In this case Xcel Energy has proposed to increase the capacity at an existing nuclear generating facility. In Appendix D of its Certificate of Need Application, Xcel Energy addressed to some extent a number of other possible types of facilities including Fossil-Fuel technologies, Renewable Resource Technologies, Composite Resource Technologies and Developing Resource Technologies. Although no specific project is reviewed in this screening analysis, the various technologies are evaluated on their applicability, reliability, economics, and environmental performance.

[2] http://www.xcelenergy.com/XLWEB/CDA/0,3080,1-1-1_41994_43524-2835-0_0_0-0,00.html

4.4.1 FOSSIL-FUEL TECHNOLOGIES

Fossil fuel technologies considered in the screening included: integrated gasification combined cycle (IGCC); coal-fired boiler, and natural gas-fired advanced combined cycle. These units have similar operating characteristics to the MNGP project and are potentially viable alternatives.

Supercritical Pulverized Coal-Fired boiler. A supercritical pulverized coal-fired steam power plant consists of a steam boiler, a steam turbine and an electric generator side. In the simplest terms, steam is generated when water is heated by the thermal energy released when pulverized coal is burned in the boiler. The steam from the boiler is piped to, and drives, a steam turbine, which in turn drives an electric generator. The term “supercritical” refers to a particular range of thermodynamic conditions (pressure and temperature) under which such a plant is designed to operate. Supercritical boilers are typically several percentage points more efficient than boilers not designed to operate under supercritical conditions.

Integrated Gasification Combined Cycle (Coal). An integrated gasification combined cycle (IGCC) power plant consists of a coal gasifier, a combustion turbine, a heat recovery steam generator and a steam turbine. In the gasifier, coal is heated to produce a “syngas” that is burned in a combustion turbine that turns a generator to produce electricity. Waste heat in the exhaust gases from the combustion turbine are used to produce steam in a heat recovery steam generator. Steam from the heat recovery steam generator is piped to, and drives, a steam turbine, which in turn drives an electric generator also.

Natural Gas Combined Cycle. A gas-fired combined cycle power plant is a combination of combustion turbine technology, heat recovery and electric generation. In the combustion turbine, incoming air is compressed and mixed with the natural gas fuel. Igniting this mixture results in an expansion of gases (the combustion products and excess air) through a power turbine that in turn drives an electric generator. Hot exhaust gases exiting the combustion turbine pass through a heat recovery steam

Natural Gas Simple Cycle. A simple cycle power plant uses natural gas as its primary fuel and may use fuel oil as a backup fuel during times of gas supply interruption. A simple cycle combustion turbine is less expensive per kW of capacity and also significantly less efficient than a combined cycle facility because the heat from the combustion turbine exhaust gases is not recovered for secondary electric generation from a steam turbine.

Impacts. Environmental impacts refer to the effects the alternative is expected to have on the environment. Potential environmental impacts associated with fossil-fuel generation technologies include air emissions, effects on land, water consumption, wastewater generation, noise, aesthetics, and traffic.

Pulverized coal-fired plants typically operate in a range of 32 to 35 percent efficiency. When designed for supercritical operating conditions, a pulverized coal-fired plant can be up to 37 percent efficient. The direct environmental impacts of coal burning include air emissions, solid waste (ash) generation, waste-heat discharge to air and water, and rail or barge traffic. Typical carbon dioxide emission rates for new supercritical pulverized coal units are in the range of 200 lb CO_2 per million btu heat input.

IGCC plants are predicted to typically operate in the range of 35 percent to 40 percent efficiency. The direct environmental impacts of coal gasification include air emissions, solid waste (ash) generation, waste-heat discharge to air and water, and rail traffic. Without CO_2 sequestration, an IGCC plant is projected to have similar CO_2 emissions to a supercritical pulverized coal generating plant (in the range of 200 lb CO_2 per million btu fuel consumed).

Environmental impacts show distinct advantages for a natural gas combined-cycle project vs. a coal-fired plant. The energy efficiency for a combined cycle plant can be expected to be in the range of 45 to 50 percent with the efficiency of an advanced combined cycle plant exceeding 50 percent. The direct environmental impacts of operating a natural gas combined-cycle plant include air emissions, wastewater discharge, waste heat discharge to air and water and the potential for on-site ammonia storage if post-combustion NOx control is required. Air emissions from an advanced gas-fired combined cycle plant are lower than that of a coal-fired plant, especially in terms of SO_2 and CO_2 (150 lbs per mmbtu of fuel input). A gas-fired combined cycle plant does not produce any ash.

Environmental impacts would not show a distinct advantage for a natural gas simple cycle turbine-driven project vs. a natural gas combined-cycle plant. The energy efficiency for simple cycle combustion turbine generator can be expected to be in the range of 25 to 30 percent. The direct environmental impacts of operating a simple cycle plant burning natural gas include air emissions, waste heat discharge via the stack and the potential for on-site ammonia storage if post-combustion NO_x control is required.

Feasibility and Applicability. Applicability of the technology refers to the technology's appropriateness for the Applicant's stated purpose and need, including operational mode. One of the objectives of the MNGP project is to provide energy and capacity for base load service (i.e., operational mode). Base load resources normally operate in the range of 50 percent to 100 percent annual capacity factor, with typical capacity factors of newer base load resources being in the range of 80 percent to 90 percent. Base load resources generally have few starts per year (<10) and may be operated at reduced output levels to follow system load during off-peak periods.

An important factor relating to the feasibility of an alternative is its implementation time. The primary activities that affect implementation time are obtaining necessary regulatory approvals, acquiring necessary transmission services, negotiating financing agreements, selecting and acquiring a site, design and engineering, procuring, construction, and testing facility equipment.

Although the fossil fueled alternatives have similar operating characteristics, the IGCC, coal, and natural gas combined cycle units cannot be built to the appropriate 71 MW scale and none could be constructed in time to meet the 2011 capacity need. Additionally, the advanced combined cycle is currently not a commercially viable technology.

Natural gas simple cycle plants are typically employed for peaking duty and are not well suited to economically meet intermediate and base load needs. Simple cycle combustion turbine generators exceeding 20 percent capacity factor would likely defer to intermediate load facilities or be considered for conversion to a combined cycle unit. Advantages of simple cycle turbine generators include flexibility in siting, relatively low capital cost and, a relatively short construction period.

At the expense of dispatch economics, a simple cycle plant can generally demonstrate high reliability (both the adequacy and security aspects). A simple cycle combustion turbine facility may utilize fuel oil as a backup to address the potential interruption of natural gas supply. However, environmental permitting may be substantially complicated if fuel oil is utilized as a back-up fuel due to the potential for higher air emissions related to there being more sulfur in fuel oil than in natural gas. This consideration limits siting flexibility for additional units at existing peaking plant sites and/or near areas that have little available room to permit any additional air emissions.

The total capital requirement for a simple-cycle gas-fired combustion turbine power plant installation is much lower than for other fossil-fuel technologies. However, the typical energy cost for a simple-cycle gas-fired combustion turbine power plant is estimated to be much higher than for other fossil fuel units, making it a better option for meeting low capacity factor needs.

Building a simple cycle power plant is a major construction project with about a 12-18 month time frame for permitting and 12 months for construction. The time required to implement transmission upgrades necessary to accommodate the output of such a facility is highly variable, depending on the particular site chosen.

4.4.2 RENEWABLE RESOURCE TECHNOLOGIES

Renewable resource technologies considered as potential alternatives include wind, solar, biomass, hydropower, and landfill gas.

Wind. Wind energy conversion technology consists of a set of wind-driven turbine blades that turn a mechanical shaft coupled to a generator, which in turn produces electricity. The major components of the wind turbine include: Rotor blades, Gear box, Generator, Nacelle (gearbox/generator housing), Tower, and Collection system of electrical lines connecting a number of wind turbines to a substation (applicable only to multiple wind turbine projects).

Solar. Solar energy to electricity conversion technologies includes thermal conversion (typically using sunlight to generate steam to turn a turbine) and photovoltaic (direct conversion of sunlight to direct current power). Thermal, or concentrating solar power technology (parabolic troughs, power towers, and dish/engine systems), converts sunlight into electricity efficiently with minimal effects on the environment. The heat generated is transferred via a heat exchanger to produce steam. The electricity is produced in conventional steam turbine generators.

The “photovoltaic effect” is the basic physical process through which a photovoltaic (PV) cell converts sunlight into electricity. Solar energy (composed of photons) is transferred to the electrons of atoms making up the PV cell. Higher energy electrons begin to flow and become electric current. By grouping single PV cells into arrays, and then placing many arrays together, power plants of up to 6.5 megawatts have been built.

Biomass (Direct-Fired). The process of direct-firing biomass fuels is very similar to the firing of other solid fuels. Fuel handling and storage, fuel firing, ash handling and disposal, air emissions, water consumption, and wastewater management will have many similarities to coal-fired systems. The primary activity steps for a biomass plant include: Biomass fuel receiving; On-site processing (size reduction, drying, screening); Fuel storage/conveying; Boiler (usually a stoker design); Ash and flue gas handling; Air emission controls (baghouse/ESP for particulate; ammonia for NO_x control); Steam turbine; and Cooling tower.

Biomass fuels can be harvested from the forest, collected as waste materials from processing plants or agriculture, or grown in biomass plantations. Fuel may be shipped to the power plant by truck, rail or barge depending on the plant location and type. Fuel will generally be stockpiled as insurance against interruptions in supply. Depending on fuel characteristics, drying and size reduction may be necessary prior to firing. Drying is sometimes accomplished by utilizing the heat from stack gases. Prepared fuel is fed to the furnace and the resulting heat is used to generate steam. The steam from the boiler is piped to, and drives, a steam turbine, which in turn drives an electric generator to produce saleable electrical power.

Hydropower. Hydroelectric power plants convert the potential energy of water, pooled at a higher elevation, into electricity by passing the water through a turbine and discharging it at a lower elevation. The water turns the turbine connected to an electric generator, thus producing electrical energy. The turbines and generators are installed in, or adjacent to, dams, or use pipelines (called penstocks) to carry the pressurized water below the dam or diversion structure to the powerhouse. Hydropower projects are generally operated in a run-of-river, peaking, or storage mode.

Run-of-river projects use the natural flow of the river and produce relatively little change in the stream channel and stream flow. A peaking project impounds and releases water when the energy is needed. A storage project extensively impounds and stores water during high-flow periods to augment the water available during low-flow periods, allowing the flow releases and power production to be more constant.

The capacity of a hydropower plant is primarily a function of two variables: (1) flow rate expressed in cubic feet per second (cfs); and (2) hydraulic head which is the elevation difference the water falls in passing from the reservoir through the turbine. Depending on the particular waterway being considered, project design may concentrate on either of these variables (high head/low flow or low head/high flow).

Landfill Gas. The most common use of landfill gas (LFG) is for on-site electricity generation by firing stationary engine generator sets. Some LFG is used to fire boilers or turbines and LFG, sufficiently processed, could be an energy source for fuel cell operation. Electric generating plants using LFG and those using natural gas or distillate oil are nearly identical; however, firing LFG does require gas processing and careful monitoring of equipment because LFG tends to be more corrosive. Significant quantities of LFG are emitted from municipal solid waste where it has been deposited in landfills; however, LFG typically has a medium Btu content and is not typically a source of energy on a scale larger than a few MW.

