ENVIRONMENTAL ASSESSMENT

XCEL ENERGY BLUE LAKE POWER GENERATING PLANT EXPANSION
SHAKOPEE, MINNESOTA
EQB DOCKET NUMBER 04-75-PPS-XCEL BLUE LAKE
PUC DOCKET E-002/CN-04-76

Prepared by:
Minnesota Environmental Quality Board
http://www.eqb.state.mn.us/

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OVERVIEW

The Project. Xcel Energy is proposing to expand its Blue Lake Generating Plant in Scott County near Shakopee, Minnesota. Xcel intends to install two simple cycle, natural gas-fired combustion turbines that will be capable of generating approximately 320 megawatts of power. These turbines will be used to generate electricity during periods of peak demand, and Xcel expects that the turbines will be used no more than 1300 hours per year. Xcel already maintains four combustion turbines burning fuel oil at the Blue Lake Generating Plant site with a capacity of approximately 200 MW.

In conjunction with installation of the two new turbines, Xcel is proposing to construct the necessary transmission facilities to convey the electricity to the transmission grid. Xcel proposes to construct a new double circuit transmission line – a 115 kilovolt line and a 230 kV line – to connect the Blue Lake Plant with a nearby substation about 4000 feet south of the Plant and across Highway 169.

In addition, Xcel has proposed to construct a new natural gas pipeline 16 inches in diameter about eleven miles long to bring fuel to the Plant. The pipeline will connect to an existing pipeline owned by Northern Natural Gas Company that runs through Scott County several miles to the south of the Blue Lake Plant.

Certificate of Need. Xcel is required to obtain a Certificate of Need from the Minnesota Public Utilities Commission for the installation of the two turbines. Minn. Stat. § 216B.243. A new power plant with a capacity of 50 megawatts or more is a "large energy facility" under the definition in section 216B.2421, subd. 2(1). A Certificate of Need is not required for the new transmission lines because the statute does not apply to transmission lines of the length involved here. Minn. Stat. § 216B.243, subd. 8(4). And a Certificate of Need is not required for the pipeline because it does not meet the distance requirement either. Minn. Stat. § 216B.2421, subd. 2(5).

Xcel applied to the PUC for a Certificate of Need on January 16, 2004. The PUC found the application to be complete on March 17, 2004. Under rules adopted by the Environmental Quality Board, the EQB is required to conduct environmental review of a proposed large energy facility during the Certificate of Need proceeding. Minn. Rules part 4410.7020. The environmental review looks at the potential impacts of the proposed project and various options, such as other forms of generation, or conservation, or additional transmission. This review also takes into account the possibility of not building the project at all.

Permits. In addition to a Certificate of Need, Xcel is required to obtain a Site Permit from the Environmental Quality Board identifying the location upon which the new facility can be built. Minn. Stat. § 116C.57, subd. 1. A Route Permit is also required from the EQB for the new transmission lines, notwithstanding that a Certificate of Need is not required. Minn. Stat. § 116C.57, subd. 2. The Route Permit establishes the route that the new transmission line will follow. Finally, Xcel is required to obtain a Pipeline Routing Permit from the EQB for the new pipeline. Minn. Stat. § 116I.015. The Pipeline Routing Permit establishes the route for the pipeline and imposes certain conditions designed to minimize the impact of the pipeline construction on landowners and the environment.

Environmental Assessment. As part of its review of an application for a Site Permit or a Route Permit for the kind of project proposed here, the EQB is required to prepare a document called an Environmental Assessment. Minn. Stat. § 116C.575, subd. 5. In the Environmental Assessment the EQB evaluates the potential impacts of the project at the sites and routes proposed by the applicant and at possible alternative sites and routes that are identified and discusses ways to mitigate these potential impacts. The public is given an opportunity to participate in the development of the scoping decision, which identifies the alternatives and impacts that will be evaluated in the Environmental Assessment.

When an applicant for a certificate of need also applies for permits from the EQB, the EQB can combine the environmental review that is required into one document that looks at the factors to be determined by the Public Utilities Commission, such as what kind of facility to construct, with the site-specific issues evaluated by the EQB in determining what site or route to approve. Minn. Rules part 4410.7060. That is what was done in this case. The EQB is preparing one document called an Environmental Assessment that will satisfy both requirements. The PUC and the EQB will both rely on the same Environmental Assessment in reaching their final decisions.

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 alleged need in this case by installing two new turbines at the Blue Lake Plant. The EQB 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 natural gas, upgrading other existing facilities, and building a new transmission line. With regard to each alternative, the EQB has described the alternative, discussed the feasibility and availability of each alternative, and addressed the potential environmental impacts associated with each alternative.

If the Public Utilities Commission determines that there is a need for additional power, it will issue a certificate of need for a particular size and type of facility. The EQB, then, must determine the appropriate location for this new facility. The only site under review in this proceeding is the Blue Lake site. If the PUC issues a certificate of need for two natural gas turbines, the Blue Lake Plant will be the location where they are installed. If the PUC finds that some other type of facility is needed, Xcel will have to start the permitting process over with an application for this other type of facility.

The EQB could include conditions in any Site Permit it issues for expansion of the Blue Lake Plant if certain conditions are necessary and appropriate. Also, the other permits that Xcel is required to obtain, such as an air permit from the Pollution Control Agency, 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.

If a certificate of need is issued for new combustion turbines, the EQB will also have to determine a route for the new double-circuit (115/230 kV) transmission line that Xcel has proposed to construct from the Plant to the substation to the south. Several alternative routes, besides the route proposed by Xcel, are under review and discussed in this document. The EQB will determine which route to approve. A major factor to take into account with regard to the selection of the route is the impact that the transmission lines will have on an oak savannah just south of Highway 169 in a parcel of land owned by the Minnesota Department of Transportation called Parcel 75.

Xcel will also have to build a new natural gas pipeline for this project. While the pipeline is a significant feature of the overall project, and a permit will be required from the EQB establishing the route for the pipeline, preparation of a separate environmental review document on the pipeline is not required.

Public Hearing. The Public Utilities Commission is required to hold a public hearing on the application for a certificate of need. Minn. Stat. § 216B.243, subd. 4. The Environmental Quality Board is also required to hold a public hearing on the applications for the site permit and the transmission line route permit. Minn. Stat. § 116C.575, subd. 6.

Both hearings are scheduled for May 17, 2004, in Shakopee. Administrative Law Judge Raymond Krause of the Office of Administrative Hearings will preside at the hearing. Interested persons will have an opportunity at the hearing to ask questions about the project and to make comments that will become part of the administrative records for both agencies. As part of the hearing, Judge Krause will set a date for receipt of written comments.

Upon close of the record, Judge Krause will write a report and make a recommendation to the Public Utilities Commission on Xcel's request for a certificate of need. The PUC will schedule the matter in due course for a final decision.

Judge Krause will also write a second report and make a recommendation to the EQB on which specific site and specific route to approve. The final decision on the issuance of the permits will be made by the full EQB Board. It is anticipated that this matter will come before the EQB Board for a final decision at its monthly meeting on July 15, 2004.

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1.0 INTRODUCTION

Xcel Energy filed a Certificate of Need (CON) application with the Minnesota Public Utilities Commission (PUC) on January 16, 2004, for the two combustion turbines. The PUC Docket No. for that proceeding is E-002/CN-04-76. On March 17, 2004, the PUC found the Xcel Energy CON application to be substantially complete.

On February 10, 2004, Northern States Power Company, d/b/a Xcel Energy (Xcel Energy), filed a Site Permit and Route Permit application with the Minnesota Environmental Quality Board (MEQB). The application is for the addition of two simple cycle, natural gas fueled combustion turbine generators to the Blue Lake Generating Plant (BLGP) in Shakopee, Minnesota, and the construction of a new segment of double circuit 115/230 kV transmission line approximately 4000 feet long that will connect the BLGP to the transmission grid. The EQB Docket No. for that proceeding is 04-75-PPS-XCEL BLUE LAKE.

On February 17, 2004, the EQB chair accepted Xcel Energy's Site and Route Permit application.

The transmission line portion of the project does not require a CON because it is less than one miles long (Minnesota Statutes 216B.243, Subdivision 8, paragraph 4).

In addition, Xcel Energy submitted a separate application for a permit for a new natural gas pipeline 16 inches in diameter about eleven miles long to bring fuel to the plant. The pipeline will connect to an existing pipeline owned by Northern Natural Gas Company (NNG) that runs through Scott County several miles to the south of the BLGP.

1.1 PURPOSE AND NEED

The need for this proposed expansion project is to ensure that Xcel Energy has adequate generating capacity in 2005 and beyond to reliably meet customer demand for electricity.[1] The need for the addition of peaking units at the BLGP is described in more detail in Xcel Energy's application for a Certificate of Need that is before the Public Utilities Commission.

1.2 REGULATORY REQUIREMENTS

The EQB is required to prepare a document called an Environmental Report when a certificate of need for a large energy project is applied for (Minn. Rules part 4410.7020). In the Environmental Report the EQB evaluates the human and environmental impacts of a project of the type proposed and of various alternatives to the proposed project (Minn. Rules part 4410.7035). The certificate of need process is the only time when issues of size and type of the facility, and the no-build alternative, are considered.

A project proposer who seeks a certificate of need for a new power plant must also obtain a site permit from the EQB for a site for the project. During the site permitting process, the EQB is

[1] Certificate of Need Application, Blue Lake Generating Plant Expansion Project. January 16, 2004.

required to prepare a document called an Environmental Assessment, analyzing the potential site specific impacts of the project (Minn. Rules chapter 4400.2750). If an applicant has applied to the EQB for a site permit for a specific site for a proposed project while the certificate of need application is pending before the Public Utilities Commission, the EQB may elect to evaluate the more general impacts of the proposed project with the site specific impacts associated with the proposed location of the power plant and the EQB prepare one environmental review document called an Environmental Assessment (Minn. Rules part 4410.7060). This is the procedure that the EQB has chosen to follow in this instance.

On March 11, 2004, a public meeting was held by the MEQB staff at the Shakopee city hall 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. The public was given until 5:00 pm April 2, 2004, to submit written comments. Two comments were submitted.

After consideration of the public comments, the Chair of the EQB issued a Scoping Order on April 13, 2004 (**Appendix A**).

Much of the information contained within this document was provided by the applicant or the applicant's representatives (Barr Engineering Company) in the form of: (1) the Application for Certificate of Need for the Blue Lake Generating Plant Expansion Project, (2) the Application for a Site Permit and Transmission Line Route, Blue Lake Generating Plant Expansion Project, (3) Correspondence with Xcel Energy, and (4) public comments received from the City of Shakopee.

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)
- City of Shakopee (http://www.ci.shakopee.mn.us/)
- U. S. Department of Agriculture Natural Resources Conservation (http://soils.usda.gov/about/)
- Minnesota Geological Survey (http://www.geo.umn.edu/mgs/)
- Department of Administration, State Demographic Center (http://www.demography.state.mn.us/)
- Federal Emergency Management Agency (http://www.fema.gov/)
- U. S. Department of Energy, Energy Information Administration (http://eia.doe.gov/)

2.0 PROJECT DESCRIPTION

2.1 Large Electric Power Generating Plant

2.1.1 General

The address for the Blue Lake Generating Plant (BLGP) is 1200 70th Street South, Shakopee, Minnesota 55379. The property is located approximately 15 miles southwest of Minneapolis in Township 115N, Range 22W, Section 11 in Scott County (**Figure 1 and Figure 2**).

The BLGP property is owned by Xcel Energy, is located between MN Highway 101 to the north and US Highway 169 to the south, and covers about 127 acres. The site boundaries are shown in **Figure 3**. The area immediately to the north, west and east of the Plant site is industrial in use. US Highway 169 borders the Plant to the south. Across US 169 from the site is single family residential housing. The Minnesota River is located approximately 8,000 feet to the north.

Xcel Energy proposes to construct the new combustion turbine generators (CTG) on the existing Blue Lake Plant site between existing fuel tanks and four existing oil-fired peaking units on an area previously graded and surfaced with gravel. The layout of the two units and associated facilities on the plant site is shown in **Figure 3**. No expansion of the Plant footprint will be required by the project.

The new generating units will be supplied with high pressure natural gas via a new 16-inch diameter high pressure natural gas pipeline connecting to the existing Northern Natural Gas interstate pipeline that runs east-west approximately 11 miles south of the Project.