LFG recovery for energy is practiced in the United States, Europe and other countries around the world. A typical system consists of the following components:

- The gas collection system, typically a series of wells strategically placed throughout the landfill, which gathers the gas being produced within the landfill;
- The gas processing system and engine/generator set, which cleans the gas and converts it into electricity; and
- The interconnection equipment, which delivers the electricity from the project to the final use.

Impacts. Environmental impacts refer to the effects the alternative is expected to have on the environment. The potential environmental impacts associated with renewable resource technologies can be highly variable depending on the technology and may include air emissions, effects on land, water consumption, wastewater generation, noise, aesthetics, and traffic.

Wind turbine generation has many environmental advantages over fossil fuels because there are no air emissions nor solids or water discharges associated with operating the turbines. Turbines may encounter some siting opposition with regard to noise and aesthetics. In many cases, the original use of the land (i.e., agriculture) can continue in the presence of the turbine installation with less than 5 percent of the original land area taken out of production.

Solar power generation has many environmental advantages over fossil fuels because there are no air emissions or solids discharges associated with operating the systems. Trough/gas hybrid systems do utilize a steam loop, which requires process and cooling water, some water treatment and some wastewater discharge (blowdown).

Waste streams from a Biomass fueled furnace include stack gases, bottom ash, and boiler water blowdown. Bottom ash produced in many biomass combustion plants is often of a quality that can be sold, or used as a soil conditioner/fertilizer due to the lack of many trace metals, which often contaminate coal ash. Boiler blowdown, along with other process wastewater streams, will typically be treated to remove solids, oils, and grease prior to discharge. Cooling water used to condense the steam exhausted from the turbine would most likely be cooled using a direct-contact cooling tower. The use of a cooling tower represents a significant consumption of water.

The stack gases will contain particulate matter as well as gaseous pollutants – depending upon the fuel source used. If a thermal drier with auxiliary firing is used, the drying step will increase energy use and environmental emissions. Typically, stack gases will pass through an air pollution control device where particulate matter is removed. A large new boiler will likely be required to also address the control of NOx and CO emissions.

Biomass-fired plants typically operate in a range of 20 – 30 percent efficiency. Biomass power production is affected by a greater variability in biomass fuel quality than is coal-fired power production. Variability in moisture and ash content are characteristic of a diverse fuel source and leads to variability in heat value on a mass basis. The direct environmental impacts of biomass burning are similar to those for coal combustion and include air emissions, solid waste (ash) generation, waste heat discharge to air and water, and truck and/or rail traffic.

A biomass plant utilizing a closed-loop biomass fuel, such as switchgrass or hybrid poplar trees, would have less environmental impact per unit of energy produced with regard to CO_2 emissions because the uptake of CO_2 during the growth of fuel feedstocks would offset CO_2 emissions from the plant when the fuel was burned.

Hydropower projects are not typically associated with air emissions, water discharges or the solid waste disposal issues associated with solid fuel-fired power production; however, hydropower may involve other significant environmental impacts such as altered river basin hydrology, fish mortality, fish migration interference, decrease in water quality, and flooding of land.

Landfill gas projects are expected to be a net benefit to the environment by reducing the amount of LFG emissions to the atmosphere; however, some of the landfill emission reductions are offset by the combustion emissions such as NOx and CO from the combustion equipment. LFG collection systems (i.e., the well networks) are not totally efficient, and combined with the inherent inefficiencies of combustion equipment, the overall energy efficiency of an LFG system generally less than 30 percent.

Feasibility and Applicability. Applicability of a technology refers to the technology's appropriateness for the Applicant's stated purpose and need, including operational mode. One of the objectives of the MNGP project is to provide energy and capacity for base load service (i.e., operational mode). Base load resources normally operate in the range of 50 percent to 100 percent annual capacity factor, with typical capacity factors of newer base load resources being in the range of 80 percent to 90 percent. Base load resources generally have few starts per year (<10) and may be operated at reduced output levels to follow system load during off-peak periods.

Wind turbines can help meet overall system energy needs, but offer inadequate dispatch flexibility to support intermediate or peaking load needs. Wind generation can help meet base load energy needs, but cannot meet the capacity component of base load needs on its own; it must be coupled with other technologies or resources.

Utilization of taller wind turbine towers and the ever-greater geographic diversity of wind resources in the region can reduce the intermittency of wind generation on a system-wide basis and, thus, offer a correspondingly greater capacity contribution to base load capacity needs. However, there are limitations to the benefits these techniques can provide.

Wind turbines are generally expected to have a high availability, but actual availability is dependent on the quality of wind resources of the geographic location in which the resource is located. Even when wind energy is present, wind turbines can only generate power within an optimum range of wind speeds.

A wind turbine installation cannot have an objective of providing a guaranteed performance from the perspective of the utility customer. At best, wind-generated power can replace a percentage of base load generation during periods of low to moderately high wind conditions and subsequently conserve fossil fuels.

The total costs associated with wind vary according to market conditions. Two important factors are the availability of the production tax credit and supply conditions for wind turbines. Permitting and construction for large wind turbine installations can be completed in as little as 12 to 24 months. However, transmission upgrades necessary to accommodate energy production from wind turbines may take as long to implement as transmission upgrades for other base load options, particularly in areas where significant wind generation development has already occurred (i.e., Buffalo Ridge) or where little or no transmission infrastructure currently exists.

The applicability for solar generation to meet capacity needs is defined primarily by problems with reliability. Solar power systems generally represent less capacity than a wind turbine installation and, combined with a dependence on quality insolation rates, cannot meet intermediate load and peaking service needs. Siting of a large solar power plant is also predicated on locating candidate areas that have the solar energy data that would support the project economics.

Solar generating facilities are generally expected to have a high availability, but actual availability is dependent on the quality of solar resources of the geographic location in which the resource is located. A solar power installation cannot meet an objective of providing a guaranteed performance to the end user of generated power. The hybrid design of some solar plants, utilizing natural gas during periods of poor solar intensity, may enable the facility to maintain a capacity rating.

The total capital requirement for either a photovoltaic power plant or a trough/gas hybrid plant continues to be significantly higher than for other resources, making it cost prohibitive for large-scale applications.

A biomass facility may serve as an intermediate load unit; however, biomass-fired power boilers are best suited for base load (steady, high-capacity) duty. Boiler-based biomass-fueled plants are not well suited to operate as peaking plants because of the long lead time (a day or more) necessary to bring a solid fuel-fired plant on-line at full capacity. The forest products and agriculture industries in Minnesota and the Midwest offer a wide and expanding variety of biomass fuels.

The net availability of biomass-fired units is expected to be reasonably high, potentially 85 percent. A biomass-fired plant can generally demonstrate high reliability (both the adequacy and security aspects) for base load and intermediate load service if an adequate supply of fuel is available. Overcoming the logistical and economic challenges of collecting enough fuel to support the operation of a biomass-fueled power plant at a nominal 85 percent capacity factor is a substantial undertaking. Competition for economic fuel feedstocks can be fierce, depending on the feedstock(s) in question and the location of the biomass-fueled plant. This has been especially true of forest product waste fuels and urban wood waste fuel feedstocks.

The total capital requirement for a biomass power plant is highly variable and size dependent. Higher capacity plants will generally be less expensive. Due to the variability, it is important to analyze specific proposals before making cost estimates.

Building a biomass-fired power plant is a major construction project with 12 to 24 months required for permitting and 24 to 36 months for construction. Transmission upgrades necessary to support such a project could take as long to implement as the transmission upgrades for other types of base load options. The relatively small size of biomass power plants (under 100 MW) could minimize the transmission upgrades implementation timeframe.

Hydroelectric plants are operated in several modes; plants with large water storage capability lend themselves well to peaking power production and hydroelectric plants are able to come on line much quicker than steam generating systems. Run-of-river plants are more likely to produce a more constant power output though that output is dependent on water levels and, in cold climates, ice conditions.

The U.S. Department of Energy's (DOE) Hydropower Program has estimated that there is additional hydropower in this region. While it is possible that some of the identified potential hydropower could be developed, decisions to do so would need to also consider that transmission systems may not exist in remote areas containing hydropower potential. Development of hydropower, and associated transmission systems, faces the scrutiny of a general environmental trend toward releasing water reservoirs where possible. Developing capacity of a hundred MW or more would require development of multiple existing and/or potential hydropower sites. Such an effort would take several years of environmental study and negotiation to acquire water use and land rights, and permits and licensing for dams and/or transmission lines. During periods of normal precipitation and ice-free conditions, the availability of established hydropower generation is typically very high.

The hydropower sector of power generation is well established with proven technologies installed as standard design. In mechanical terms, hydroelectric plants are highly reliable. Because hydropower depends on water flow, hydroelectric plants are susceptible to fluctuations in output as a function of weather patterns. Reliability can suffer during periods of drought or during periods of freezing conditions in northern climates. Weather-induced fluctuation in power output may be less pronounced than it is for wind or solar power; however, for long-term planning to meet projected demand, hydropower may be better suited to reliably provide peak load capacity.

The total capital requirement for a hypothetical hydropower power plant can be very high, although the all-in energy requirements are reasonable as compared to other alternatives. Most of the potential sites within the region have capability of less than 10 MW and economies of scale would not be realized. Annual operating expenses would likely be less than for a fuel-fired power plant because the hydropower energy source (pooled water) is not typically a purchased input. Building a hydroelectric power plant is a major construction project with a several-year time frame.

Landfill gas power generation projects are generally sited on large landfills and produce power in the range of kilowatts to a few megawatts. The driver for LFG power generation is the utilization of a fuel source that would otherwise be flared to avoid an explosion hazard and to avoid an emission source by producing saleable energy. A LFG plant could reasonably be viewed as an emission control technology. LFG does not exist at the levels needed to support large energy needs.

The availability of a LFG-fired generation system is expected to be high, similar to systems firing natural. However, the corrosive nature of landfill gas does introduce more potential for equipment problems. Because of the small-scale nature of most LFG plants, a LFG power installation project typically does not have an objective of providing a guaranteed performance from the perspective of the utility customer. Power output for LFG plants depends upon the LFG production rate that does not adjust to power demand. LFG-generated power can replace a percentage of base load generation and subsequently conserve fossil fuels.

The total capital requirement for developing a hypothetical LFG power plant is not very high and all-in costs are also quite competitive. However, the LFG volumes do not exist within one site necessary to fuel a plant with a hundred MW or higher capacity. Most landfill sites will not support more than 10 MW of generation. Annual operating expenses may be less than for a typical fuel-fired power plant because the LFG is not typically a purchased input. However, some municipalities associated with landfills may require a royalty to be paid from energy sales.

4.4.3 DEVELOPING TECHNOLOGIES

Concerns about the adequacy of future generation, air quality and longer-term impacts of global warming have caused many industry participants, policy makers and the public to focus more on renewable and emerging technologies. As with wind power, the higher energy prices during the past few years have improved the commercial viability, stimulated R&D, and encouraged the rapid development of emerging technologies.