Xcel Energy will use the project's capability for peak demand periods. The new units will be operated from Xcel Energy's central control center. Each new unit will be able to start up and be at full load within about 40 minutes of initiating the startup sequence. The second unit must lag the first unit in start up initiation by about 20 minutes because of shared startup equipment, so the two units can be at full combined load within one hour.

The new units will be limited, by air permit, to a total of 1,300 unit-hours per year of operation combined, corresponding to an annual capacity factor of less than 8 percent. The units will have at least a 30-year operating life. The new CTGs are expected to be in the range of 36 percent efficient, depending on operating conditions.

Maintenance activities for the CTGs and the balance of plant equipment will be based on power industry practices and the equipment manufacturer's recommendations. The scheduled maintenance activities for the CTGs typically include inspections of the combustor every 400 starts, of the hot gas path every 800 starts, and of all major components every 1200 starts.

2.1.2 Description of Power Generating Equipment and Processes

A simple cycle combustion turbine has three major components: (1) a compressor, (2) a combustion chamber, and (3) a turbine. Air is drawn into the compressor, compressed, and discharged to the combustion chamber, where it is mixed with fuel and ignited. The resulting expanding hot gases are sent through a turbine, causing the turbine blades to rotate. The rotating turbine blades turn a shaft connected to a generator that produces electricity.

Exhaust gasses are emitted to the atmosphere through a stack. The stack for the new CTGs will be approximately 50 feet tall.

Xcel Energy proposes to add two General Electric 7FA dry low NOx gas-fired combustion turbine generators to the Blue Lake Generating Plant, each with a nominal capacity of 162 MW.

In addition to the combustion turbine generators (CTGs), new Plant equipment will include:

- two generator step-up transformers,
- a 1000 foot transmission line from the transformers to the existing Blue Lake Substation,
- a gas metering station,
- an evaporative cooler,
- an exhaust stack with silencer.

2.1.3 Air Emissions

Natural gas combustion generates significantly less particulate matter than oil or coal, and very little sulfur dioxide or other trace air emissions. Uncontrolled natural gas combustion does produce nitrogen oxides (NO_X) and carbon monoxide (CO).

Dry low NO_X (DLN) combustor technology premixes air and a lean fuel mixture that significantly reduces peak flame temperature and thermal NO_X formation. Conventional combustors are diffusion controlled where fuel and air are injected separately, resulting in hot spots that produce high levels of NO_X. In contrast, DLN combustors operate in a "premixed mode" where air and fuel are mixed before entering the combustor, thus reducing the production of NO_X. Additionally, in DLN combustors the amount of NO_X formed does not increase with residence time, allowing the DLN system to achieve low CO and unburned hydrocarbons (UHC) emissions while maintaining low NO_X levels.

Emissions of nitrogen oxides from the two new units combined will be at or below 39.5 tons annually.

Emissions of CO, volatile organic compounds (VOC), sulfur oxides (SO_X) and particulate matter (PM_{10}) will be controlled through fuel selection and operational controls (combustion control, operating load, and firing temperature).

2.1.4 Water Use

Xcel Energy proposes to include evaporative inlet air cooling to enhance operating efficiency of the units during the warmest days of the year. Simple cycle combustion turbine technology can operate without the need for water. It is estimated that over 80 percent of the time the proposed units will operate without using any water. Approximately 20 percent of the time evaporative cooling may be used to cool the air entering the units. Air is cooled through humidification by allowing water to flow over a fabric or cellular media at the inlet to each combustion turbine. The evaporative cooling process consumes a small amount of water, but increases output about 3 to 5 percent depending on the ambient relative humidity.

Water quality data indicates that the available groundwater contains high levels of minerals and other undesirable constituents. Therefore, water treatment (i.e., pH adjustment and filtration) will be required prior to use of the water in the evaporative coolers.

A water balance diagram that summarizes water use and wastewater generation from the operation of the new units is shown in **Figure 4**. Each unit will use about 60 gallons per minute (gpm) of treated makeup water during peak load operation. Based on operating the two CTGs for approximately 1,300 unit-hours per year combined, and assuming the evaporative coolers are used for about 20 percent of the time, the total annual evaporative cooler water requirement will be about 840 thousand gallons of treated water.

A reverse osmosis water treatment system would require about 1 million gallons of raw water to produce 840 thousand gallons of treated water of adequate quality for the evaporative coolers.

2.1.5 Wastewater

There are three wastewater sources associated with the addition of the new CTGs. The sources and quantities of wastewater are (1) the groundwater reverse osmosis treatment process with 140,000 gallons per year, (2) the CTG evaporative cooler with 420,000 gallons per year, and (3) the groundwater treatment dual filter backwash with 50,000 gallons per year.

The wastewater will be temporarily stored on-site as it is generated before being trucked for disposal at a publicly owned treatment works (POTW). The wastewater will be stored in two 30,000 gallon fiberglass tans. At maximum allowed capacity factor and assumed frequency of evaporative cooling, the wastewater generated by the project operation would require about 100 truckloads annually.

Site domestic wastewater will continue to be discharged to an existing on-site drain field.

2.1.6 Solid and Liquid Waster Generation

Table 1 summarizes information on the solid and liquid wastes generated by the Project. The most significant waste streams will be wastewater resulting from the treatment process for groundwater used for evaporative cooling. Other solid and liquid wastes will stem from routine maintenance activities.

All waste management activities will be conducted in accordance with applicable requirements.

2.1.7 Fuel Supply

Natural gas will be the only fuel used to generate electricity in the two new units. An 11 mile long pipeline with a diameter of 16 inches will be constructed to supply natural gas from the Northern Natural Gas Interstate gas pipeline to the south. After metering, the natural gas will pass through a moisture separator and fine dust filter. The natural gas may require preheating prior to entering the combustion turbines. Preheating the gas prevents moisture in the fuel gas stream from damaging combustion turbine parts. Fuel use at the facility is a function of temperature and operating characteristics of the unit. It is anticipated at full capacity during summer months, each combustion turbine unit will use approximately 1.5 million cubic feet of natural gas per hour.

Consumption of natural gas in these new CTGs is not expected to impact the ability of the Northern Natural Gas interstate pipeline to supply natural gas for winter heating needs. Xcel Energy will have firm natural gas delivery contracts only for summer gas supply, when the CTGs are expected to operating.

A major consideration for electrical power generation through 2025 will be the availability of adequate natural gas supplies at competitive prices to meet growth in demand. Domestic natural gas consumption is met by domestic production and imports.

The Department of Commerce, in a similar application, stipulated that natural gas is expected to be available over the next 30 years.[2]

2.1.8 Other Permits

Air Quality Permit

Xcel Energy submitted an application to the Minnesota Pollution Control Agency (MPCA) on January 19, 2004, for an amendment to the BLGP's air emission permit (Permit No. 13900010-002) to accommodate the new CTGs.

[2] Stipulation and Agreement jointly submitted by FEP and the DOC. MPUC Docket No. IP-6202/CN-02-2006. April 2, 2003. p 7.

Groundwater Appropriation Permit

Xcel Energy will request an amendment to its existing Minnesota Department of Natural Resources (MDNR) groundwater appropriation permit (No. 731114) for the Plant to meet the water needs of the Plant resulting from the Project.

Wastewater Discharge Permit

Xcel Energy plans to dispose of Project wastewater at a Publicly Owned Treatment Works (POTW), so its discharges would be covered under the treatment plant's National Pollutant Discharge Elimination System discharge permit. Xcel Energy will be required to comply with any requirements of the POTW for accepting Project wastewater.

Storm Water discharge Permit

The Project will disturb over one acre of land and therefore triggers the requirement to apply for coverage under the Minnesota Pollution Control Agency's (MPCA) National Pollutant Discharge Elimination System Stormwater Permit Program for Construction Activities. Xcel Energy will require its contractor to apply for and comply with the construction storm water permit.

Other Permits

Xcel Energy has applied for a gas pipeline routing permit (EQB Docket No. 04-82-PRP-Xcel Blue Lake) in accordance with the requirements of Minnesota Statutes 116I.015 and Minnesota Rules 4415 to construct a natural gas pipeline to furnish natural gas for the Project.

The Project may require permits, approvals or notifications under the following programs:

- Exemption to allow burning of natural gas for power production (DOE, 10 CFR 503)
- Road Crossing Permits (Mn/DOT, Minn. Rules Chpt. 8810)
- Miscellaneous State Building and Construction Permits and Inspections
- Miscellaneous Local Building and Construction Permits and Inspection

2.1.9 Electrical Interconnection

The two units will generate electricity at a voltage of 18 kilovolts (kV). Two generator step up transformers will increase the voltage to 115 kV. A 115 kV transmission line approximately 1000 feet long will connect the transformers to the existing 115 kV bus in the Blue Lake Substation located on the eastern edge of the BLGP site. The transmission interconnection will require at least two tubular steel structures, one adjacent to the Plant and the other just outside the substation.

2.1.10 Construction

The first construction activity will be mobilization and establishment of field offices, security fencing, and construction entrances.

The site will then be leveled near the plant entrance to allow for construction parking of up to 70 vehicles. The gravel area where the new turbines will be located will be excavated approximately 2-4 feet to prepare the area for pile driving. A pile-driving rig will be set up on the site just prior to the start of permanent construction.

Upon approval of the necessary permits, construction will begin. Piles will be driven over a 15-day period. Following the setting of pilings, turbine foundation forms will be constructed and underground services will be installed. At the same time, the foundations for the generator step-up transformers and miscellaneous equipment will be formed. Extensive concrete work for all foundations will follow. Rough-ins for cable and pipe will be installed in the various foundations.

Within two to three months of initial mobilization, deliveries will begin arriving at the site, including the auxiliary equipment shipped by truck and the transformers shipped by rail. These shipments will continue over a four to five month period. Shipments of the transformers, turbines and generators will be via rail. The timing of these shipments will coincide with the completion and readiness of their respective foundations. Shipments at the rail siding and the plant entrance road will be coordinated by the Contractor’s heavy haul subcontractor. This equipment will be lifted from the rail cars and loaded onto transport vehicles to be driven to the construction site.

A construction crane will be located on site to lift large equipment from transport vehicles onto foundations. The combustion turbines, generators, and transformers for the new generating units will be set first, followed by the remaining auxiliary equipment. Erection of the turbine modular air inlets and the exhaust stacks will take place next.

The greatest number of on-site workers will be present during the erection of the turbines, installation of the wiring and piping, and while work is being performed at the Blue Lake Substation.

Xcel Energy will be constructing an overhead 115 KV line from the generator step-up transformers to the Blue Lake Substation as plant work nears completion. Work will also be ongoing in the substation to install breakers, transformer and additional protection devices. The number of construction personnel will decrease during final stages of construction such as installation of inlet air filters and bird screens, and completion of equipment platforms, insulation and painting.

The initial turbine start-up requires a two-week schedule. The first two days will be to fire gas in the unit and bring it up to full speed with no load on the turbine. On days three and four, the turbine will be run and synchronized with the grid at a low load. Subsequently the unit’s output will be slowly raised to its maximum capacity while testing the performance of various plant systems.

2.2 High Voltage Transmission Line – Double Circuit 115/230 kV

2.2.1 General

In addition to the previously discussed 115 kV line connecting the set-up transformers to the existing 115 kV bus, a conductor consisting of a 230/115kV double circuit transmission line and associated equipment will be necessary to provide an outlet from the Blue Lake Substation for the energy generated by the proposed generating units. The new HVTL route will connect the Blue Lake Substation to an existing 230 kV transmission line located approximately 2,700 feet south of the BPGP across highway 169.

2.2.2 Design

The proposed conductor for the transmission line is 795-kcmil 26/7 aluminum core steel supported (ACSS). For lightning protection, Xcel Energy will use 3/8-inch shield wire.

Xcel Energy is proposing to use single pole, galvanized steel, davit arm structures designed to accommodate a 230/115 kV double circuit for the transmission line. **Figure 5** depicts the double circuit structures that will be used. The steel structures will allow for longer spans. Xcel Energy proposes to locate the structures for the new line adjacent to the structures of the existing 345 kV transmission line.

The structures will be erected on concrete foundations and will be approximately 110 feet tall. Equipment will be added inside the existing fenced area of the substation and will include additional buswork, breakers and switches, communications equipment, and a new 230 kV transformer

2.2.3 Right-of-Way Requirements and Acquisition

The proposed transmission line route is parallel to an existing 345 kV transmission line along its entire route, except immediately adjacent to the existing Blue Lake Substation (**Figure 3**). The proposed transmission line will require an additional 45 feet of right-of-way (ROW) along the existing 345 kV transmission line (**Figure 6**). The total ROW, including the existing line and the proposed line, will be approximately 218.

After approval to construct the HVTL is secured, Xcel Energy will initiate contact with landowners. Xcel Energy will consult with the landowners to discuss the HVTL route in detail prior to conducting any necessary surveys and soil investigations. As the design detail for the line is developed, contacts with the owners of affected properties will continue and the negotiation and acquisition phase will begin to obtain the necessary land or easement rights for the facilities.

During the acquisition phase, individual property owners will be advised of construction schedules, needed access to the site, and any vegetation clearing required for the HVTL route. The right-of-way will be cleared of the amount of vegetation necessary to construct, operate, and maintain the proposed transmission line.

It is standard practice to remove any vegetation if the vegetation at a mature height would be a danger to the line. Also, any vegetation that is in the way of construction equipment may have to be removed. Wood from the clearing operation will be offered to the landowner or removed from the site. Brush will be chipped and disposed of on the right-of-way.

Some structure locations may require geotechnical analysis to assist with the design of the line's support structures. Xcel Energy will inform the landowners at the initial survey consultation that these borings may occur. An independent geotechnical testing company will conduct these studies.

Where possible, staging and lay down areas will be located within the right-of-way and limited to previously disturbed or developed areas. When additional property is temporarily required for construction, temporary limited easements may be obtained from landowners. Temporary limited easements will be limited to special construction access needs or additional staging or lay down areas required outside of the proposed transmission line right-of-way.

2.2.4 Construction

The steel structures will be supported by a drilled concrete pier foundation that will require an excavation 15 to 20 feet deep and four to six feet in diameter. Any excess soil will be removed from the site unless otherwise requested by the landowner. Erosion control measures will be implemented to minimize erosion during construction.

Xcel Energy construction crews or an Xcel Energy contractor will comply with local, state, National Electric Safety Code (NESC)[3] and Xcel Energy standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, right-of-way widths, erection of power poles and stringing of transmission line conductors.

Poles will be delivered to the structure locations and placed on the right-of-way out of the clear zone of any adjacent roadways or designated pathways. Insulators and other hardware will be attached while the pole is on the ground. The pole will then be lifted, placed and secured on the foundation by a crane or similar heavy equipment.

Once the structures have been erected, conductors will be installed by establishing a stringing setup area on the portion of the right-of-way on Xcel Energy property. Conductor stringing operations will also require brief access to each structure to secure the conductor cable to the insulators and to install shield wire clamps once final tensioning is completed. Temporary guard or clearance poles will be installed as needed over existing distribution or communication lines, streets, roads, highways, railways or other obstructions after any necessary notifications are

[3] http://standards.ieee.org/nesc/

made and permits obtained. This ensures that conductors will not obstruct traffic or contact existing energized conductors or other cables.

During construction, crews will attempt to limit ground disturbance wherever possible. Upon completion of construction activities, landowners will be contacted to determine if any additional restoration due to construction is necessary. Disturbed areas will be restored to their original condition to the extent practicable and as negotiated with the landowner. Post-construction reclamation activities include the removing and disposing of debris, dismantling all temporary facilities (including staging and lay down areas), leveling or filling tire ruts, employing appropriate erosion control measures and reseeding areas disturbed by construction activities with vegetation similar to that which was removed.

2.2.5 Operation and Maintenance

Periodic access to the right-of-way (ROW) of the completed transmission lines will be required to perform inspections and repair any damage. Regular maintenance and inspections will be performed during the life of the facility to ensure its continued integrity. Periodic inspections will be performed by ground personnel. Inspections will be limited to the ROW. If problems are found during inspection, repairs will be assigned to construction crews.

The ROW will continue to be managed to remove vegetation that might interfere with the operation and maintenance of the line. Transmission line vegetation management is typically reviewed on a five-year cycle. ROW clearing practices include a combination of mechanical and hand clearing, along with herbicide application to remove or control the growth of vegetation in some areas.

2.2.6 Other Permits

The 230/115 kV transmission line portion of the Project does not require a Certificate of Need because, although it meets the definition of a Large Energy Facility, it qualifies as an exempted project as defined in Minnesota Statutes 216B.243, Subd. 8. Paragraph (4): *"a high-voltage transmission line of one mile or less required to connect a new or upgraded substation to an existing, new, or upgraded high-voltage transmission line"*.

2.3 Pipeline

Associated with the proposed expansion of the BLGP is a natural gas pipeline that requires a Pipeline Route Permit from the Environmental Quality Board (Minnesota Statutes §116I.015, Minnesota Rules Chapter 4415).

The BLGP will be interconnected with a planned meter station near the Northern Natural Gas Company's (NNGC) interstate natural gas pipeline via this proposed new pipeline. The proposed pipeline will be constructed of steel, approximately 11 miles in length and 16 inches in diameter, and designed to deliver between 76.8 and 148.8 million cubic feet of natural gas per day at a nominal operating pressure of 530 to 950 psig.

The pipeline will be located entirely in Scott County, Minnesota. The northsouth segment of the pipeline route, just under 6 miles long, parallels Zumbro Avenue in Sand Creek and Louisville Townships for about 4 miles, then in Jackson Township runs parallel to 130th Street for a mile and Koeper Avenue for just under a mile. This is a sparsely populated rural area just south of the City of Shakopee. Approximately 24 houses are located along this segment of the route. The east-west segment of the pipeline route is parallel to U.S. Highway 169 and crosses under the highway just west of the Blue Lake Generating Plant. This portion of the route lies adjacent to two existing electric transmission lines along most of its length. The western-most ½ mile of the east-west segment lies in Jackson Township, while the remainder is within the City of Shakopee. The area immediately south of US Highway 169 is a fast-developing commercial and multi-unit residential area. The area along the proposed pipeline route north of US Highway 169 is developed as light industrial.

On May 10, 2004, a public meeting was held by the MEQB staff at the Shakopee city hall to discuss Xcel Energy's Pipeline Route Permit Application with interested persons and to solicit public comment. Twenty-eight people, in addition to representatives of Xcel Energy attended the public meeting. The public also had an opportunity to ask questions during informal discussions with project personnel. The comment period will be held open until 5:00 pm May 27, 2004.

The issues raised during the public meeting included:

- comments specific to individual parcels impacted by the proposed pipeline route,
- pipeline safety,
- effects of the pipeline property values, and
- compensation for right-of-way easements.

Copies of Xcel Energy's application for a Pipeline Route Permit can be viewed and copied at the Board's web site at www.eqb.state.mn.us/Docket.htm?Id=6272

3.0 ALTERNATIVES TO THE PROPOSED LEPGP

3.1 Introduction

Under Minn. Rules part 4410.7035, subpart 1, the Environmental Assessment 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.

3.2 No-Build Alternative

Description. The no-build alternative means that Xcel does not build anything. 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 PUC 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 Blue Lake Plant will not occur.

If Xcel 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. About 90 to 120 construction jobs will be created over the one year project construction period and approximately $8 million of payroll will be added to the regional economy. Operation of the new facility will require two to three full-time positions.

Feasibility and Availability. The no-build alternative is not one that requires any analysis regarding its feasibility or availability.

3.3 Demand Side Management

Description. 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 January 16, 2004.

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 January 16, 2004. Xcel 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

3.4 Purchase power

Description. Purchased power is exactly what it says – the purchase of electricity from another entity. Utilities like Xcel 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 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 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's certificate of need application and from the staff briefing papers in the proceedings before the Public Utilities Commission regarding withdrawal of Xcel's 2002 Resource Plan, which the PUC authorized on March 9, 2004. PUC Docket No. E-002/RP-02-2065.

Short Term Power Purchase Agreements. At this time Xcel 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 in 2005 and beyond.

In years 2000 through 2003, Xcel Energy planned for and successfully secured 800 to 1100 megawatts of short-term power purchases along with the required firm transmission rights to deliver the contracted electricity to be delivered during the summer peak demand season. While the generation resources appear to be available in the region, Xcel believes that the transmission capacity is no longer available to deliver that power from other systems to the Xcel Energy system. Accordingly, Xcel has reduced its estimates of available short-term power that can be successfully delivered to the Xcel system in future years. In 2005, short-term purchases are projected to be approximately 600 MW, about 300 MW lower than assumed previously. Available short-term purchase forecasts in future years are even lower: 500 MW in 2006 and 2007, and 400 MW in 2008.

Over the past five years, approximately 400 to 500 megawatts of Xcel Energy's short-term purchases were made from utilities to the south of the Xcel Energy System. Excess generation resources and transmission availability from the south had been sufficient to make these purchases an excellent source of economic capacity for Xcel Energy's System. Entering 2003, Xcel Energy believed that this situation would not change in the near term. Therefore, in early 2003, when Xcel Energy began its short-term purchase planning for 2004 and 2005, it continued to assume that the resources originating from utilities to the south would be available. As early as November of 2002, Xcel Energy submitted requests for transmission service to the Midwest Independent System Operator (MISO) for power to be delivered during the 2003 summer season. MISO notified Xcel Energy that these requests would require system impact studies.

To ensure adequate capacity coverage for 2003, Xcel Energy requested monthly firm transmission while MISO studied the annual request. The principal difference between monthly and annual firm transmission service is that annual transmission reservations establish a transmission access right that can be preserved from year to year or rolled over, and monthly service cannot. MISO authorized the monthly transmission at the same time that it was studying the annual request in more detail.

However, during the summer of 2003, Xcel began experiencing refusals of other monthly transmission requests to facilitate day-to-day power transactions from the south. While these monthly transmission reservations did not impact the production capacity purchases for 2003, they did restrict economical electric energy purchases, an indication that transmission availability was tightening sooner than anticipated.

On September 4, 2003, Xcel received the results of the system impact study from MISO for the annual transmission request submitted in November of 2002. The study identified numerous constraints that would limit Xcel's ability to acquire firm annual transmission access from the south. Among others, MISO identified that transfers from the south were constrained by the Quad Cities limitation on the Mid-American system, part of the transmission network at the Iowa Illinois border. Xcel then authorized MISO to conduct a Facility Study to identify the transmission improvements necessary to overcome the constraints.

MISO is currently working on this study.

Additionally, in early October 2003, the earliest time allowed by MISO procedures, Xcel made new monthly firm transmission requests for power purchases from the south for the summer season of 2004. MISO immediately denied those requests. Xcel expects that it will receive similar results for 2005.

Based on these transmission access developments, Xcel Energy concluded that it could not depend on short-term power purchases to the same degree as in the past. To complicate matters further, the North American power system experienced its largest blackout ever on August 14, 2003. Xcel Energy is concerned that the transmission system will be more conservatively administered until significant improvements are made and thus power purchases from other systems may decline further.

FERC and MISO procedures and tariffs provide for the rollover of certain transmission rights from one year to the next. While Xcel Energy is limited in the amount of power that can be delivered from the south, Xcel Energy continues to believe it can secure enough power for the 2004 summer season from other sources, using rollover transmission rights and unconstrained transmission paths, to cover peak demand and reserve obligations to the 85th to 90th percentile forecast probability.

However, because of the significant uncertainty in the regional transmission capacity picture in 2005 and beyond, Xcel Energy believes it is no longer prudent to rely as heavily on short-term seasonal power purchases from distant utilities to meet Xcel Energy customer's needs and reliability obligations. Xcel Energy will continue to pursue purchases as they are available but can no longer count on their availability for the foreseeable future.

The transmission system constraints that are adversely affecting the ability to deliver power from generation sources preclude short-term power purchases from reliably meeting the project's primary objectives.

Feasibility and Availability of Long Term Purchase Power. Xcel 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.

Xcel Energy anticipated that approximately 800 to 1,000 MW of capacity would be available in the years 2005 through 2008 through the 2001 All-Source bid process. Xcel continues to believe that over 800 megawatts of production capacity will ultimately be available but not by 2005. Xcel estimates that perhaps 600 MW will be available by 2005.