Fuel Cell. A fuel cell converts energy directly, without combustion, by combining hydrogen and oxygen electrochemically to produce water, electricity, and heat. Fueled with pure hydrogen, they produce no pollutant emissions. Even if fueled with natural gas as a source of hydrogen, emissions are orders of magnitude below those for conventional combustion generating equipment. The principle of operation of a typical fuel cell consists of the following processes:

- When hydrogen is fed into a fuel cell a catalyst on the anode converts hydrogen gas into negatively charged electrons (e^-) and positively charged ions (H^+).
- The electrons (e^-) flow through an external load to the cathode.
- The hydrogen ions (H^+) migrate through the electrolyte to the cathode where they combine with oxygen and the electrons (e^-) to produce water.

There are a variety of fuel cell designs (referring mainly to the electrolyte style) including solid oxide, alkaline, phosphoric acid, molten carbonate, and proton exchange membrane. The main components of a fuel cell system include:

- A porous anode (example materials are graphite, and nickel, chromium and zirconium alloys);
- An electrolyte (example phosphoric acid);
- A porous cathode (same materials as anode);
- Precious metal catalyst;
- Fuel reformer (to generate hydrogen from fossil fuel); and
- Power conditioner (to convert from DC to AC and to regulate power production in accordance with load).

Mircoturbines. Microturbines are a type of combustion turbine that is used for stationary energy generation applications. They are usually small units (common refrigerator size) with outputs that are very small, usually in the kilowatt range. Microturbines operate similar to a combustion turbine except on a much smaller scale. Generally, microturbines contain the following design features:

- Radial flow compressors;
- Low pressure ratios (single or possibly two stage compression);
- Minimal use of van or rotor cooling;

- Recuperation of exhaust heat for air preheating;
- Use of materials that are amenable to low cost production; and
- Very high rotational speeds on the primary output shaft (25,000 rpm or more).

Microturbines are capable of using many alternative/optional fuels including natural gas, diesel, ethanol, landfill gas, and other biomass-derived liquids and gases.

Energy Storage. The application of energy storage technologies is best suited to peaking power needs since it presumes that there is excess or underutilized generating capacity at some point during which energy can be stored and released at a later point in time. Energy storage technologies have long been considered as a means of leveling the load on existing generating plants, thus allowing them to operate closer to their peak efficiencies. Energy storage is not well suited for meeting base load energy needs and must be combined with other energy resources to address reliability issues. Types of energy storage systems include:

- battery energy storage systems (BESS);
- compressed air energy storage (CAES);
- pumped storage hydroelectric; and
- flywheel energy storage.

Impacts. Environmental impacts refer to the effects the alternative is expected to have on the environment.

Fuel cells can boast great potential for improving energy efficiency. Fuel cells generate significant quantities of waste heat that can be recovered in a cogeneration configuration. The proximity of fuel cells to the end user of generated power greatly reduces transmission losses. Fuel cell environmental impacts directly related to operating the cell are minimal. By eliminating the combustion step of fossil fuel utilization, air emissions are virtually eliminated relative to conventional fuel-fired power generation. Indirect impacts may arise if a preliminary fuel processing step (e.g., coal gasification) is utilized to provide fuel for a fuel cell.

Environmental impacts associated with mircoturbines in terms of energy efficiency show a distinct disadvantage versus natural gas combined-cycle and coal-fired plants. Direct environmental impacts of operating a natural gas combustion microturbine include air emissions and waste heat discharge. Microturbines have manufacturer listed NOx levels from 9 to 50 ppm (typical generator natural gas combustion sources range from 45-200 ppm NOx).

Values for efficiency of each storage system have not been identified here. A feature of all storage systems is that less energy will be extracted than was originally stored. The process of storage requires an energy expenditure that cannot be recovered. None of the four systems will directly release air pollutant emissions in significant amounts, nor will they directly discharge significant quantities of wastewater or noise; these impacts will depend on the sources of energy that is being stored Pumped storage hydro development will have impacts similar to any hydroelectric project development. Substantial areas of land and habitat may be lost due to hydro development.

Feasibility and Applicability. The feasibility and applicability of a technology refers to the technology's appropriateness for the Applicant's stated purpose and need, considering both economics and operational mode.

Fuel cell installations are viewed as an extended generation strategy and thus are typically sited adjoining the end user. Currently, fuel cell installations remain small, just a few megawatts. The fuels potentially used by fuel cell installations are widely available.

Power industry estimates for significant fuel cell technology implementation range from 5 to 10 years. As design improves with experience, fuel cells will provide high availability. Fuel cells have demonstrated high reliability in pilot installation settings. Current manufacturing capacity of fuel cells is not yet established to the point where fuel cell installations are expected to address significant demand.

The total capital requirement for developing a hypothetical fuel cell power plant is estimated to be prohibitively high. The size of fuel cell installations would require hundreds of fuel cell sites to provide capabilities in the range of a hundred MW or more.

Microturbines are well suited to meet intermediate, base load, peaking, or co-generation load needs. High kW output needs may not be feasible because existing power conditioning equipment does not allow easy interconnection between microturbine systems.

Microturbines have relatively few moving parts and can operate continuously with little maintenance. Existing microturbine based power generation systems have demonstrated extremely high availability. Microturbine systems can generally demonstrate high reliability (both the adequacy and security aspects). Natural gas-fired systems typically do no have alternative fuel options for backup. A reliable natural gas or other primary fuel source is required to have a reliable system.

The total capital requirement for a microturbine power plant varies significantly, making it important to evaluate specific proposals before making economic conclusions. However, at this time large-scale implementation of this resource does not appear to be feasible.

Energy storage projects require an energy producer with excess or underutilized generating capacity to charge the storage system. Where this excess capacity exists, energy storage technologies are a means of leveling the load on existing generating plants thus allowing them to operate closer to their peak efficiencies. However, energy storage technologies do not meet intermediate or base load energy needs well.

By their nature, energy storage systems have high availability so that power may be readily extracted and used. These systems would typically back up less reliable parts of the overall electric supply system and are best suited for peaking power needs. Implementation times for the energy storage technologies would be variable due to the differences in issues between them. Small, disperse battery and flywheel systems could likely be installed within months, whereas CAES and pumped storage hydro facilities may require years of development effort likely involving contentious approval processes.

The capital costs for constructing an energy storage facility are variable and dependent on the technology selection. However, as noted previously, energy storage projects require an energy producer to charge the storage system. The costs for energy storage typically assume that underutilized energy production facilities exist. Operating costs are primarily dependent upon the operating costs associated with the original energy source.

None of the developing technologies pass the initial screening as being viable for current implementation to meet the purpose and need as stated for the MNGP project.

4.5 UP-GRADING EXISTING GENERATING FACILITIES

This alternative is a consideration of whether Xcel Energy could upgrade one of its existing generating facilities to provide the additional electricity requested in the CON for the MNGP project. Indeed, Xcel Energy's proposal is essentially one to upgrade an existing facility – the Monticello Nuclear Generating Plant.

Impacts. It is impossible to determine the impacts of upgrading another facility without knowing what the facility is. The actual physical construction of an expansion to an existing facility could result in environmental effects. The potential environmental impacts of operating an expanded facility have been discussed to some extent in other portions of this report through the discussion of the various alternatives that were considered.

Feasibility and Availability. Xcel Energy has identified and is also pursuing uprate/upgrade projects for its existing Prairie Island and Sherco generation plants and has incorporated estimates of these projects in their recently filed resource plan. Xcel Energy's next three largest plants King, Riverside, and High Bridge are all part of our Metro Emission Reduction Program (MERP) and are undergoing significant modifications to reduce their emissions and increase their electrical output. This leaves few opportunities for additional efficiency projects and therefore increased efficiencies at existing plants were not considered further.

4.6 NEW TRANSMISSION

This alternative considers constructing new transmission facilities rather than new generation.

Impacts. The impacts associated with a transmission line depend to a large degree on the location of the line. Landowners whose property will be crossed by a new transmission line are often opposed to the project, particularly if the landowner perceives no personal benefit from the line.

Feasibility and Availability. Additions to or improvements in the electric transmission system are not viable alternatives to the Monticello power uprate proposal. The underlying assumption with this alternative is that additional transmission infrastructure would provide access to additional capacity resources. However, since the capacity construction boom of the late 90's there had been relatively little capacity built in the region. The result has been very tight capacity markets with little or no excess capacity available. Thus, no opportunities exist for new transmission to bring in additional capacity. Timing is also an issue for transmission as an alternative. The planning, permitting, and construction of transmission facilities is a multi-year process. It is unlikely that additional transmission could be planned, permitted and built to import additional energy by the 2011 in-service date.

5.0 ASSESSMENT OF IMPACTS AND MITIGATION

Under Minn. Rules part 7849.5700, subpart 4, the Environmental Assessment must include an analysis of the human and environmental impacts of the proposed project, and mitigative measures that could reasonably be implemented to eliminate or minimize these impacts.

This section contains site specific information on the human and environmental impacts of the proposed MNGP Uprate project and mitigative measures taken to minimize these impacts. The impacts evaluated include those resulting from construction and operation of the plant and include potential impacts of the proposed plant on water resources, air quality, noise, vegetation, fish, wildlife, traffic, land use, socioeconomic factors, and cultural resources.

5.1 AIR QUALITY

The region surrounding Monticello is an "attainment area" that currently meets all federally allowed air concentration limits for criteria air pollutants. The power uprate project will not affect air quality in the area. Non-radiological air emissions are not expected to increase or decrease as a result of the uprate. Diesel engines, a boiler, and other sources currently associated with the Monticello site emit various nonradioactive air pollutants to the atmosphere, such as NOx, $S0_2$ and CO. Air emissions from these sources are subject to the terms and conditions of a Title V air pollution control operation permit issued by the MPCA (Air Emission Permit No. 17100019-003). No changes to the MPCA air permit are required due to the uprate.

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 Monticello 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 Monticello has been reduced steadily and is significantly below discharges during initial operating conditions.

The power uprate is expected to increase the production and activity of gaseous effluents approximately 13 percent. However, this increase is well within regulatory limits (10 CFR 20 Standards for Protection Against Radiation) and maintains compliance with the design objectives of Appendix I to 10 CFR 50 (Domestic Licensing of Production and Utilization Facilities). 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.

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 5-1 presents the gaseous releases from Monticello for the years 2001 through 2006. **Table 5-2** presents the potential increase in gaseous releases due to the power uprate project.

5.2 BIOLOGICAL RESOURCES

Aquatic

The Upper Mississippi River near the Monticello site supports a variety of plant and animal species that are typical of free-flowing rivers in the upper Midwest. The major primary producers, or plant groups, present are periphyton (attached algae), phytoplankton (floating algae), and macrophytes, which are larger flowering plants, either rooted or floating. Near the site, periphytons are the most important primary producer. Their ability to attach to underwater substrates allows these organisms to function in the higher velocity waters near Monticello.

Although present in the area, neither phytoplankton nor macrophytes are prominent, because they are not well adapted to the relatively turbulent currents in the area. The Benthic invertebrate community, comprising a great variety of insects, crustaceans, mollusks, and others, constitute a prominent faunal feature of the Mississippi River near Monticello, as is typical in any flowing water system. The Mississippi River also supports a diverse array of fish species, which are integral to ecosystem functioning. These fish communities also support significant recreational fishing activities in the vicinity of the Monticello site.

The results of the Clean Water Act (CWA) Section 316(a) demonstration for MNGP determined that 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 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 25 years.

In addition to the CWA 316(a) demonstration, Xcel Energy 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. The uprate will not alter water volume requirements for the heat dissipation system, the physical construction of the discharge canal terminus, or temperature limits established by the NPDES permit. Therefore, the uprate does not change the findings of the thermal gradient and plume studies and will not affect the NPDES permit.

Cold shock is caused by an unplanned shutdown; the probability of an unplanned shutdown is independent of power uprate. The projected increase in discharge canal inlet temperature of 4.5°F does not result in a significant increase in the overall discharge canal temperature, thus the magnitude of the temperature decrease in a cold shock situation is not significantly changed. The cold shock concerns of river fish species have been reduced by the construction of a weir at the end of the discharge canal, and by backwashing of the traveling screens above 50°F. The weir limits the number of fish in the discharge canal and reduces the effects of cold shock on aquatic species in the river.

In addition, administrative procedures for controlled temperature reduction of the discharge canal are in place to minimize thermal shock to the aquatic biota.

Section 316(b) of the Clean Water Act requires 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 in 1978. The demonstration was ultimately accepted and approved by the MPCA in September 1979, with the conclusion that entrainment and impingement at Monticello offers "... no substantial detriment to the fisheries population." Electrofishing surveys to assess relative abundance and seasonal distribution of fish in response to the MNGP's thermal discharge have been conducted from 1976 to the present. Areas of the river sampled extend 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. Based on these facts, Xcel Energy concluded that the power uprate will not affect the impingement and entrainment of organisms and will not cause effects that have not been previously evaluated.

The projected increase in discharge canal inlet temperature of 1.7°F to 4.5°F would not involve any significant increase in harmful thermophilic organisms in the discharge canal. MNGP's daily average discharge canal temperature range from 66 to 95 °F and rarely averages 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).

Terrestrial

Flora and fauna of the MNGP site are typical of the upland and wetland communities found along this stretch of the Mississippi River. For the most part, the plant itself is located on previously cultivated areas. Existing vegetation in these areas consists of early successional forbs and grasses. Upland forests on site are predominantly northern pin oak (*Quercus ellipsoidalis*), green ash (*Fraxinus pennsylvanica*), basswood (*Tilia americana*), and prickly ash (*Zanthosxylum americanum*). Species composition of the forested wetlands on the northeast bank of the river and the river islands include American elm (*Ulmus americana*), box elder (*Acer negundo*), silver maple (*Acer saccharinum*) , cottonwood (*Populus deltoides*), and black willow (*Salix nigra*)

A recent search of the Minnesota Department of Natural Resources (MDNR) Natural Heritage and Non-Game Research Program database indicated two native plant communities within 1 mile of the Monticello site. These included the Dry Sand Gravel Oak Savanna (Southern) Type #9 and the Dry Sand Gravel Prairie (Southern) Type #114.

Rare and Unique Natural Resources

No changes to land use are anticipated as a result of the power uprate and therefore there are no anticipated impacts to rare and unique natural resources or species.

The MDNR has identified one recently delisted threatened species, one recently listed threatened species and two special concern species within one mile of the MNGP site. No federally listed threatened or endangered species were reported. The uprate will not affect these nearby endangered species because the construction footprint will be limited to areas inside the MNGP existing site perimeter.

The bald eagle *(Haliaeetus leucocephalus)*, previously listed as federally threatened, is known to occur in the vicinity of the MNGP site. Originally listed as endangered by the FWS in 1967, the bald eagle was delisted in August 2007 (FWS, 2007). The bald eagle is listed by MDNR as a special concern species.

The Peregrine falcon (*Falco peregrinus*) is also listed as a special concern species by MDNR. 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 2002, five young have fledged from the nesting box (MDNR, 2007).

The third special concern species reported within 1-mile of the MNGP site is the Black Sandshell mussel (*Ligumia recta*). In 2004, forty live individuals were found during the Statewide Mussel Survey conducted at survey sites near the MNGP site.

Finally, the formerly rare trumpeter swan has been observed recently in increasing numbers on the Mississippi River, downstream from Monticello. The trumpeter swan was recently listed as a threatened species by the MDNR. The swans are drawn to the open water in the winter months, which results from the 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 MDNR and FWS surveys showing more than 75 nesting pairs and nearly 900 year round residents. The power uprate will increase the discharge temperatures slightly at times in the Mississippi River, but the slight increase will not affect the swans' use of the downstream area in winter.

The uprate will have no impacts on the current species composition in the area because construction will be limited to within the existing footprint and mainly the exiting building, and the only off-site impact is a slight increase in water discharge temperature in some seasons. The most visible potentially affected species, the trumpeter swan, could be affected by the cessation of warm water discharges during the winter months, resulting in the loss of the open water habitat downstream from the MNGP. However, the timing of outages are unaffected by the power uprate. The outages are typically scheduled to coincide with periods of reduced demand for power and this will not change due to the power uprate. The uprate will not affect the likelihood of reduced warm water discharges in the winter, but could slightly increase the water temperature during those discharges.

5.3 CULTURE, ARCHEOLOGICAL and HISTORIC RESOURCES

The area has a history of Indian and early French trader activity, however, no evidence of this activity has been found at the site. The construction of the MNGP and the associated transmission line corridors did not impact any known historic or archaeological resources. No significant resources were found on or near the site during historic and archaeological investigations performed prior to operations.

The uprate will not result in any construction activities outside the Monticello facility; therefore, no impacts to these resources are anticipated as a result of the project.

5.4 GEOLOGY and SOILS

Soils at the site consist of loams and loamy sands of the Hubbard-Mosford complex with 0 to 3 percent slopes. These soils are classified as sandy mixed, frigid Entic Hapludolls. These soils are permeable, have limited available water capacity, have the potential for groundwater contamination and are susceptible to wind erosion.

Site geology consists of unconsolidated sedimentary deposits consisting of (from the surface downward) modern alluvium, glacial outwash sand with subordinate layers of gravel, silt, and clay. The unconsolidated sediments overlie upper Cambrian quartz sandstone of the Jordan and Mt. Simon Formations. The sandstone overlies older, Precambrian granitic and basic intrusive that form the crystalline basement rock below the site.

The uprate will not impact the geologic or soil resources on the MNGP site.

5.5 HEALTH and SAFETY

Long-term monitoring of the radiation levels near the MNGP have been ongoing since before the plant was in operation. The monitoring of air, surface water, groundwater and biota has been done by both Xcel Energy (as part of the federally required Radiation Environmental Monitoring Program or REMP) and the Minnesota Department of Health.

The MNGP does release small amounts of radionuclides during normal operation (see Section 5.1 Air Quality). However, the results of long-term monitoring indicate no increases in radioactivity in nearby areas due to plant operations. Details regarding the monitoring program and results are provided in the Environmental Impact Statement for the Monticello ISFSI (also see Appendix F, Attachment 1 Xcel Energy Certificate of Need Application to the PUC for the MNGP Uprate Project, February 14, 2008, Appendix F, Attachment 1, Section 5.5).

The uprate will not introduce any new or different radiological release pathways and the uprate will not result in radiological levels above the safe thresholds established by the NRC and in the Technical Specifications for the plant.

The radioactive waste systems at 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 are to limit discharges in accordance with 10 CFR 20 and to satisfy the design objectives of Appendix I to 10 CFR 50. These limits and objectives will continue to be adhered to after the power uprate.

The in-plant refueling cycle average dose at the MNGP has decreased at an average annual rate of 10 percent from cycle 18 refueling to cycle 23. Power uprate will involve increases in radiation levels. Dose reduction programs will continue to address the increases in individual doses due to the power uprate project.

The 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 and alpha activity for fission products and corrosion products is 0.5 µCi/cc.

Table 5-3 summarizes the exposure history for the MNGP from 1990 through 2006.

The MNGP radiation protection program will be used to maintain individual doses consistent with As Low As Reasonably Achievable (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.

The MNGP project is expected to increase the production and activity of gaseous effluents by approximately 13 percent. The increase in activity levels is generally proportional to the percentage increase in core thermal power. This slight increase does not affect the large margin to the offsite dose limits established by 10 CFR 20.

Doses from liquid radioactive effluents were currently zero in 2006 and should remain zero after power uprate implementation.

The MNGP Technical Specifications implement the guidelines of 10 CFR 50 Appendix I, which are well within the 10 CFR 20 limits. Table 5-1 contains the results of the offsite dose assessment for 2001-2006. An increase of 13 percent remains a very small fraction of the reporting limits.

As shown in **Table 5-4**, the offsite dose does not change significantly and continues to be well within the conservative Technical Specification dose limits.

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

5.6 LAND USE

The MNGP project will not increase the land requirements for the generating plant. The project does not involve the construction of any new facilities, access roads, parking areas, or lay down areas. The only permanent change outside the existing facilities will be the addition of a new 13.8 KV bus and new 1R and 2R transformers. These improvements are necessary to assure the reliability of the onsite auxiliary electrical distribution system. Except for transportation of equipment and routine disposal of waste, power uprate maintenance activities will be confined to the inner-plant security fenced area. The uprate project will not affect the storage requirements for above- or below-ground tanks. Other lands located outside the inner security fence will not be modified or changed to support power uprate activities.

5.7 NOISE

Power uprate will not result in any significant changes to the character, sources, or energy of noise generated at Monticello. The majority of new equipment necessary to implement power uprate will be installed within existing plant buildings – the new transformers being the exception. All equipment will be installed within the existing plant footprint. No new significant noise-generating equipment is planned as part of the uprate project. No significant increases in ambient noise levels are expected within the plant.

5.8 SOCIOECONOMICS

The power uprate construction activities are expected to occur primarily during refueling outages in the first quarter of 2009 and 2011. The size of the workforce during the two refueling outages when power uprate is implemented is not expected to increase significantly from the size of the workforce during a normal refueling outage. Typically, a routine outage would require an additional workforce of approximately 500 employees depending on contractor's anticipated staffing needs.

There is minimal to no impact from the power uprate on the size of Monticello or the City of Monticello's workforce during periods of normal operation. Because no changes to existing workforce are anticipated, no workers will be displaced by the power uprate.

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

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

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

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

5.9 TRANSPORTATION

The MNGP modifications to accomplish power uprate will be completed primarily during the 2009 and 2011 refueling outages. Xcel Energy does not expect the number of workers at the MNGP to be significantly higher during the refueling outages when power uprate is implemented than during nonpower uprate refueling outages. There are approximately 500 additional workers on-site during a typical refueling outage. Xcel Energy estimates the power uprate construction will increase that by a few dozen more.

Since the uprate project will only minimally increase the number of workers at the MNGP during the outage, the additional traffic generated is negligible. Power uprate equipment deliveries will involve similar types of equipment deliveries as have been made for past refueling outages.