In June 2003, Xcel Energy announced its selection of 7 finalists in the 2001 All-Source, long term, and resource acquisition program. Those selections were:

- a 100 MW purchase from the Minnesota Power system,
- a 250 MW purchase from Reliant Energy from an existing plant in Illinois,
- a 240 MW purchase from Calpine Corporation from a gas combined cycle plant to be built in Wisconsin,
- a 155 MW purchase from TransCanada from a gas combustion turbine unit to be built near Hutchinson, Minnesota, and

- three power purchases totaling 450 MW of nameplate capacity from wind farms on Buffalo Ridge and in south-central Minnesota.

While all of the finalists initially identified 2005 in-service dates in their proposals, Xcel anticipated it would be difficult to complete the as yet undeveloped projects by 2005. However, Xcel did expect to complete negotiations and make purchases from at least the Minnesota Power proposal and the Reliant Energy's Illinois proposal, both existing generation, beginning in 2005.

However, each of the above proposals does not appear to be a reliable source of power. With regard to the Minnesota Power proposal, on August 6, 2003, Minnesota Power informed Xcel Energy that Minnesota Power was completing negotiations with another utility to dedicate the capacity and energy that was the subject of its proposal to Xcel. On August 25, 2003, Minnesota Power notified Xcel Energy that it had executed the long-term transaction with another utility and formally withdrew its All-Source bid.

The Reliant proposal and the Calpine proposal ran into difficulties because of the same transmission constraints (in the Quad City area) that prevented MISO from approving short term transmission requests from generation sources to the south. The Reliant Energy facility in Illinois is on an existing site and therefore cannot be developed in a different location. Reliant Energy has expressed a willingness to complete the negotiation process for a power purchase that would be contingent upon cost-effective transmission improvements necessary to eliminate the Quad Cities constraint. Xcel is investigating the facility improvements that would be required to overcome the constraints. However, it is very unlikely that this matter will be resolved in time to accommodate power deliveries in 2005 or 2006.

Recently, Calpine Corporation (through a wholly owned subsidiary called Mankato Energy Center, LLC) applied to the Environmental Quality Board for a site permit to build a natural gas plant in the Mankato, Minnesota, area. EQB Docket N. 04-76-PPS-Calpine Mankato. Mankato Energy Center has authorization from the PUC for approximately 360 MW of power (peaking capacity based on winter conditions) and is seeking a certificate of need for an additional 300 MW of capacity. Xcel is continuing to negotiate a contract with Calpine Corporation for power from this facility, but the project's in-service date will not be until at least 2006.

The TransCanada project is on hold, to the best of EQB's knowledge. No site permit application has been submitted to the EQB and TransCanada representatives have informed the EQB staff that plans have been placed on hold.

The net effect of all these issues is that the possibility of any of these All-Source projects providing the additional power by 2005 is extremely doubtful.

In response to these changes, Xcel revisited the shortlist of bidders in the All-Source program to determine if any viable proposals remained that could address the issues that have developed, with an emphasis on 2005 availability. After some initial screening, contacts were made with three bidders. As the result of the effort, discussions are underway with Rainy River regarding the purchase of 157 MW from a peaking facility in Superior, Wisconsin. Rainy River holds all permits and construction authorizations for the facility and has expressed a willingness to complete the project by the summer of 2005. Xcel Energy is attempting to negotiate a contract that would let them proceed; however, as with any complex power purchase agreement, significant issues need to be negotiated.

Xcel continues to seek other potential sources of power from All-Source developers and others as part of its efforts to ensure reliable service. However, at this time it is increasingly unrealistic to expect that that process will result in any new generating resources in 2005.

3.5 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 has proposed to install a natural gas-fired simple cycle turbine. In Appendix D of its Certificate of Need Application, Xcel addressed to some extent a number of other possible types of facilities that burn fossil fuels. Other types include a coal-fired boiler; a natural gas-fired combined cycle; and a fuel oil-fired simple cycle, although as mentioned earlier, no specific project is reviewed in this analysis.

3.5.1 Coal Fired Boiler

Description. This option is the burning of coal to generate electricity. Coal plants are generally baseload plants that operate nearly all the time. The Sherco Plant near Becker (approximately 2200 MW), and the Allen S. King Plant near Stillwater (approximately 571 MW), are examples of two baseload coal plants owned by Xcel Energy.

Impacts. The direct environmental impacts of coal burning include air emissions, solid waste (ash) generation, waste heat discharge to air and water, and rail traffic. Burning coal results in the emission of various air pollutants, including sulfur dioxide, nitrogen oxides, particulate matter, mercury, carbon monoxide, and carbon dioxide.

It is not possible to build a new coal-fired plant by the summer of 2005, when Xcel says the new Blue Lake facility must be online, and it is not likely that one of Xcel's existing coal-fired power plants could provide the peaking power to be provided by Blue Lake, but just to put the environmental impacts into perspective, it is possible to calculate how much of certain pollutants would be emitted if the power to be generated by the new natural gas turbines at Blue Lake were generated instead at one of the existing coal plants.

The Minnesota Pollution Control Agency has determined the emission rates per unit of electricity generated for a number of generating facilities in the state. These results are found in the Energy Planning Report prepared by the Department of Commerce in 2001 at page 95, Figure A-4. That report is available at:

http://www.state.mn.us/mn/externalDocs/Energy_Planning_Report_121602022402_2002PlanningRpt.pdf

If it is assumed that the Blue Lake turbines run at full capacity for the maximum 1300 hours per year that Xcel intends, the emissions associated with such generation at another facility can be calculated. If this electricity were replaced by electricity generated at Xcel Energy's Sherco Plant, for example, the additional emissions of NOx, SO2 and CO2, based on the PCA figures in the Planning Report, would be:

624 tons/year of NOx

624 tons/year of SO2

497,000 tons/year of CO2.

(The math is as follows: 1300 hours/yr times 320 megawatts = 416,000 MWhrs/yr. 416,000 MWh/yr times 0.003 lb NOx/kWh times 1000 kWh/MWh times 1 ton/2000 lbs = 624 tons/yr.) (The emission rate per unit of electricity is the same for both NOx and SO2 and 2.39 lbs per kWh for CO2.) Presently, emissions from existing baseload generating plants in Minnesota total approximately 80,000 tons for NOx, 90,000 tons for SO2, and 34 million tons for CO2.

Feasibility and Applicability. A coal-fired facility may serve as an intermediate load unit; however, coal-fired power plants are best suited for base load (steady, high-capacity) duty. Coal-fired units are not well suited to operate as peaking plants because of the long lead time (a day or more) necessary to bring a coal-fired plant online at full capacity.

Coal-fired power plants typically expect an annual outage rate for maintenance of 11 percent. Unplanned outages typically consume another 4 percent of the unit's availability. The net availability of coal-fired units is expected to be in the range of 85 percent.

The total capital requirement for a hypothetical coal-fired power plant is estimated to be $1,100/kW6. A typical energy cost for a hypothetical coal-fired power plant is estimated to be 3.5 cents per kWhour. Building a coal-fired power plant is a major construction project with a 24- to 36-month or longer time frame. While the construction work force is of a significant size, its contribution to the local economy is temporary. Power plants in today's market are operating with significantly fewer staff than in the past and are probably not regarded as having a key impact on local employment rates. Power plants in Minnesota are assessed a significant local property tax that can be viewed as likely offsetting the tax burden on other local enterprise.

3.5.2 Oil Fired Simple Cycle

Description. Xcel has proposed to install a simple cycle natural gas-fired system. A simple cycle system could be built to burn fuel oil instead of natural gas. In fact, the existing turbines at the Blue Lake Plant are fuel oil-fired simple cycle turbines.

The simple cycle power plant is similar to the technology described for combined cycle except that the heat from the combustion turbine exhaust gases is not recovered for secondary electric generation from a steam turbine. Because of this difference, simple cycle technology has a significantly lower efficiency than combined cycle technology.

Ancillary equipment is likely limited to:
- natural gas vaporizers;
- possible ammonia storage if post-combustion NOx control is required;
- control buildings;
- fuel oil storage tanks;
- a fuel forwarding system (pumps/piping/controls) to transfer fuel oil from storage to the turbine; and,
- fuel heating systems for winter operations.

Impacts. There will be more emissions into the air from burning fuel oil than from burning natural gas. Emissions from burning the fuel will be determined by the qualities of the particular fuel oil burned. **Table 2** contains a comparison of the operational data for an oil-fired simple cycle and the natural gas-fired units proposed. **Table 3** contains a comparison of fuel data for an oil-fired simple cycle and the natural gas-fired units proposed. **Table 4** contains a comparison of selected air pollution emissions data for an oil-fired simple cycle and the natural gas-fired units proposed. **Table 5** contains a comparison of estimated ground level air emissions for an oil-fired simple cycle and the natural gas-fired units proposed.

Since the proposed Faribault Energy Park Generating Facility will keep a supply of fuel oil available as a backup fuel and can burn fuel oil in place of natural gas for a certain number of hours per year, the Faribault EIS contains additional information on the emissions associated with burning fuel oil.

Environmental impacts in terms of energy efficiency (input fuel energy per kilowatt-hour produced), would not show a distinct advantage for a simple cycle turbine vs. a combined-cycle plant or a coal-fired plant. The energy efficiency for simple cycle turbine generators can be expected to be in the range of 25 to 30 percent, regardless of fuel. 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 NOx control is required.

Feasibility and Applicability. There is no technical reason why any turbines Xcel installs at the Blue Lake facility could not have the capability of burning fuel oil. The existing turbines at the Plant are fuel oil-fired.

If the turbines were to be designed to burn fuel oil, Xcel would have to arrange for a supply of fuel oil and would have to provide the storage facilities for the fuel.

The total capital requirement for a simple-cycle dual fuel-fired combustion turbine power plant installation is estimated to be in the range of $544 to $816/kW. Typical energy cost for a simple-cycle dual fuel fired combustion turbine power plant is estimated to be 14.1 cents per kW-hour. Building a simple cycle power plant is a major construction project with about a 12-month time frame. The positive impact of the construction work force on the local economy is temporary. A simple cycle unit dual fuel-fired plant will require significantly fewer staff than a corresponding coal-fired facility having to deal with major coal and ash handling operations. As with a natural gas fired simple cycle plant, a dual fuel-fired simple cycle plant could not be regarded as having a key impact on long-term local employment rates. Certain components of a simple cycle driven power plant would be subject to local property tax assessments.

The itemized cost comparison, in 2003 dollars, between the oil-fired simple cycle and the natural gas-fired simple cycle units proposed yield a cost of \$0.116/kW-hour and \$0.149/kW-hour, respectively.

3.6 Natural Gas Fired Combined Cycle

Description. 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 generator (HRSG) to produce steam that is used to drive a steam turbine connected to a second electric generator. Typically, of the overall electric output from a combined cycle unit, two-thirds is produced by the combustion turbine, and one-third is produced by the steam turbine generator.

Other major combined-cycle plant equipment would include:

- a system (e.g., condenser or cooling tower) to condense the steam turbine exhaust steam;
- a water treatment equipment to provide high-quality makeup water to the steam cycle;
- electrical switchgear to provide power to auxiliary plant equipment;
- water storage tanks and fuel oil storage tanks (if applicable);
- natural gas vaporizers;
- possible ammonia storage if post-combustion NOx control is required; and,
  operations and maintenance buildings.

Impacts. Environmental impacts in terms of energy efficiency (input fuel energy per kilowatt-hour produced), show distinct advantages for a combined-cycle project vs. a simple cycle project. The energy efficiency for a combined cycle plant can be expected to be in the range of 45 to 50 percent. The direct environmental impacts of operating a combined-cycle plant burning natural gas 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.

In February 2004, the Environmental Quality Board completed an Environmental Impact Statement on a proposed combined cycle natural gas plant – the Faribault Energy Park Generation Facility – in Rice County. EQB Docket No. 02-48-PPS-FEP. The reader is referred to that document for more information about combined cycle natural gas plants. The EIS and other documents related to that project can be found at

http://www.eqb.state.mn.us/Docket.html?Id=3217

Feasibility and Applicability. The combined cycle technology, both natural gas fired and fuel oil fired, is generally not considered for peaking service due to the relatively high capital cost when compared to simple cycle plants. Although it is more efficient to operate over longer periods than simple cycle, combined cycle technology is not as well suited to fast startup and short deployments because of the time required to bring the steam side of the plant into operation. The complexity of combined cycle plants and associated permitting and construction makes commercial availability of such a plant by 2005 unachievable.