After the project has been implemented, the on-going operation of the plant will not require additional employees and traffic will not differ from current levels.

Traffic safety will not be degraded, because the power urate will not result in a long-term change to the routes, number of trips, types of vehicles, speed compared to current conditions. Any changes affecting traffic will be temporary in nature to accommodate delivery of equipment for the project.

5.10 VISUAL IMPACTS and AESTHETICS

The uprate project will not change the visual appearance of plant features from outside the facility boundaries; therefore there is no anticipated impact to aesthetics. Cooling tower operation involves the discharge of water vapor that is potentially visible from outside the plant boundaries. Although the number of days that the cooling towers are used may increase by about 20 days per year, the appearance of cooling tower operation will not change as a result of the uprate.

5.11 WATER RESOURCES

5.11.1 SURFACE WATER

The surface water at the MNGP site, which is drawn from the Mississippi River, is used for plant condenser cooling and auxiliary water systems, such as service water cooling, intake screen wash, and fire protection. Under typical river conditions, the circulating water system removes heat from the Monticello condenser by the once-through circulating water system.

Currently, surface water use averages about 509 cfs. A small percentage (2 percent) of this cooling water is evaporated due to plant operations. The surface water consumption due to open cycle evaporative losses and cooling tower evaporation and drift is currently estimated at approximately 6,800 acre-ft/year (9.4 cfs) assuming 130 days of cooling tower operation, 235 days of open-cycle operation and nominal values of cooling tower flow (at a water use rate of approximately 509 cubic feet/second).

Following the 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 (10.6 cfs). Even using the maximum surface water appropriation limit of 645 cubic feet/second as the cooling tower flow value, the resulting estimated total water consumption would be no more than 8,700 acre-ft/year (12 cfs). This level is still well below the level determined to be insignificant in the NRC EIS completed for the Monticello re-licensing.

Surface water use at the MNGP is permitted by the MDNR under Surface Water Appropriation Permit number PA 66-1172-S. The Surface Water Appropriations Permit allows the facility to withdraw up to 645 cfs (or 290,000 gpm) of water from the Mississippi River, with special operating conditions if the river flow is less than 860 cfs, and further restrictions if river flow is 240 cfs or less. The power uprate will not introduce any significant changes to the screen wash, service water, or circulating water flow requirements. Thus, the estimated additional consumption due to power uprate is within the values previously evaluated by the NRC and is not considered to be significant. Therefore, the uprate will not involve any changes to the Surface Water Appropriations Permit.

Temperature

The MNGP uses cooling water 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 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, the MNGP can also be operated in a partial recycle mode or closed-cycle mode. These alternative operating modes are used to comply with MDNR water appropriation restrictions and MPCA thermal discharge limits established in the NPDES permit.

The NPDES permit for the MNGP is periodically reviewed and re-issued by the Minnesota Pollution Control Agency. The MPCA recently reissued the NPDES permit for the MNGP on October 16, 2007. The NPDES permit specifies maximum daily average temperature at the end of the discharge canal depending on the month: 95°F in April through October; 85°F in November and March; and 80°F in December through February.

The NPDES authorizes discharges from five outfalls and requires monitoring at the river water intake. The outfalls and their effluent limits are listed in **Table 3-1**. None of the limits listed in this table will require modification to implement power uprate. Thus, no changes to the permit requirements, other than administrative and descriptive changes, are necessary to implement the power uprate.

The relevant changes identified thus far include the slight increase in circulating water discharge temperature (Outfall SD 001). Due to the increased thermal energy produced following the power uprate, 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 the MNGP is the source of thermal discharges from the plant. No physical modifications or operational changes are required for these systems to implement the uprate.

The 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.

The limits imposed by the NPDES permit are conservative and assure no significant adverse impact on the environment. 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 SD 001 (discharge canal) is continuous; 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 estimated that the MNGP 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. With cooling towers in service, the discharge canal temperature is expected to increase less.

The calculated maximum temperature increase of 4.5°F at the discharge canal inlet would be experienced during months when cooling tower operation is not required to meet NPDES permit temperature requirements. This resultant discharge canal temperature increase is well bounded by seasonal variations.

During combinations of low river flow and high atmospheric temperatures, discharge canal temperatures have approached the NPDES permit limits with cooling tower operation. During such periods Xcel Energy has reduced power at Monticello to maintain compliance with the NPDES permit. This practice will continue after the power uprate.

The uprate will not alter water volume requirements for the heat dissipation system, the physical construction of the discharge canal terminus, or temperature limits established by the NPDES permit. Therefore, the uprate does not change the findings of the thermal gradient and plume studies.

Water Quality
The water quality of the Mississippi River at the MNGP point of discharge is classified 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 Monticello, Xcel Energy submitted a report for review by the MPCA in 1987. In 1988, the MPCA determined that Monticello's operation had not adversely affected the water quality of the Mississippi River downstream of the plant and allowed us to reduce the monitoring program. There is no indication that chemical discharges from Monticello have caused any detrimental effects to the aquatic biota.

The MNGP water quality monitoring programs are conducted in accordance with the NPDES permit. Effluent limitations and monitoring requirements for the discharges are an integral part of the NPDES permit. Each Outfall identified in the permit requires continuous flowrate monitoring when discharging. Chemical discharges from the MNGP have been nominally less than those predicted. Modifications of the non-radiological drain systems or the retention basin system are not required as part of power uprate, and biocide/chemical discharges will be consistent within existing permit limits. No new contaminants or pollutants will be introduced as a result of power uprate, nor will contaminants presently allowed for release by the MPCA be significantly increased.

Bromine and sodium hypochlorite are injected into plant water systems at various concentrations to minimize microbiological fouling. The additional 20 days of cooling tower operation per year may require a very slight increase in normal bromine and sodium hypochlorite injection. The discharge of any additional residual halogens attributable to the increased use of cooling towers is expected to be insignificant, and effluent concentrations would continue to be well below the NPDES daily discharge limits.

Wetlands

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

5.11.2 GROUNDWATER

Ground water is used at the MNGP site to supply domestic potable water to the plant administration building, raw water to the reverse osmosis/make-up demineralizer system, and seal water to pumps at the plant intake structure. Groundwater supplies in the area are drawn primarily from surface deposits consisting of glacial outwash sand and gravel. The primary regional groundwater use in the vicinity of the Monticello site is for crop irrigation. The nearest potable water supply wells are located at the Monticello site. The groundwater table is about 20 feet below the surface at an approximate elevation of 910 feet MSL. The flow in the water table aquifer is toward the Mississippi River, which is at about elevation 905. Groundwater flow in the deeper bedrock units is toward the southeast, generally parallel to the regional surface water drainage.

Actual usage of groundwater between 1998 and 2006 averaged less than 38 gpm. Groundwater use for the facility is permitted by the MDNR Groundwater Appropriations Permit number 67-0083. The permit pertains to two water wells, each equipped with a 100-gpm capacity pump, which are connected together and are regulated under a single water appropriations permit with a withdrawal limit of 200 gpm. Four additional wells are operated at the facility for potable and non-potable uses similar to above. However, these wells have usage below 10,000 gallons per day and are not required to have a water appropriation permit. The estimated consumption due to the power uprate is not considered to be significant; therefore the uprate will not involve any changes to the Groundwater Appropriations Permit.

The MNGP monitors groundwater as part of the Radiological Environmental Monitoring Program. Since 1976, four wells have been sampled quarterly for radioactive and chemical contamination which includes sampling for tritium and gamma-emitting radionuclides. No contamination has been detected in any of the wells.

5.12 WASTE MANAGEMENT and DISPOSAL

Non-Radioactive Solid Waste
Construction activities associated with the power uprate will generate non-radioactive solid wastes. The volume will be comparable to the waste generated during a typical refueling/maintenance outage. No ongoing non-radioactive solid wastes will be generated due to power uprate.

Radioactive Waste
All of the radioactive waste systems at the 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 limit discharges in accordance with 10 CFR 20 and to satisfy the design objectives of Appendix I to 10 CFR 50. These limits and objectives will continue to be adhered to after power uprate. The uprate will not result in any changes in the operation or design of equipment of the solid and liquid waste systems; the safety and reliability of those systems is unaffected.

Reactor system wastes will increase slightly due to the uprate. These wastes are currently stored in the spent fuel pool and are not shipped offsite. An Independent Spent Fuel Storage Installation (“ISFSI”) is currently being constructed at the MNGP and spent fuel will begin being stored there in 2008. Under power uprate conditions, the number of irradiated fuel assemblies discharged from the reactor will increase from a 150 assemblies/cycle to 173 assemblies/cycle. These additional assemblies will be stored in the existing spent fuel pool and ISFSI facility.

The uprate will not result in radiological levels above the safe thresholds established by the NRC and in the Technical Specifications for the plant. The uprate will not introduce any new or different radiological release pathways. The uprate will increase the number of fuel assemblies to be handled at each refueling, but this change does not increase the probability of an operator error or equipment malfunction that would result in an uncontrolled radioactive release.

The volume of radioactive solid waste ("radwaste") generated on-site at the MNGP is continually tracked. Significant volume reductions have occurred in past years making the MNGP a recognized industry leader in waste reduction. For calendar years 1994 and 1995, the low-level solid radwaste volume at the MNGP was 48 and 49 cubic meters respectively.

This is well below the U. S. BWR Industry Median Volume of Low-Level Solid Radwaste of 178 cubic meters in 1994 and 107 cubic meters in 1995. 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 the power uprate (estimated at 3 cubic meters/year) could be accommodated in one additional truck shipment per year.

The bulk volume of total solid radwaste shipped from the MNGP (in addition to the spent resin, filter sludge, evaporator bottoms, etc.) consists of dry compacted waste, and contaminated equipment. This portion of the solid radwaste volume is not directly impacted by the power uprate on an ongoing basis, but is a factor in 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 the power uprate. However, procedures and practices at the MNGP remain in place, with the goal of minimizing the volume of solid radwaste that is created and ultimately requires shipment.

The power uprate will result in 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 after power uprate due to chemistry limits. Power uprate will not involve changes in RWCU flow rate or filter performance. We have estimated that the number of backwashes for RWCU would likely increase by approximately 5 backwashes per year from 24 to 29.

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. Xcel Energy has estimated that the number of backwashes for condensate demineralizer operation would likely increase from 78 to 93 backwashes per year for an increase of 15 backwashes per year.

The increases in solid wastes from the aforementioned processes will result in waste volumes increasing from 17.5 cubic meters/year to approximately 20.6 cubic meters/year, an increase of approximately 3 cubic meters/year.

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.

Xcel Energy is authorized to discharge liquid radioactive at the MNGP, however, the MNGP has been operated as a zero radioactive liquid release plant since 1972. No change is expected in the zero release policy as a result of the power uprate project.

The annual liquid volume processed due to the uprate is estimated to increase from approximately 11,000 gals/day to 11,250 gals/day due to the increased frequency of reactor water clean-up system filter/demineralizer and condensate demineralizer backwashes necessary 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 2 percent of overall system capacity and brings the total usage to about 55 percent of system capacity. In addition, because of the zero liquid radioactive discharge at the MNGP, this slight increase in input to the liquid radioactive system will be recycled, not discharged, and therefore will not produce any environmental impact.