Combined cycle plants are well suited to meet intermediate load needs. Secondary service modes of base load and peak load are also achievable. A combined cycle plant is more economical to keep on heated standby than a coal-fired boiler would be. A combined cycle plant has a shorter construction period compared to a coal-fired plant.

Combustion turbine-based power generation can expect to reflect a planned outage rate of about 7 percent and an unplanned outage rate of about 5 percent. However, properly operated and maintained combined-cycle facilities will achieve 90 to 95 percent availability.

A combined-cycle plant can generally demonstrate high reliability. Natural gas-fired combined cycle facilities typically have fuel oil backup to address the potential interruption of natural gas supply.

The total capital requirement for a gas-fired combined-cycle power plant is estimated to be $590/kW. A typical energy cost for a gas-fired combined cycle power plant is estimated to be 4.6 cents per kW-hour. Building a combined-cycle power plant is a major construction project with a 12- to 24-month time frame. The construction work force is sizeable, however, its contribution to the local economy is temporary. A combined-cycle unit fired with pipeline natural gas will require significantly fewer staff than a corresponding coal-fired facility having to deal with major coal and ash handling operations. A combined cycle plant is not regarded as having a key impact on long-term local employment rates. A combined cycle plant would be subject to applicable property tax assessments.

3.7 Renwable Sources of Energy

Xcel also considered possible renewable energy sources as part of its certificate of need application, including wind, solar, biomass, hydropower, and landfill gas. Each of these alternative energy sources is addressed below. Again, no specific proposals or projects have been identified.

3.7.1 Wind Technology

Description. Wind energy 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:

- the rotor blades;
- gear box;

- generator;
- nacelle (gearbox/generator housing); and,
- tower.

Wind turbines are either horizontal access or vertical access machines, which make full use of lift generating air flows. Each type of turbine has advantages and disadvantages. Most types are commercially available, although the horizontal access turbine is predominant. Horizontal access turbines are typically built with two or three turbine blades. Turbines for utility applications are normally installed in clusters of 5 to 50 megawatts, and may be referred to as wind farms.

Impacts. 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.

The EQB recently completed an Environmental Report on a proposed wind project – the Trimont Wind Project – for the Public Utilities Commission. PUC Docket No. IP-6339/CN-03-1841. That document and others relating to that project can be found at

http://www.eqb.state.mn.us/Docket.html?Id=5208

Feasibility and Availability. Xcel Energy eliminated wind technology from further consideration because its lack of reliability makes it unsuitable for peaking service. The reliability of a wind turbine-based generating facility depends on the wind, which is highly intermittent. The objective of the application to provide on-demand generation for peak load cannot be served by a variable energy non dispatch able resource.

Applicability for wind turbines is defined primarily by problems with reliability of the plant's "fuel", the wind. A wind turbine installation cannot adequately meet intermediate and peaking load needs. The variable nature of wind patterns does not support a strategy to address the growing demand for electric power in the near term. Siting of a large wind turbine installation is also predicated on locating candidate areas that have wind energy data that would support the project economics.

Wind turbines are generally expected to have an availability in the high 90-percent range (i.e., the turbines are capable of providing generating service). Even when wind energy is present, wind turbines can only generate power within an optimum range of wind speeds.

The total capital requirement for a wind turbine installation is estimated to be in the range of $1,000/kW. Typical energy cost for a wind turbine is estimated to be 5.4 cents per kW-hour. Building a wind farm project, like other power projects, would utilize a significant work force for the duration of construction. Operating a wind farm does not require a large staff. Wind power electricity often qualifies for tax credits or production incentives on a cents per-kilowatt basis.

3.7.2 Solar Technology

Description. Technologies for converting solar energy to electricity include 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. Trough systems predominate among today's commercial solar-powered plants. Trough systems focus the sun at 30 to 60 times its normal intensity to heat a heat transfer fluid (synthetic oil). The hot oil is pumped to a generating station heat exchanger to produce steam. Finally, electricity is produced in conventional steam turbine generators. Trough systems may be configured as hybrids to operate on natural gas on cloudy days or after dark. Natural gas provides 25 percent of the output of the Barstow plants.[4]

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.

Impacts. 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).

Feasibility and Applicability. Like wind turbine generation, the applicability for solar generation is defined primarily by its fuel availability. Solar power systems generally represent even less capacity than a wind turbine installation and, combined with a dependence on quality insolation rates, cannot meet intermediate load and peaking service needs. The variable nature of solar intensity does not support a strategy to address the growing demand for peak electric power in the near term. 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 power plants are generally expected to have an availability in the 90-percent range (i.e., the installations are capable of providing generating service if sufficient solar energy is present).

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, acknowledges that solar energy cannot be depended upon to maintain a capacity rating.

[4] http://www.sandia.gov/Renewable_Energy/solarthermal/NSTTF/question.htm

The total capital requirement for a photovoltaic power plant is estimated to be $4,000/kW. Typical energy cost for a hypothetical photo voltaic power plant is estimated to be 48.4 cents per kW-hour. A trough/gas hybrid plant is estimated to have a total capital requirement in the range of $3,240/kW19. Building a solar generation project, like other power projects, could utilize a significant work force for the duration of construction. Operating solar generation facilities does not require employing a large staff.

Xcel Energy eliminated solar generation from further consideration because its lack of reliability makes it unsuitable for peaking service. Like wind, solar power generation has real environmental advantages; however, like wind, solar radiation is a variable energy source that is not able to meet the intent of the project to provide peaking power generation on demand. Geography also plays a role in that Minnesota is not a prime location for significant solar power generation projects. Additionally, solar technology has significantly higher costs per kilowatt to install.[5]

3.7.3 Direct Fired Biomass

Description. 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 NOx control)
- Steam turbine
- 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 the 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.

Impacts. Waste streams from the 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,

[5] http://www.eere.energy.gov/solar/cs_ca_substation.html

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. 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. Viewing environmental impacts indirectly in terms of energy efficiency (input fuel energy per kilowatt hour produced), 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.

The EQB evaluated a biomass plant in the Environmental Report on the Trimont Wind Project. The reader is referred to that document for additional information about the possible environmental effects of a biomass plant burning hybrid willows, poplars, and corn stover.

Feasibility and Applicability. 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. Stoker boilers 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 offer a wide variety of available biomass fuels.

Biomass power plants are expected to have an annual outage rate for maintenance of 10 percent. Unplanned outages typically consume another 5 percent of the unit's availability. The net availability of biomass-fired units is expected to be in the range of 85 percent.

A biomass-fired plant can generally demonstrate high reliability (both the adequacy and security aspects) for base load and intermediate load service. The supply of biomass fuel in quantities sufficient to generate power at the hundred MW level and higher will require development of a fuel collection plan; however, Minnesota's agricultural and silva-cultural industries can likely support a reliable fuel supply.

The total capital requirement for a hypothetical wood burning power plant is highly variable and size dependent. Higher capacity plants will generally be much cheaper. Capital costs are estimated to be in the range of $1,100 to $1,840/kW. Typical energy cost for a wood burning power plant is estimated to be 4.9 cents per kW-hour. Building a biomass-fired power plant is a major construction project with a 24 to 36 month or longer time frame. While the construction work force is of a significant size, its contribution to the local economy is temporary. The long-term operation of a biomass power plant would not be regarded as having a large impact on local employment rates via plant staffing. The creation of a (larger) biomass-for-fuel market may be an opportunity for farmers and landowners to exploit biomass materials that would otherwise be neglected as an income producing source.

The plant would be subject to applicable property taxes that can be viewed as likely offsetting the tax burden on other local enterprise.

Xcel Energy eliminated biomass from further consideration because a biomass-fired plant cannot meet the peaking generation objectives of the project efficiently. Historically, biomass operation has not been available in sizes necessary to meet the needs of this project. Additionally, biomass generation takes long lead times to develop, has high capital cost and is most efficient in a base load application.

3.7.4 Hydropower

Description. Hydropower is clearly the major player in the renewable group of power options, accounting for about 97 percent of renewable generation. 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 streamflow. 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. Many projects combine the modes. 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).

Most conventional hydropower plants include the following major components:

- Dam; controls the flow of water and increases the elevation to create the head. The reservoir that is formed is in effect stored energy.
- Penstock; carries water from the reservoir to the turbine in a power plant.
- Turbine; turned by the force of water pushing against the blades.
- Generator; connects to the turbine and rotates to produce the electrical energy.

The principal advantages of using hydropower are its large renewable domestic resource space, the absence of polluting emissions during operation, its capability in some cases to respond quickly to utility load demands, and its very low operating costs. Disadvantages can include high initial capital costs and potential site-specific and cumulative environmental impacts.

Xcel Energy eliminated hydropower from further consideration because of its long lead time. Development of hydropower potential requires a prolonged study to determine environmental and hydrologic impact. New hydropower sites will also require siting of transmission systems through remote areas, which typically require a long approval process. The current project's primary objectives include near-term capacity that hydropower cannot address because of its long development lead times.

Impacts. Hydropower projects are not sources of the typical air and water emissions and solid waste disposal issues associated with solid fuel-fired power production; however, hydropower has faced scrutiny for its significant environmental impacts (i.e., altered river basin hydrology, fish mortality, fish migration interference, decrease in water quality, and flooding of land).

Feasibility and Applicability. 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 developed an estimate of undeveloped hydropower in the United States.[6] The study and its model estimate a hydroelectric potential of about 2,500 MW to be available at more than 450 potential sites located within MAPP region states. Those potential megawatts come from additional capacity at existing hydro plants (about 800 MW), from existing dams not equipped with power generating equipment (about 1,200 MW), and from sites which would require dam construction (about 400 MW).

While it is possible that some of the identified potential hydropower could be developed, exploiting the potential requiring dam construction 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

[6] http://hydropower.inel.gov/techtransfer/pdfs/doe_hydropower_fy03_annual_report_final.pdf

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.

There is potential for additional hydropower development within the MAPP region. It is unclear whether that potential can be practicably realized. The timetable to develop those resources is not likely to be able to meet near-term capacity and energy requirements.

During periods of normal precipitation and ice-free conditions, the availability of established hydropower generation is typically in the range of 95 percent.

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 is estimated to be $2,000/kW. Typical energy cost for a hydropower plant is estimated to be 6.6 cents per kW hour. Most of the potential sites within MAPP have capability of less than 10 MW and economies of scale cannot 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.

The construction work force is of a significant size, however, its contribution to the local economy is temporary. The long-term operation of a hydroelectric power plant would not be regarded as having a large impact on local employment rates via plant staffing. The creation of a new reservoir does have the potential for creating commerce from recreational activity if fisheries and surrounding land area are developed to attract the public.

3.7.5 Landfill Gas

Description. The most common use of landfill gas (LFG) is for on-site electricity generation by firing stationary engine generator sets. Some LFG facilities are used to fire boilers or turbines. LFG that is 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 megawatts.

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 user.

Impacts. LFG 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. From an energy efficiency perspective, 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. LFG power generation projects are generally sited on large landfills and produce power in the range of kilowatts, perhaps 1 to 2 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.[7]

The availability of a LFG-fired generation system is expected to be similar to systems firing natural gas (i.e., availability greater than 90 percent); 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 baseload generation and subsequently conserve fossil fuels.

The total capital requirement for developing a LFG power plant ranges from $1,100 to $1,700/kW27; however, the LFG volumes do not exist within one MAPP site necessary to fuel a

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[7] http://www.eia.doe.gov/cneaf/solar.renewables/page/landfillgas/landfillgas.html

plant with a hundred MW or higher capacity. Typical energy cost for a hypothetical LFG power plant is estimated to be 6.0 cents per kW-hour. Annual operating expenses may be less than for a typical fuel-fired power plant because the LFG is not typically a purchased input; however, municipalities associated with landfills may require a royalty to be paid from energy sales.

Xcel Energy eliminated landfill gas (LFG)-fired generation from further consideration primarily because potential landfill sites are not large enough to meet the project's primary objectives.

3.8 Up-grading Existing Generating Facilities

Description. This alternative is a consideration of whether Xcel Energy could upgrade one of its existing generating facilities to provide the additional electricity that is anticipated to be needed at peak periods in the summer. Indeed, Xcel's proposal is essentially one to upgrade an existing facility – the Blue Lake Plant.

Xcel is also proposing to upgrade another one of its peaking plants, the Angus Anson Generating Plant near Sioux Falls, South Dakota, by installing natural gas-fired turbines at that facility.

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. For reasons already discussed, other existing facilities do not lend themselves to serve as peaking facilities. Moreover, any alternative to rely on a facility that is a great distance away from the service area to be served by the Blue Lake Plant, such as the Angus Anson Plant in South Dakota, will encounter the same type of transmission constraints that were discussed above.

3.9 New Transmission

Description. 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. The potential impacts of the 4000 foot transmission line that is proposed as part of this project (which are described in Section 6.0 of this document) are a good indication of the kind of impacts that can be caused by any high voltage transmission line.

Feasibility and Availability. Additions to or improvements in the electric transmission system are not viable alternatives to the project, primarily because new transmission lines or transmission system upgrades could not be completed in the timeframe necessary to meet the deficit forecasted for 2005.

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4.0 ALTERNATIVE HVTL ROUTES

On March 11, 2004, a public meeting was held by the MEQB at the Shakopee city hall to discuss the project with interested persons and to solicit input into the scope of the EA. Ten people, in addition to representatives of Xcel, attended the public meeting. The public also had an opportunity to ask questions during informal discussions with company representatives. The comment period was held open until the close of business on April 2, 2004.

The major areas of concern voiced during the public meeting were noise, air emissions and routing of the transmission line through Minnesota Department of Transportation (MnDOT) Parcel No. 75. The property commonly referred to as MnDOT Parcel 75 is an oak woodland lot, approximately 50 acres in size, located directly south of the Blue Lake Substation on the south side of Highway 169.

The proposed HVTL route runs parallel (90 feet from centerline to centerline) to an existing 345 kV double circuit transmission line that passes over the western edge of MnDOT parcel No. 75. The new HVTL route will require an additional 45 foot wide right-of-way immediately east of the existing line right-of-way. The proposed route and alignment in relation to the existing line are shown in **Figure 3** and **Figure 6.**

Written comments were received from the Shakopee City Administrator (Mr. Mark McNeil) and the Shakopee Director of Natural Resources (Mr. Mark McQuillian) (**Appendix B**) concerning the proposed HVTL route and MnDOT Parcel 75

Three alternative routes to the proposed HVTL route (**Figure 7**) have been identified, in order to minimize or eliminate any impacts on the oak woodland (MnDOT Parcel No.75). **Table 4** contains summary data on the three alternative routes.

4.1 Alternative A: Eastern Edge of Parcel 75

Alternative A is a route paralleling the existing 230 kV double circuit transmission line that borders the east side of MNDOT Parcel 75. The Alternative A route will require a ROW 1,500 feet along the eastern edge of MnDOT Parcel No. 75. The total route length is approximately 3,400 feet.

4.2 Alternative B: Western Edge of Dean Lake

Alternative B is an alignment that runs west along the north side of U.S. Highway 169 and then crosses over the highway to connect to an existing line west of Dean’s Lake. The route is approximately 12,000 feet in length. This route does not impact MnDOT Parcel No. 75.

4.3 Alternative C: Along Highway 169 West

Alternative C crosses U.S. Highway 169 immediately south of the Blue Lake Substation and runs east along the south side of U.S. Highway 169 to County Road 18. The route then turns south parallel and just west of County Road 18 to the existing 230 kV transmission line. The route is approximately 6,300 feet in length. This alternative impacts approximately 200 feet of parcel 75.

5.0 ENVIRONMENTAL EFFECTS OF THE PROPOSED LEPGP

This section contains site specific information on the human and environmental impacts of the proposed large electric power generating plant. 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 U.S. Environmental Protection Agency and the Minnesota Pollution Control Agency have established air quality standards for a number of common pollutants, called criteria pollutants.[8] The criteria pollutants are called that because they are the pollutants that are emitted in large quantities and for which health criteria existed in 1972 when Congress passed the Clean Air Act.[9]

The criteria pollutants are sulfur dioxide (SO_2), nitrogen oxides of different chemical composition (represented by the term NO_X,), particulate matter PM_{10} and $PM_{2.5}$, (where the number specifies the size of the particulates), carbon monoxide (CO), ozone (O_3), and lead (Pb).

The combustion of natural gas can also result in the emission of noncriteria pollutants of concern. EPA refers to certain chemicals that cause health and environmental hazards as “hazardous air pollutants” or “air toxics.” Air toxics include chemicals such as benzene, formaldehyde, acrolein, mercury and polycyclic aromatic hydrocarbons (PAHs). EPA tracks emissions of these chemicals in the National Toxics Inventory (NTI) database.

Air quality in the Blue Lake generating plant area is similar to that of the Twin Cities in general. Air quality in the area meets or is better than National Ambient Air Quality Standards and Minnesota Air Quality Standards for all pollutants for which there are promulgated standards, including sulfur dioxide, nitrogen oxide, carbon monoxide, ozone, and particulate matter. The Twin Cities is under a maintenance plan for carbon monoxide and sulfur dioxide. The US EPA recently agreed with the MPCA that the entire state, including the Twin Cities and Shakopee area, should be classified as meeting the new 8-hour ozone standard.

Xcel Energy submitted an application for an amendment to the Blue Lake Generating Plant air emission permit, Permit No. 13900010-002, to the Minnesota Pollution Control Agency on January 19, 2004, to accommodate the project. The permit application requests that emissions from the Plant once operational be limited to 39.5 tons per year (tpy) NOx, 99.5 tpy CO, 39 tpy SO_2, and 14 tpy PM_{10}. This will effectively limit operation of the project to just over 1,300 unit-hours per year. The estimated air emissions from the new units, based on the conditions outlined in the air permit application, are presented in **Table 7**.

[8] http://www.pca.state.mn.us/air/air_rulesregs.html
[9] http://www.epa.gov/air/urbanair/6poll.html

Modeling completed in support of the air permit application demonstrates that ambient air quality around the Blue Lake Generating Plant is currently well within ambient air quality limits and will remain well within ambient air quality standards with the proposed expansion. The estimated maximum emission contributions to ambient air quality and the applicable standards are presented in **Table 8**.

Another potential source of air emissions is fugitive dust from site preparation and construction activities. Fugitive emissions will be controlled to reduce their impact on area residents by watering or applying dust suppressants to exposed soil surfaces as necessary.

5.2 Biological Resource

The area where the new CTG units will be placed is already free of vegetation. The new CTGs will be constructed on the existing BLGP grounds between existing fuel tanks and four existing oil-fired peaking units on an area previously graded and surfaced with gravel. The layout of the two units and associated facilities on the plant site is shown in **Figure 3**. No expansion of the Plant footprint will be required by the project.

The pre-settlement ecosystem in the area of the BLGP was dominated by oak openings and barrens. Since settlement, the area has been developed, which has effectively removed most evidence of the pre-settlement vegetation. The native oak woods were almost entirely replaced with industrial and residential land uses.

The area where the new CTGs will be placed does not contain any rare and unique natural resources.

5.3 Cultural Resources

5.3.1 Public Services and Infrastructure

The operation of the new CTGs will not require additional public services or public infrastructure. The expansion of the BLGP will not require additional electric service from the Shakopee Municipal Electric Utility. The expanded BLGP will utilize its own generating capacity to provide on-going operational electrical needs.

The BLGP does not currently have natural gas utility service. The natural gas fuel supply will be furnished through a new natural gas transmission pipeline (See Section 2.3). The natural gas pipeline is the subject of a separate application to the Environmental Quality Board for a Pipeline Route Permit (EQB Docket No. 04-82-PRP-Xcel Blue Lake).

Additional traffic generated by the operation of the expansion project will be limited to the truck traffic associated with the transporting of wastewater to a discharge point connected to a regional publicly-owned treatment works. It is estimated that an additional 100 truck trips annually will result from the expansion.

5.3.2 Archaeological and Historic Resources

The placement of the new CTGs will be on a previously graded area within the BLGP. There will be no impacts to any buildings, including historic structures.

The Minnesota State Historic Preservation Office (SHPO) was asked to review its records to determine whether there are any reported historic or archaeological resources potentially impacted by the expansion project. In its November 3, 2003, response, SHPO indicated that the closest archaeological site is approximately 900 feet north of the BLGP (**Appendix C)**. The SHPO requests that the identification and exact location of archaeological sites be kept confidential and not published in public documents.

5.3.3 Socioeconomic

The local community will benefit from the construction of the generating units and transmission line. Plant and transmission line construction will require an estimated 90 to 120 construction workers over the 12-month construction period. These positions will include pipe fitters, iron workers, millwrights, boilermakers, carpenters, electricians, and other trades. Estimates of an $8 million payroll into the regional economy will result from the plant expansion. Operation of the new units after construction will require approximately 2 to 3 additional full-time positions. Periodic maintenance will also create local jobs.

The expansion project and existing BLGP facilities will contribute property taxes for the City of Shakopee, Scott County and the Shakopee School District. The state and Scott County will also benefit from income and sales taxes paid as a result of the construction of the project. Payroll taxes will be collected from the operating staff associated with the project.

5.4 Geology and Soils

The BLGP is located on a broad flat flood terrace along the Minnesota River Valley that is approximately 800 feet above mean sea level (MSL). The surficial geology at the proposed turbine location consists of about 20 feet of alluvial sands over dolomite bedrock of the Prairie du Chien group.

Area soil resources will not be significantly impacted by the addition of the new CTGs. Most of the area to be disturbed for construction of the generating units has already been graded and covered with gravel.

No areas containing "prime farmland" soils, as defined by Minnesota Rules, part 4400.3450, subp.4, are present at the site of the new CTGs.

Figure 8 illustrates the soil series in the vicinity of the BLGP. Soils are primarily Zimmerman fine sand, 6 to 12 percent slopes (ZaC2). The Zimmerman fine sand soils are light-colored, windblown sands on the terraces between Shakopee and Savage. Zimmerman soils are subject to severe drought, as they have little moisture-holding capacity, and wind erosion is active.

5.5 Health and Safety

During construction, Xcel will employ a security service to guard equipment and prevent vandalism at the site. The existing BLGP has a six-foot high chain link fence around the property to prevent vandalism and to secure operations on site.

The Shakopee Police provide law enforcement services in the area. The Shakopee Police Station is located in the residential downtown part of the City of Shakopee, approximately 4.5 miles from the BLGP. The Shakopee Police department has 35 sworn officers and two community officers. Three to four officers are on duty during day time shifts, along with a sergeant, the Chief of Police and the Deputy Chief of Police. Night shifts have three officers available. The local Shakopee police force currently has the capability to respond to any law enforcement needs at the BLGP and will continue in the future.

The BLGP is equipped with a complete fire protection system consisting of two wells on site, one for potable water and one for fire protection. An electric fire pump supplies water from the dedicated fire well to hydrants situated around the site. The oil storage tanks at the BLGP are equipped with a foam fire suppression system. The new expansion project, as well as the existing units, will employ a carbon dioxide fire protection system. This existing equipment is designed in accordance with National Fire Protection Association (NFPA) requirements, and the new plant will meet the same NFPA requirements.

5.6 Land Use

5.6.1 Zoning and Displacement

The proposed location of the new expansion project takes advantage of existing generating station, substation and transmission infrastructure. The additional generating units will be located within the footprint of an existing peaking plant in an industrial-zoned area, so will not change the land use of the area.

The area surrounding the BLGP is zoned by the City of Shakopee as an I-1 Light Industry Zone. A zoning map of the Project area is included as **Figure 9**.

The expansion project will not require the displacement of any occupied residences or businesses. Work on the site will not displace any other existing or planned land use, including residential land uses. The proposed site for the additional CTG units is located within a 127-acre parcel owned by Xcel Energy. The nearest residential area are located beyond Highway 169, approximately 1,000 feet south of the new CTG units.

5.6.2 Aesthetics and Visual impacts

The proposed location of the new CTG units is on a portion of the BLGP that is already developed, housing the fuel oil storage tanks and the existing four oil-fired CTG units. The existing stacks at the BLGP are about 50 feet tall, as will be the new stacks.