6.0 ACRONYMS, ABBREVIATIONS and DEFINITIONS

ALARA	As low As Reasonably Achievable
AC	Alternative Current
BWR	Boiling Water reactor
CWA	Clean Water Act
CFR	Code of Federal Regulations
CFS	Cubic feet per second
CO	Carbon monoxide
CO_2	Carbon dioxide
CON	Certificate of Need
CT	Combustion Turbine
DC	Direct Current
DOC	Department of Commerce
DSM	Demand Side Management
EA	Environmental Assessment
ER	Environmental Report
GE	General Electric
gpm	Gallons per minute
HRSG	Heat Recovery Steam Generator
HVTL	High Voltage Transmission Line
IGCC	Integrated Gasification Combined Cycle
ISFST	Independent Spent Fuel Storage Installation
kV	Kilovolt
kW	Kilowatt
LEPGP	Large Electric Power Generating Plant
LFG	Landfill Gas
MAPP	Mid-Continent Area Power Pool
MW	Megawatts
MDH	Minnesota Department of Health
MDNR	Minnesota Department of Natural Resources
MISO	Midwest Independent System Operator
MNGP	Monticello Nuclear Generating Plant
MPCA	Minnesota Pollution Control Agency
MSL	Mean Sea Level
NOx	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
PM	Particulate matter
PM_{10}	Particulate matter less than 10 microns in diameter
$PM_{2.5}$	Particulate matter less than 2.5 microns in diameter
ppm	Parts per million
psi	Pounds per square inch

PUC	Public Utility Commission
OES	Office of Energy Security
OLTP	Original Licensed Thermal Power
R & D	Research and Design
RES	Renewable Energy Standard
RWCU	Reactor Water Cleanup
SO_2	Sulfur dioxide
STG	Steam turbine generator
TSR	Transmission Service Request
USFWS	U.S. Fish and Wildlife Service
USACE	United States Army Corp of Engineers
VOC	Volatile organic compounds

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TABLES

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Table 3-1 NPDES Discharge Limits

Outfall Number	Description	Parameter	Limit
SD 001	Plant Cooling Water Discharge	Bromine	Monitor Only
		Chlorination	2.0 hr/day (daily max)
		Chlorine Rate	Monitor Only
		Flow (mgd) monthly avg.	Monitor Only
		Flow (mgd) calendar month max	
		Flow (MG) calendar month total	
		Oxidants, Total Residual	0.2 mg/l (instantaneous max.)
		Plant Capacity Factor	Monitor Only
		Discharge Temperature °F	Seasonala
SD 003	Holdup Pond Effluent Discharge	Flow (mgd)	Monitor Only
		PH	pH (6.0 to 9.0)
		Total Suspended Solids	9.9 kg/day monthly avg.
		Total Suspended Solids	30 mg/L monthly avg.
		Total Suspended Solids	33.2 kg/day daily max
		Total Suspended Solids	100 mg/L daily max
SD 004	Turbine Building Sump & Miscellaneous Discharge	Flow (mgd) monthly avg.	Monitor Only
		Flow (mgd) calendar month max	Monitor Only
		Flow (MG) calendar month total	Monitor Only
		Oil and Grease	4.2 kg/day calendar month avg.
		Oil and Grease	10 mg/L calendar month avg.
		Oil and Grease	15 mg/L daily max
		Oil and Grease	6.3 kg/day max calendar week avg.
		PH	pH (6.0 to 9.0)
		Total Suspended Solids	12.7 kg/day calendar month avg.
		Total Suspended Solids	30 mg/L calendar month avg.
		Total Suspended Solids	42.3 kg/day daily max
		Total Suspended Solids	100 mg/L daily max

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Outfall Number	Description	Parameter	Limit
SD 005	Screen Backwash & Roof/Yard Drain	Flow (mgd) monthly avg.	Monitor Only
		Flow (mgd) calendar month max	
		Flow (MG) calendar month total	
SD 006	Screen Backwash & Roof/Yard Drains	Flow (mgd) monthly avg.	Monitor Only
		Flow (mgd) calendar month max	
		Flow (MG) calendar month total	
SW 001	Water Intake	°F Calendar Month Avg.	Monitor Only
		°F Calendar Month Max	
		°F Calendar Month Minimum	
WS 001	Mid-downstream discharge canal	Oxidants, Total Residual	0.05 mg/L daily max

(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

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Table 5-1 Radioactive Releases

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

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Table 5-2 Increase in Releases (Ci/year)

Element	Activity Release
H-3*	2.80E+01
Kr-85m	1.33E-01
Kr-87	8.21E-01
Kr-88	4.31E-01
Kr-89	1.88E+00
Xe-131m	0.00E+00
Xe-133	5.74E+01
Xe-133m	5.40E-01
Xe-135	7.61E+00
Xe-135m	1.07E+01
Xe-137	2.46E+01
Xe-138	2.71E+01
Ar-41	3.38E-02
I-131	1.32E-03
I-133	1.23E-02
I-135	1.57E-02
Cr-51	0.00E+00
Mn-54	0.00E+00
Co-57	0.00E+00
Co-58	0.00E+00
Co-60	1.73E-04
Zn-65	0.00E+00
Se-75	0.00E+00
Cs-137	1.97E-04
Ba-140	5.81E-05
Ce-141	3.96E-07
Sr-89	1.72E-05
Sr-90	3.93E-08

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Table 5-3 Exposure History from 2006 ALARA Report (REM)

	Total	Goal	RFO	RFO Goal	Operation
1990	94	100	0	0	94
1991	465	340	371	n/a	94
1992	114	117	0	0	114
1993	496	550	429	340	66
1994	395	450	321	365	78
1995	44	80	0	0	44
1996	240	300	169	250	71
1997	106	115	0	0	106
1998	209	250	162	190	47
1999	70	60	0	0	70
2000	216	240	176	190	40
2001	221	200	166	160	55
2002	40	40	0	0	40
2003	169	161	120	121	49
2004	35	39	0	0	35
2005	175	175	149	138	26
2006	33	40	0	0	33

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Table 5-4 Radiological Effluent Doses

	Noble Gases
Technical Specification Limits	10 mrad/year and 5 mrad/quarter gamma; 20 mrad/year and 10 mrad/quarter beta
Nominal Operating Values (a)	0.01% of 5 mrad/quarter gamma; 0.004% of 10 mrad/quarter beta
Adjusted Power Uprate Values (b)	0.011% of 5 mrad/quarter gamma; 0.0045% of 10 mrad/quarter beta

(a) From the percentages given in the 2006 Monticello Radioactive Effluent Release Report.

(b) Estimated by multiplying the nominal operating value percentage times the power uprate ratio (2004 MWth/1775 MWth).

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FIGURES

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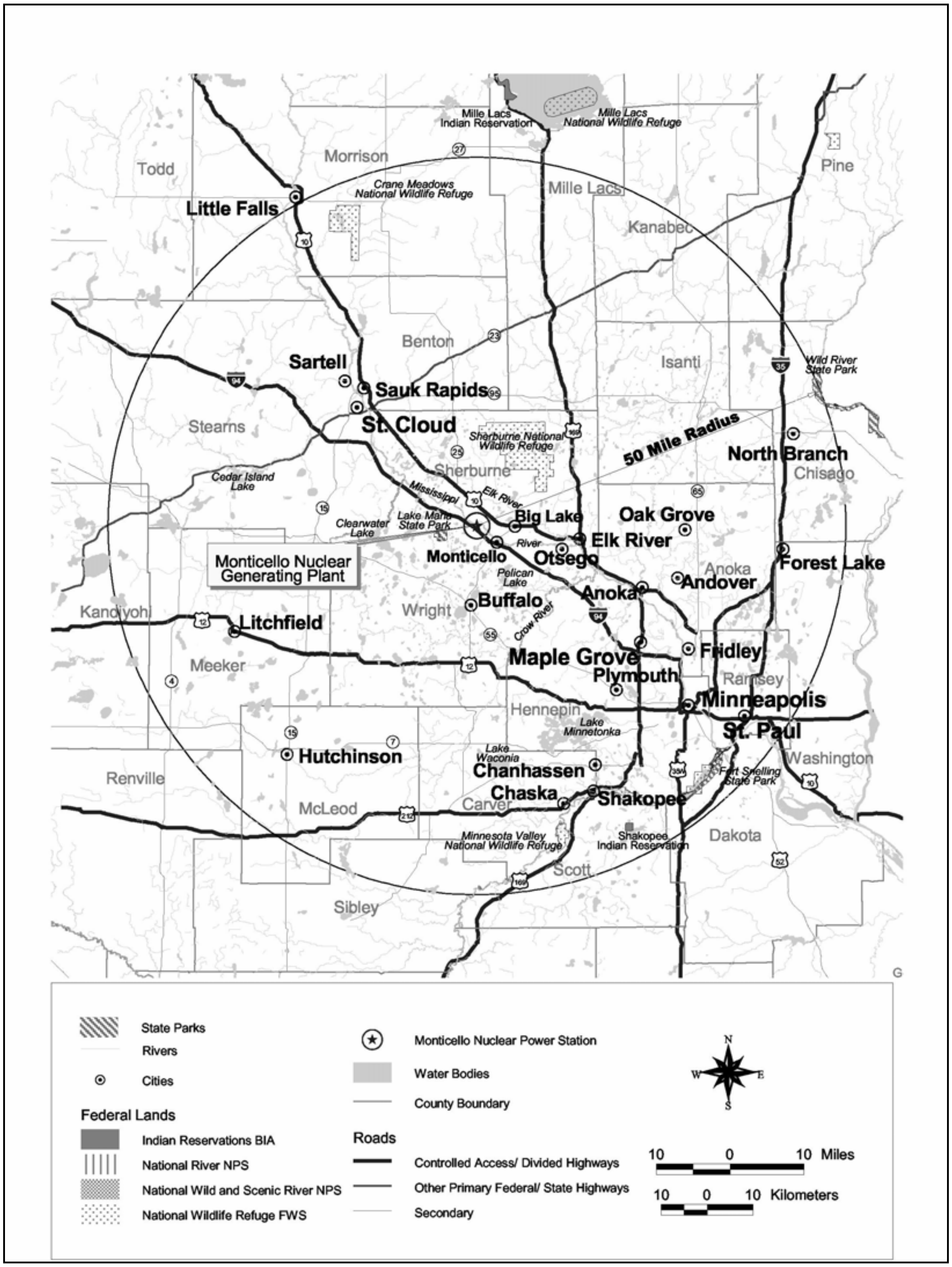