No discernable land use change will occur. The expansion project will not impact the scenic areas to the north, along the Minnesota River National Wildlife Refuge.

5.7 Noise

5.7.1 Project Noise

Noise will be generated by the construction and operation of the new CTGs. Construction noise will be predominantly intermittent sources originating from diesel engine driven construction equipment. Potential noise impacts will be mitigated by proper muffling equipment fitted to construction equipment and restricting activities conducted during nighttime hours.

Noise from the operation of the new CTGs is expected to be predominantly low frequency noise, as is noise from traffic. Noise from the new CTGs operation will not significantly impact the acoustical environment given the high background noise levels (from nearby U.S. Highway 169 and MN Highway 101), the distance of the CTGs from adjacent properties, and the noise control technology that will be employed by the new generating units.

Noise from combustion turbine operation is a result of air flow through the combustion air intakes and from the exhaust gases discharging from the stacks. The new CTGs' air inlets will be appropriately sized and fitted with diffusers to minimize velocity and therefore the noise of air moving into the inlets. The stacks will be fitted with silencers to reduce the noise of exhaust gases leaving the plant.

Transmission conductors and transformers at substations produce noise under certain conditions. The level of noise or its loudness depends on conductor conditions, voltage level and weather conditions.

5.7.2 Noise Standards

Noise is defined as unwanted sound. Sound is transmitted as waves of pressure fluctuations through the air. The intensity of the sound is called the sound pressure level and is expressed using a logarithmic scale called the decibel (dB) scale. A doubling of sound energy yields an increase of three decibels.[10]

Noise standards have been established by the MPCA, Minnesota Rules part 7030.0040, subp. 2. The MPCA is the regulatory agency responsible for the enforcement of these standards. The

[10] A Guide to Noise Control in Minnesota. pp 9-13. Minnesota Pollution Control Agency, March 1999

standards are consistent with speech (hearing and conversation), annoyance, and sleep requirements for receivers within areas classified according to land use activities.

The MPCA has established various noise area classifications (NAC) and has established noise standards for each classification. The NAC is based on the land use activity at the location of the receiver, and the NAC determines the applicable noise standard. Lower noise levels are required in residential areas, for example, than in industrial zones.

The four noise area classifications are: NAC-1, NAC-2, NAC-3, and NAC-4. Some of the land use activities under NAC-1 include household units, hospitals, religious services, correctional institutions, and entertainment assemblies. NAC-2 land use activities include mass transit terminals, retail trade, and automobile parking. Some NAC-3 land uses include manufacturing facilities, utilities, and highway and street ROW. NAC-4, which has no noise limits, consists of undeveloped and under construction land use areas.[11]

The Minnesota Noise Standards are shown in **Table 9**.

The Minnesota Noise standards are expressed in dBA and are based on a statistical analysis of hour-long measurements of noise levels. The L_{50} is the sound level that must not be exceeded for more than 50% of any given hour (30 minutes), while the L_{10} is the sound level which must not be exceeded for more than 10% of any given hour (six-minutes). The daytime noise standards apply from 7 a.m. through 10 p.m. From 10 p.m. through 7 a.m. the nighttime standards apply. Noise standards apply at the point of the receiver, not at the boundary of the noise source. For a residential area, the standard applies at the nearest home, not at the property line of the residential property or the property line of the noise source.

5.7.3 Current Noise Environment

The BLGP site is located in an industrial area. The nearest residences are in the Classics at Waybridge Subdivision approximately 800 feet south of the plant's south fence line and approximately 1,000 feet south of the proposed CTG locations. South and adjacent to the plant, and between the plant and the nearest residence, is U.S. Highway 169, a well-traveled four-lane freeway (**Figure 3**).

Noise levels were measured between 7 a.m. and 7 p.m., on November 11, 2003, by Xcel Energy's environmental consultant. Noise monitoring stations were located at five locations: (1) MnDOT Parcel No. 75's western transmission line right-of-way; (2) East side of the BLGP; (3) Gateway Drive; (4) 6527 Hartley Boulevard; and (5) 6997 Edington Circle. Noise monitoring locations are shown in **Figure 10**. The existing generating units at the BLGP did not run during the monitoring period.

Highway noise dominated the acoustic environment during the background study. Measured noise levels are shown in **Table 10**. Sound levels were measured in individual octave bands at

[11] http://www.pca.state.mn.us/programs/noise.html

the two locations within the residential subdivision. The existing background noise levels exceeded State standards in many instances. Low frequency noise (below 1,000 Hz) accounts for most of the noise within the subdivision.

5.8 Transportation

Traffic near the BLGP will increase during construction. Local motorists would be temporarily inconvenienced by the increase in large construction vehicles on the roadways and possible delays in traffic. This impact is expected to last during the construction period of 12 months. Traffic due to the construction workers could be expected to produce local impacts over a thirty-minute period at the beginning and end of the day and each time a change in shift occurs.

During operation of the facility wastewater will be trucked to a discharge point along a regional POTW for disposal; this will result in an additional 100 truck trips to and from the facility. It is anticipated that during the summer peaking months (mid-June to Mid-September), approximately 35 truck loads of wastewater will be transported off-site per month.

5.9 Water Resources

5.9.1 Surface Water

The construction and operation of the expansion project will not directly impact area water bodies. Surface water runoff from the Project will follow existing drainage patterns. Currently, plant surface water runoff generally drains to the south where it enters a drainageway paralleling US Hwy 169. The drainage discharges to the west and then north into an intermittent stream that drains into the Minnesota River (**Figure 11**).

5.9.2 Groundwater

The BLGP currently obtains water from two on-site wells. The on-site wells are completed at approximately 195 feet below grade and draw water from the Prairie du-Chien/Jordan (PdC/J) bedrock aquifer. Operation of the new CTGs will not require any additional water wells.

Simple cycle gas-fired CTGs can operate with minimal need for water—just that needed for periodic maintenance washing. The new CTGs, as designed, will require additional water to utilize evaporative cooling to increase the power output of the units. The new units are estimated to require about 1.0 million gallons of water annually, assuming 125 unit-hours of evaporative cooling operation annually.

The BLGP has an existing groundwater appropriation permit from the MDNR allowing Xcel Energy to appropriate up to 5.0 million gallons per year, with the primary use being for fire protection. Xcel Energy plans to apply for a modification of the plant water appropriations permit requesting additional use of water for evaporative cooling and other needs associated with the plant expansion, but an increase in annual appropriation volume in not necessary.

While ground water is available from the alluvial outwash, most municipal, industrial and private wells in the vicinity of the BLGP are completed in the PdC/J aquifer. Other, deeper bedrock aquifers are also available for such uses. Water from the PdC/J aquifer is of high quality, suitable for drinking water without pretreatment. Large quantities are available. As examples, the city of Shakopee has eight municipal water supply wells, six of which are located in the PdC/J aquifer. Each well is permitted to withdraw up to 2.150 billion gallons per year, and the city routinely withdraws 100 millions gallons or more from each well each year. The nearby city of Savage also has 4 municipal wells, 3 in the PdC/J formation, each of which is permitted to withdraw 1 billion gallons per year. The city of Savage routinely withdraws over 100 million gallons from the 4 wells in a single year.

In contrast to other high volume users in the area, including the cities of Shakopee and Savage, industries and golf courses, the 1 million gallons of estimated ground water appropriation for the project is small.

5.9.3 Wetlands

There are no wetlands at the location of the proposed generating units, and wetlands near the BLGP will not be impacted by the expansion project.

Potential wetland sites identified in the vicinity of the BLGP are shown on **Figure 12.** Maps of potential wetlands were created using off-site pre-field work, and then were verified in the field by Xcel Energy and its environmental consultant (Barr Engineering Company). The off-site data collection included Natural Resource Conservation Service wetland determination maps, hydric soils, topography, and National Wetland Inventory data.

Barr Engineering Company reviewed the 12 potential wetlands areas identified. Of these, three areas are wetland, six areas are probable wetland and three areas would need more detailed study to confirm if they are wetlands. All of these wetlands are Palustrine wetlands and are listed in **Table 11**. The Palustrine wetland classification includes:

> *"all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and all such wetlands that occur in tidal areas where salinity stemming from ocean-derived salts is below 0.5 ppt. It also includes wetlands lacking such vegetation but with all of the following characteristics: (1) area less than 8 ha.; (2) lack of active wave-formed or bedrock shoreline features; (3) water depth in the deepest pat of the basin of less than 2 m at low water; and (4) salinity stemming from ocean-derived salts of less than 0.5 ppt.."* (Mitsch and Gosselink, 2000)

There are no DNR Public Waters, as defined by Minnesota Statutes, Section 103G.005, subd 15., within the expansion project area.

5.9.4 Wastewater

The primary waste water streams generated by the project will be those associated with the treatment of the groundwater prior to its use for evaporative cooling. Evaporative cooling water must be very clean in order to minimize fouling of the evaporative cooling equipment and the combustion turbines. Approximately 60 percent of the project water appropriation becomes wastewater, with the remaining 40 percent evaporating during the evaporative cooling process.

The characteristics of the wastewater will be very similar to the source groundwater, except that the water treatment processes will concentrate the constituents in the wastewater about 1 and 2/3 times the concentration present in the source water.

The wastewater from the project will be temporarily stored on site and then trucked off site for disposal, approximately 600 thousand gallons annually. About 100 truckloads of wastewater will require transport off-site, based on current project operating expectations.

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6.0 ENVIRONMENTAL EFFECTS OF THE PROPOSED HVTL

This section contains site specific information on the human and environmental impacts of the proposed high voltage transmission line. The impacts evaluated include those resulting from construction and operation of the line 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.

6.1 Air Quality

During construction of the project, there will be emissions from vehicles and other construction equipment and fugitive dust from ROW excavation and clearing activities. Temporary air quality impacts caused by the proposed construction-related emissions are expected to occur during this phase of activity.

There will be no significant adverse impacts to the surrounding environment because of the short and intermittent nature of the emission and dust-producing construction phases.

6.2 Biological Resources

6.2.1 Flora

The pre-settlement nature in the vicinity of the BLGP was oak openings and barrens. Since settlement, the BLGP area has been developed, which has effectively removed most evidence of the pre-settlement vegetation. The native oak woods were almost entirely replaced with industrial and residential land uses. There are some remnants of pre-settlement vegetation indicated by the Minnesota County Biological Survey of the area. Remnant plant species that could potentially be found in the proposed utility corridor are listed in **Table 12**.

Identified plant species along the proposed transmission line route include: bur oak (*Quercus macrocarpa*), northern pin oak (*Quercus ellipsoidalis*), quaking aspen (*Populus tremuloides*), black cherry (*Prunus serotina*), red cedar (*Juniperus virginiana*), honeysuckle (*Lonicera* sp.), buckthorn (*Rhamnus cathartica*), leadplant (*Amorpha canescens*), switchgrass (*Panicum virgatum).*

The area comprising the HVTL route corridor will be subject to vegetation management; tall growing plants will be managed so that they do not reach a height above approximately 15 feet. As a consequence of this vegetation management and the clearing of the trees along the transmission route corridor, approximately one to two acres of wooded land will be converted to lower growing vegetation.

Additionally, as a result of construction activities (See Section 2.2.4 Construction) there will be temporary and permanent impacts to the on-site vegetation. Permanent impacts on the landscape for a transmission pole with a concrete foundation are estimated at about 60 square feet.

Temporary impacts from installing the structure are estimated at 2000 square feet around the pole and then approximately a 20 foot wide path to the structure from the entry area to the site. For this project it is about 1000 feet to the expected site for the pole that will be on parcel 75 and therefore approximately 20,000 square feet of temporary impact. Construction will be done in late winter, which should help minimize temporary impacts to the site.

6.2.2 Fauna

The Minnesota National Wildlife Refuge is approximately one mile from the BLGP. Work along the HVTL route is not expected to impact the Refuge, or permanently displace any wildlife species from the area. A list of potential wildlife species was generated from data for the Minnesota Valley Wildlife Refuge (**Table 13**). These wildlife species may also inhabit areas in the vicinity of the BLGP and proposed HVTL route.