Figure 3-1 Monticello Site Location

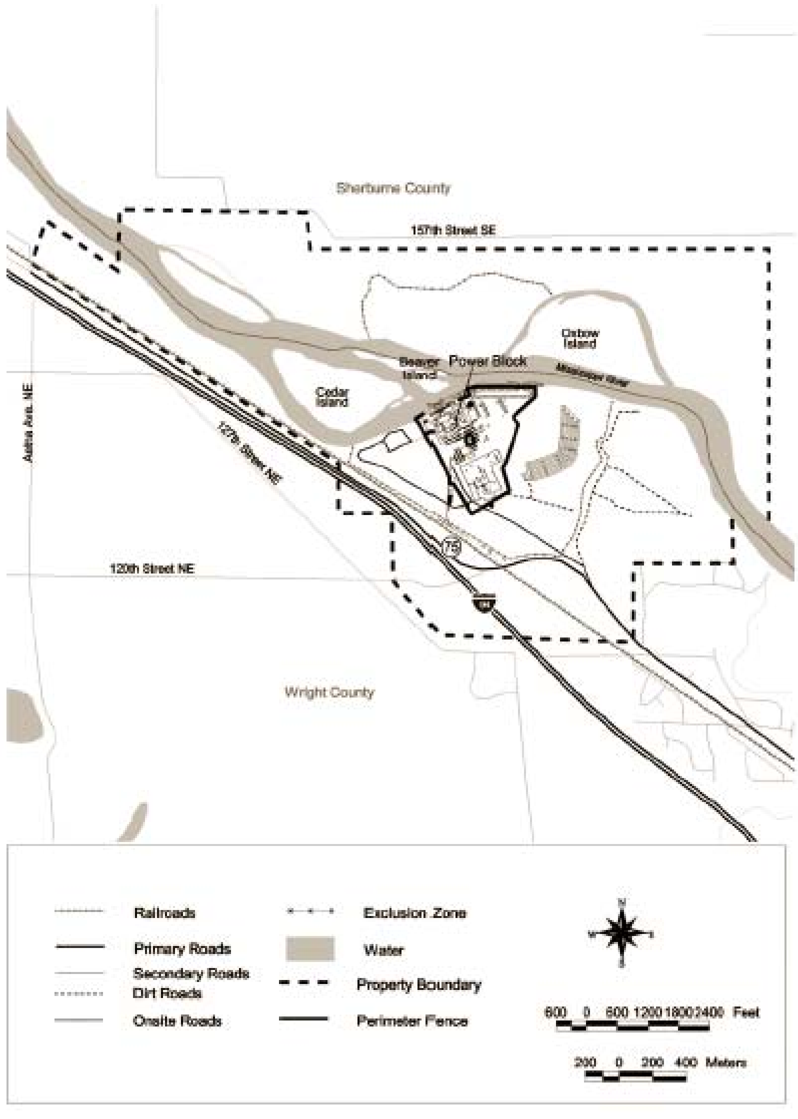

Figure 3-2 Site Boundaries Map

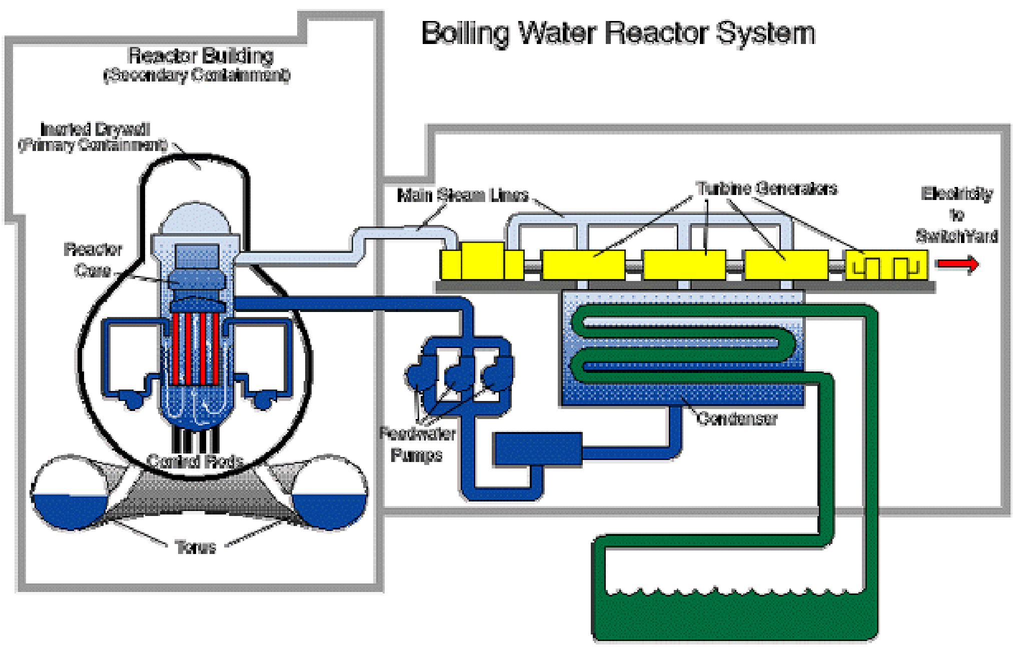

Figure 3-3 Schematic: Boiling Water RTeactor

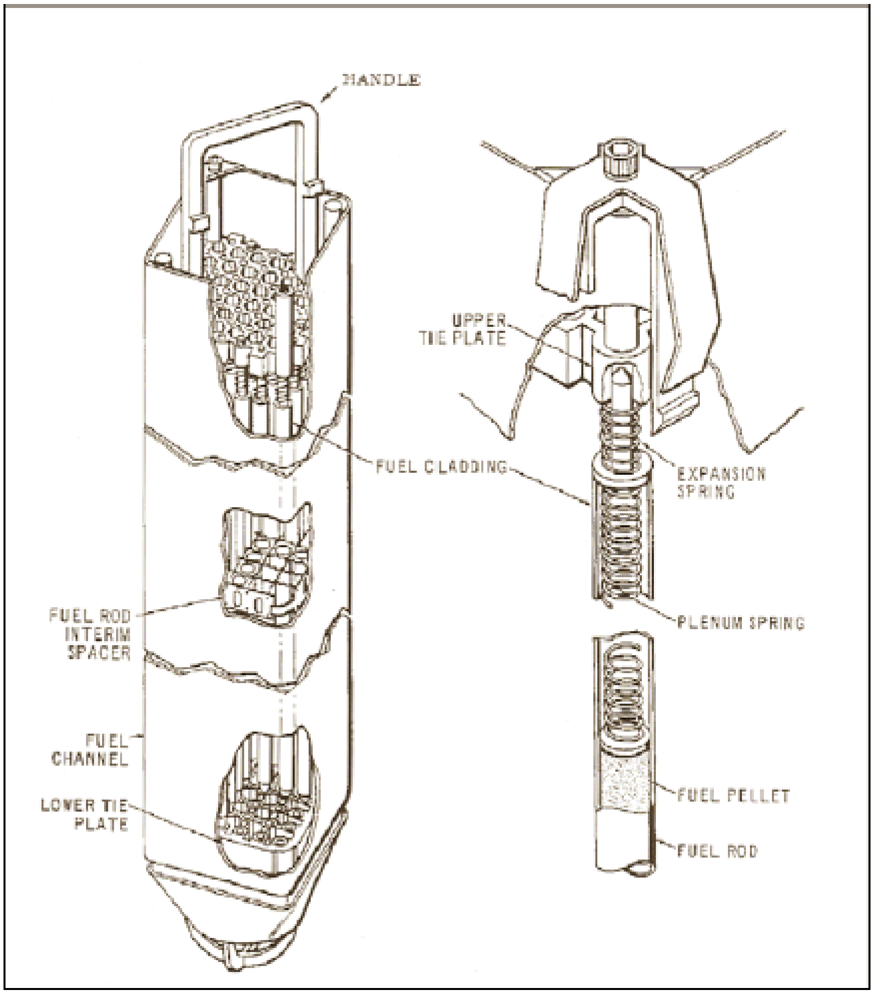

Figure 3-4 Schematic: Fuel Assembly

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APPENDIX A

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office of energy security

STATE OF MINNESOTA
Minnesota Department of Commerce

TO:	Edward Garvey, Director Office Energy Security
THROUGH:	Marya White, Manager MMW
FROM:	William Cole Storm, Staff DOC OES EFP (Tel: 651-296-9535)
RE:	DOC Staff Recommendation on Content of the Environmental Assessment Xcel Energy Monticello Nuclear Generating Plant Uprate Project PUC Docket No. E002/GS-07-1567 PUC Docket No. E002/CN-08-185

Date: June 10, 2008

ACTION REQUIRED: Signature of the Director on the attached Order, "Environmental Assessment Scoping Decision." Once signed, the Department of Commerce (DOC) Office of Energy Security (OES) Energy Facility Permitting (EFP) staff will mail the notice of the order to interested parties.

BACKGROUND:

Xcel Energy proposes to uprate the electrical generating capacity of MNGP from 585 megawatts electric to 656 megawatts electric (MWe). The uprate will occur in two phases – the first completed by 2009, the second by 2011.

The MNGP utilizes a boiling water reactor (BWR). In a boiling water reactor, a nuclear reaction in the reactor core generates heat, which boils water to produce steam inside the reactor vessel, which in turn is directed to turbine generators to produce electrical power. The steam is cooled in a condenser and returned to the reactor vessel to be boiled again. The cooling water is force-circulated by electrically powered feedwater pumps. Emergency cooling water is supplied by other pumps, which can be powered by onsite diesel generators.

The 71 MWe uprate will be achieved by increasing the steam output of the nuclear reactor and capturing this additional output with improved electrical generation equipment and systems. Steam output will be increased through an increase in the number of new fuel assemblies replaced in the reactor core at each refueling.

Need Docket

This project requires a Certificate of Need (CON) from the Commission pursuant to sections 216C.05 to 216C.30. Xcel Energy filed an application for a CON with the Commission for the project on February 14, 2008, in accordance with Minnesota Rules Chapter 7829 and 7849. On April 10, 2008, the Commission accepted the application as complete (April 18, 2008 order).

The docket number for the certificate of need is E002/CN-08-185.

The Department of Commerce Office of Energy Security (OES) prepares an Environmental Report (ER) on proposed large electric power generating plants that come before the PUC for a determination of need (Minn. Rules 7849.7100). The ER must contain information on the human and environmental impacts of the proposed project associated with the size, type, and timing of the project, system configurations, and voltage. The environmental report must also contain information on alternatives to the proposed project and address mitigating measures for anticipated adverse impacts.

Siting Docket

The proposed uprate of the electrical generating capacity of the MNGP from 585 MW electric to 656 MW electric falls within the definition of a Large Electric Power Generating Plant in the Power Plant Siting Act (Minnesota Statutes 216E.001 to 216E.18) and, thus, requires a Site Permit from the Commission prior to construction.

The proposed MNGP power uprate qualifies for the alternative environmental review process (Minn. Rule 7849.5500) and Xcel Energy applied for a site permit following the alternative review process on May 2, 2008. On May 8, 2008, the Commission accepted the application as complete (May 12, 2008 order).

Under the Alternative Review Process, an applicant is not required to propose any alternative sites or routes, but must include in the application the same information required under the full process (Minn. Rule 7849.5220). The OES Energy Facility Permitting (EFP) staff holds a public information/scoping meeting, develops a scoping decision recommendation and prepares a document called an Environmental Assessment. The review process begins with the determination by the Commission that the application is complete. The Commission has six months to reach a decision under the Alternative Process from the time the application is accepted. The commission must issue a certificate of need prior to issuing a site permit.

ENVIRONMENTAL ASSESSMENT

Minnesota Rule 7849.7100 provides that in the event an applicant for a certificate of need for a large energy project applies to the Commission for a site permit prior to the time the OES completes the environmental report, OES may elect to prepare a single environmental review document, termed an EA, which incorporates the requirements of both processes.

EFP staff recommends combining the two documents and has reflected that recommendation in the attached Scoping Decision.

SCHEDULE: The Environmental Assessment will be completed by July, 31, 2008.

STATE OF MINNESOTA

OFFICE OF ENERGY SECURITY

In the Matter of Xcel Energy's Application for a Certificate of Need and Application for a LEPGP Site Permit for the proposed Uprate project at the Monticello Nuclear Generating Plant.

ENVIRONMENTAL ASSESSMENT SCOPING DECISION
PUC Docket No. E002/CN-08-185
PUC Docket No. E002/GS-07-1567

The above-entitled matter came before the Director of the Office of Energy Security (OES) for a decision on the scope of the Environmental Assessment (EA) to be prepared on the proposed Uprate Project at the Monticello Nuclear Generating Plant.

The OES's Energy Facility Permitting (EFP) staff held a public meeting on May 29, 2008, to discuss the project with the public and to solicit input into the scope of the EA to be prepared. The public was given until June 9, 2009, to submit written comments regarding the scope of the EA.

Having reviewed the comments submitted and consulted with EFP staff, I hereby make the following Scoping Order.

MATTERS TO BE ADDRESSED

The EA on the MNGP Uprate project will address the following matters:

- 1.0 OVERVIEW
- 2.0 INTRODUCTION
  - 2.1 Project Description
    - 2.1.1 Description of Power Generating Equipment and Processes
    - 2.1.2 Air Emission Control Equipment
    - 2.1.3 Water Use
    - 2.1.4 Wastewater
    - 2.1.5 Solid and Hazardous Waste Generation
    - 2.1.6 Fuel Supply
    - 2.1.7 Electrical Interconnection
  - 2.2 Purpose
  - 2.3 Sources of Information
- 3.0 REGULATORY FRAMEWORK
  - 3.1 Certificate of Need
  - 3.2 Site Permit Requirement
    - 3.2.1 Environmental Assessment
    - 3.2.2 Public Hearing
  - 3.3 Other Permits
- 4.0 PROJECT ALTERNATIVES
  - 4.1 No-build Alternative
  - 4.2 Demand Side Management
  - 4.3 Purchase Power

- 4.3.1 Long term Purchase Power
- 4.3.2 Short term Purchase Power
- 4.4 Alternative Fuels
  - 4.4.1 Fossil Fuel Technologies
  - 4.4.2 Renewable Resource Technologies
- 4.5 Up-grading Existing Facilities
- 4.6 New Transmission

5.0 ENVIRONMENTAL SETTING

6.0 HUMAN AND ENVIRONMENTAL IMPACTS
- 6.1 Air Quality
- 6.2 Biological Resources
- 6.3 Culture, Archeological and Historic Resources
- 6.4 Geology and Soils
- 6.5 Health and Safety
- 6.6 Land Use
- 6.7 Noise
- 6.8 Socioeconomics
- 6.9 Transportation
- 6.10 Visual Impacts and Aesthetics
- 6.11 Water Resources
  - Surface Water
  - Groundwater
  - Wetlands
- 6.12 Waste Management and Disposal
  - Wastewater
  - Solid Waste
  - Hazardous Waste

7.0 SUMMARY OF MITIGATIVE MEASURES

SCHEDULE

The EA will be completed by July 31, 2008.

Signed this 10 day of June, 2008

STATE OF MINNESOTA
OFFICE OF ENERGY SECURITY

Edward A. Garvey

Edward Garvey,
Director

APPENDIX B

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ATTACHMENT 3

SITE PERMIT

FOR CONSTRUCTION OF A

LARGE ELECTRIC POWER GENERATING PLANT

IN

SHERBOUNE COUNTY, MINNESOTA

ISSUED TO

GREAT RIVER ENERGY

PUC DOCKET NO. ET2/GS-07-715

In accordance with the requirements of Minnesota Statute 216E and Minnesota Rules Chapter 7849.5010 - .6500, this Site Permit is hereby issued to:

GREAT RIVER ENERGY

Great River Energy (GRE) is authorized by this permit to construct a new natural-gas fuel, simple-cycle electric generating facility capable of producing 175 megawatts (MW) on the site of the Elk River Station Generating Plant in Sherboune County, Minnesota, identified in this Permit and in compliance with the conditions specified in this Permit.

Approved and adopted this 24th day of April, 2008

BY ORDER OF THE COMMISION

____

Burl W. Haar,
Executive Secretary

Issued: April 24, 2008

I. SITE PERMIT

The Minnesota Public Utilities Commission (Commission) hereby issues this Site Permit to Great River Energy, pursuant to Minnesota Statute216E and Minnesota Rules Chapter 7849, to construct a new natural-gas fuel, simple-cycle electric generating facility capable of producing 211 megawatts (MW) during typical winter conditions (175 MW summer rating) on the site of the Elk River Station Generating Plant in Sherburne County, Minnesota.

II. PROJECT DESCRIPTION

The project consists of adding one natural gas-fired, simple-cycle combustion turbine generator to GRE's existing refuse-derived-fuel-fired (RDF-fired) facility (i.e., Elk River Station) near Elk River, Minnesota in Sherburne County. The proposed project consists of a single, simple-cycle combustion turbine generator (CT) with a nominal summer generating capacity of 175 MW and other associated facilities. The facility will use natural gas and ultra-low sulfur distillate fuel oil.

The Elk River campus currently includes the Elk River Station, a RDF-fired combustor that co-produces electricity, and GRE's Elk River corporate offices. The CT site is an area of approximately 11-acres in the northeast portion of the campus.

An existing 69-kilovolt (kV) transmission line segment extending 5.6 miles in length from the Elk River site will be upgraded with new conductors and new poles. No change in voltage of the existing lines is necessary; therefore, no PUC High Voltage Transmission Line Route Permit is required. No other lines will require upgrades due to the project. GRE will obtain natural gas for the project from Northern Natural Gas Company (NNG) by connecting to an existing pipeline nearby. Northern Natural Gas will construct and own a new one-half-mile, 12-inch lateral natural gas pipeline off of its existing 16-inch pipeline located northeast of the project site.

The project description is more specifically described in the Site Permit Application and in the Environmental Impact Statement.

III. DESIGNATED SITE

The project site consists of an approximately 11-acres in the northeast portion of the Elk River campus.

The project location and site layout are shown in the attached figures.

The site is more specifically described in the Site Permit Application and in the Environmental Impact Statement.

IV. PERMIT CONDITIONS

The following conditions shall apply to the construction of the facility.

A. Site Plan. The Permittee shall submit to the Commission three (3) copies of a work/site plan at least fourteen (14) days prior to the commencement of construction activity. This plan will include the cut/fill/grading diagrams, the location and placement of the various structures to be constructed, including all electrical equipment, pollution control equipment, roads, and other associated facilities. The Permittee shall have the right to move or relocate any of these structures after construction commences, but the Permittee shall file an amended site plan with the MPUC at least twenty-four (24) hours prior to implementation.

B. Construction Practices

1. Application. The Permittee shall follow those specific construction practices and material specifications described in the Site Permit Application, unless this Permit establishes a different requirement in which case this Permit shall prevail.

2. Field Representative. At least fourteen (14) days prior to commencing on-site activity, the Permittee shall advise the MPUC in writing of the person or persons designated to be the field representative for the Permittee with the responsibility to oversee compliance with the conditions of this Permit. This person's address, phone number, and emergency phone number shall be provided to the MPUC, who may make the information available to local residents and public officials and other interested persons. The Permittee may change its field representative at any time upon written notice to the MPUC.

3. Roads. At least fourteen (14) days prior to commencing on-site activity, the Permittee shall advise the MPUC and other appropriate governing bodies having jurisdiction over roads, of all state, county, and city roads that will be used during that phase of the project. Where practical, existing roadways shall be used for all activities associated with construction of the facility. Wherever practical, all-weather roads shall be used to deliver heavy components to and from the project site. The Permittee shall, prior to construction activities, make satisfactory arrangements with the appropriate state, county, and local governmental bodies having jurisdiction over the roads to be used for construction, for any repair and maintenance of those roads resulting from the transportation of equipment and materials. The Permittee shall notify the MPUC of such arrangements prior to the start of construction activities.

C. Completion of Construction.

1. Plans and Specifications. Within one hundred twenty (120) days after completion of construction of the facility, the Permittee shall submit to the MPUC the "as built" site layout.

2. GPS Data. Within one hundred twenty (120) days of completion of construction, the Permittee shall submit to the MPUC, in the format requested by the MPUC, geo-spatial information (GIS compatible maps, GPS coordinates, etc.) for the power plant and associated facilities.

D. Other Requirements. The Permittee shall comply with all applicable state rules and statutes. The Permittee shall obtain all required permits for the project and comply with the conditions of these permits. The anticipated permits and approvals required for the project are listed in Table 1-1 of the Application for a Generating Plant Site Permit and in Table 5-1 of the Environmental Impact Statement.

E. Delay in Construction. If the Permittee has not commenced construction or improvement of the project within four (4) years from the date of issuance of this Permit, the MPUC shall consider suspension of the Permit in accordance with Minn Rule 4400.3750.

V. PERMIT AMENDMENT

This permit may be amended by the MPUC. Any person may request an amendment of this permit pursuant to Minn Rule 4400.3840, by submitting a request to the Commission in writing describing the amendment sought and the reasons for the amendment. The Commission will mail notice of receipt of the request to the Permittee. The MPUC may amend the permit after affording the Permittee and interested persons such process as is required.

VI. TRANSFER OF PERMIT

The Permittee may request that the MPUC transfer this permit to another person or entity. The Permittee shall provide the name and description of the person or entity to whom the permit is requested to be transferred, the reasons for the transfer, a description of the facilities affected, and the proposed effective date of the transfer. The person to whom the permit is to be transferred shall provide the MPUC with such information as the MPUC shall require in determining whether the new permittee can comply with the conditions of the permit. The MPUC may authorize transfer of the permit after affording the Permittee, the new permittee, and interested persons such process as is required.

VII. REVOCATION OR SUSPENSION OF THE PERMIT

The MPUC may initiate action to revoke or suspend this permit. The MPUC shall act in accordance with the requirements of Minnesota Rule part 4400.3950 to revoke or suspend the permit.

FIGURES

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Figure 1-2
Vicinity Map - Preferred Site

Elk River Peaking Station
Siting Permit Application
Great River Energy
Elk River, MN

Legend

- ★ Project Plant Site
- Highway
- Mississippi River centerline
- Lakes/River
- Railroad

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Figure 2-2
GRE Campus and Preferred Site

Elk River Peaking Station
Siting Permit Application
Great River Energy
Elk River, MN

250 0 250
Feet
100 0 100
Meters

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