6.2.3 Rare and Unique Natural Resources

The Natural Heritage and Nongame Research Program, a unit within the Division of Ecological Services, Minnesota Department of Natural Resources has identified a portion (i.e., MnDOT Parcel 75) of the utility corridor (T115, R22W, Section 11) as a "Site of High Biodiversity Significance" area (**Figure 13**).[12]

The Natural Heritage Information System (NHIS) provides information on Minnesota's rare plants, animals, native plant communities, and other rare features. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, natural communities, and other natural features. Its purpose is to foster better understanding and conservation of these features.[13]

Sites of Biodiversity Significance are areas with varying levels of native biodiversity that may contain high quality native plant communities, rare plants, rare animals, and/or animal aggregations. Biodiversity significance is evaluated on the basis of the number of rare species, the quality of the native plant communities, size of the site, and context within the landscape.

The portion of the proposed HVTL route which passes along MnDOT Parcel 75 includes a natural community categorized as Dry Oak Savanna – barrens subtype. This natural community is described as a dry savanna on excessively drained soils, wind blown sand dunes on terraces along the Minnesota River. It is characterized by an open tree canopy (10-50% cover) composed of open grown Bur Oak (*Quercus macrocarpa*) and Northern Pin Oak(*Quercus ellipsoidalis*). Leadplant (Amorpha canescens), prairie willow (Salix humilis), and prairie rose (Rosa arkansana) are common shrubs. Ground cover is dominanted by forbs and graminoids typical of a dry prairie.

[12] Minnesota Department of Natural Resources. http://www.dnr.state.mn.us/ecological_services/mcbs/maps.html
[13] Minnesota Department of Natural Resources, Natural Heritage Information System.
http://www.dnr.state.mn.us/ecological_services/nhnrp/nhis.html

As stated earlier, preparation and maintenance activities along the transmission line ROW will consist of clearing of any trees that have the potential to encroach on the transmission line. Areas disturbed by construction will be graded and re-seeded with native plants typical of an oak savanna.

6.2.4 MnDOT Parcel 75

The parcel has been identified by the DNR as a dry oak savanna remnant. There are indications that due to the impact of urban development (i.e., fire suppression, ecological isolation, soil disruption) that the parcel is succeeding into an oak woodland-brushland. The tree canopy is composed primarily of pin oaks with a few chokecherry and some stands of sumac. The oak canopy has begun to close in many areas. In other areas red cedar, large numbers of aspen, and common buckthorn have overgrown the site, further increasing the shading of the ground layer.

The site has been and continues to be impacted by invasive species (i.e., Leafy spurge , *Euphorbia esula;* Common buckthorn, *Rhamnus cathartica;* Exotic honeysuckles, Lonicera tartarica, L. morrowii, L. x bella; Spotted knapweed, *Centaurea maculosa*), especially in disturbed areas.

Several native species have been identified on the site that are noteworthy indicators of the savanna community; Leadplant (*Amorpha canscens*), prairie clover (*Petalostemon* sp.), little bluestem (*Schizachryrium scoparium*) and several other clumped native grasses.

Existing HVTL Corridor

Within the adjacent transmission corridors, clearing over the years has allowed common buckthorn (*R. Cathartica*) and Tartarian honeysuckle (*Lonicera tartarica*) to become the established woody vegetation. Within these corridors some of the native ground layer still appears to be present. The narrow strips of vegetation between the transmission corridors and the residential developments to the east and west are currently heavily infested with invasive species and provide easy movement of invasives into the savanna remnant.

Xcel Energy's Preferred HVTL Corridor

As stated previously, Xcel Energy's preferred HVTL route will require an additional 45 feet of ROW through the dry oak savanna, immediately adjacent to the current HVTL corridor on the western edge of parcel 75.

Since the preferred HVTL corridor has a greater number of open areas than the proposed corridor on the east side of the parcel (i.e., Alternative A) the direct impact to the tall trees will be less. Additionally, construction of the HVTL along the eastern alignment would open that area up to invasive species.

Xcel Energy has stated that it would be willing to develop a Vegetation Management Plan for the preferred HVTL corridor that would allow for the regeneration and management of an oak savannah community, subject to the need for Xcel Energy to manage the tall-growing trees.

It should be noted that for a vegetative management plan of this nature to be effective, a similar plan would need to be developed and implemented for the reminder of MnDOT parcel 75

6.3 Cultural Resources

6.3.1 Human Settlement

No displacements of any residences or businesses will occur as a result of the construction of the HVTL along the preferred or alternative routes.

6.3.2 Archaeological and Historic Resources

The State Historic Preservation Office reviewed the proposed project area for potential archaeological and/or historical resources. The SHPO indicated that there were "no properties eligible for or listed on the National Register of Historic places will be affected by this project" (**Appendix C**). The closest archaeological site is approximately 900 feet north of the Blue Lake generating plant.

6.4 Geology and Soils

The steel HVTL support structures will be carried by a drilled concrete pier foundation that will require an excavation 15 to 20 feet deep and four to six feet in diameter. Any excess soil will be removed from the site unless otherwise requested by the landowner. Erosion control measures will be implemented to minimize erosion during construction.

During construction, crews will attempt to limit ground disturbance wherever possible. Upon completion of construction activities, landowners will be contacted to determine if any additional restoration due to construction is necessary. Disturbed areas will be restored to their original condition to the extent practicable and as negotiated with the landowner. Post-construction reclamation activities include the removing and disposing of debris, dismantling all temporary facilities (including staging and lay down areas), leveling or filling tire ruts, employing appropriate erosion control measures and reseeding areas disturbed by construction activities with vegetation similar to that which was removed.

6.5 Health and Safety

6.5.1 Electric and Magnetic Fields

The term EMF refers to electric and magnetic fields that are present around any electrical device. Electric and magnetic fields arise from the flow of electricity and the voltage of a line. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the current flow through the conductors.

The question of whether exposure to power-frequency (60 Hz) electric and magnetic fields can cause biological responses or even health effects has been the subject of considerable research for the past three decades. The EQB has addressed this issue in the environmental review documents it has prepared for other proposed transmission lines. See *Environmental Assessment for Great River Energy 115 kV Proposal – Plymouth Maple Grove,* EQB Docket No. 03-65-TR-GRE PMG and *Environmental Assessment for Xcel Energy Lakefield Junction – Fox Lake 161 kV Transmission Line,* EQB Docket No. 03-64-TR-Xcel. Both of these environmental assessments are available on the EQB webpage
http://www.eqb.state.mn.us/

Xcel Energy, too, has addressed the EMF issue in its Certificate of Need application and in its application for the EQB permits. Xcel will conduct EMF measurements for landowners, customers and employees who request them. In addition, Xcel has followed "prudent avoidance" guidance suggested by most public agencies. This includes using structure designs that minimize magnetic field levels and siting facilities in locations with fewer people living nearby.

Electric Fields

Voltage on any wire (conductor) produces an electric field in the area surrounding the wire. The electric field associated with a high voltage transmission line extends from the energized conductors to other nearby objects such as the ground, towers, vegetation, buildings and vehicles.

The strength of an electric field from a power line decreases with increasing distance from the line. Nearby trees and building material also greatly reduce the strength of power line electric fields. The intensity of electric fields is measured in kilovolts per meter (kV/M).

Table 14 provides the electric fields at maximum conductor voltage for the proposed 230/115 kV transmission line. The existing line and the proposed line would create maximum electric field of approximately 2.04 kV per meter centered beneath the existing line. The maximum limit that has been a permit condition previously imposed by the MEQB in other HVTL route permits is 8 kV per meter. The MEQB permit condition was designed to prevent serious hazard from shocks when touching large objects, such as semi tractor trailers or large farm equipment, parked under extra high voltage transmission lines of 500 kV or greater. See "Public Health and Safety Effects of High Voltage Overhead Transmission Lines" prepared by Robert S. Banks, Minnesota Department of Health, 1977.

Magnetic Fields

Current passing through any conductor, including a wire, produces a magnetic field in the area around the wire. The magnetic field associated with a high voltage transmission line surrounds the conductor and decreases rapidly with increasing distance from the conductor. The magnetic field is expressed in units of magnetic flux density, gauss (G).

Table 15 provides the existing and estimated magnetic fields based on the proposed line and structure design. The estimated magnetic field for the existing 345/115 transmission line and the proposed transmission line has been calculated at various distances from the center of the proposed transmission line. According to Xcel Energy, the maximum calculated ground level magnetic field expected when the new line and the existing line are both conducting electricity is approximately 50 milligausses directly below the new line.

Neither the Environmental Quality Board nor any other Minnesota agency has established a limit on the maximum magnetic field permitted under a high voltage transmission line. The only two states that have established standards are Florida (a 150 milligauss limit) and New York state (a 200 milligauss limit). The maximum magnetic field expected from the new line proposed here is well under those limits.

Electric and Magnetic Fields and Public Health

The following discussion about the health concerns related to electric and magnetic fields is taken from the *Environmental Assessment for Great River Energy 115 kV Proposal – Plymouth Maple Grove.*

The Minnesota Department of Health maintains a web page with information about electric and magnetic fields. The following statement is found at

http://www.health.state.mn.us/divs/eh/radiation/emf/index.html21

> Even though electric and magnetic fields are present around appliances and power lines, more recent interest has focused on the potential health effects of magnetic fields. This is because some epidemiological studies have suggested that there may be an association between increased cancer risks and magnetic fields.

Interagency White Paper on EMF

In 2002, Minnesota formed an Interagency Working Group to evaluate the body of research and develop policy recommendations to protect the public health from any potential problems resulting from HVTL EMF effects. The Working Group consisted of staff from the Department of Health, the Department of Commerce, the Public Utilities Commission, the Pollution Control Agency, and the Environmental Quality Board. The Department of Health coordinated the activities of the Working Group. In September 2002, the Working Group published its findings in a White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options (hereinafter “White Paper”).[14] The following quote from the White Paper summarizes the findings of the Working Group:

[14] A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options,

> Research on the health effects of EMF has been carried out since the 1970's. Epidemiological studies have mixed results – some have shown no statistically significant association between exposure to EMF and health effects, some have shown a weak association. More recently, laboratory studies have failed to show such an association, or to establish a biological mechanism for how magnetic fields may cause cancer. A number of scientific panels convened by national and international health agencies and the United States Congress have reviewed the research carried out to date. Most concluded that there is insufficient evidence to prove an association between EMF and health effects; however many of them also concluded that there is insufficient evidence to prove that EMF exposure is safe.[15]

Given the questions and controversy surrounding this issue, several Minnesota agencies that regularly deal with electric generation and transmission formed an Interagency workgroup to provide information and options to policy- makers. Based on its review the Work Group believes the most appropriate public health policy is to take a prudent avoidance approach to regulating EMF.24 Policy recommendations of the Work-Group include:

- apply low-cost EMF mitigation options in electric infrastructure construction projects,
- encourage energy conservation,
- encourage distributed generation,
- continue to monitor EMF research,
- encourage utilities to work with customers on household EMF issues and
- provide public education on EMF issues.[16]

Other EMF Studies

Recent studies of potential human health effects from transmission line EMF done in California[17] and for the Arrowhead line EIS in Wisconsin[18] have shown the same conclusions of no discernible health impacts from power lines. Both of these studies recommend the general precaution of minimizing unnecessary contact and advise prudent avoidance to EMF exposure.

The 1999 National Academy of Science report from its National Research Council found,

> No clear, convincing evidence exists to show that residential exposures to electric and magnetic fields (EMFs) are a threat to human health. After examining more than 500 studies spanning 17 years of research, the committee said there is no

Minnesota State Interagency Working Group on EMF Issues, September 2002, http://www.health.state.mn.us/divs/eh/radiation/emf/emfrept.pdf
[15] "White Paper" pg. 1
[16] Ibid, pg. 2
[17] California Department of Health, California EMF Program (2002), An Evaluation of Possible Risks from Electric and Magnetic Fields (EMFs) from Power Lines, Internal Wiring , Electrical Occupations and Appliances AND Policy Options in the Face of Possible Risks from Power Frequency Electric and Magnetic Fields (EMF) pg. 383
[18]Arrowhead-Weston Transmission Project, Final Environmental Impact Statement (EIS) Wisconsin Public Service Commission, Oct 10, 2000 pg 5-21

> conclusive evidence that electromagnetic fields play a role in the development of cancer, reproductive and developmental abnormalities, or learning and behavioral problems. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects. Committee chair Charles F. Stevens, investigator, Howard Hughes Medical Institute, and professor, Salk Institute, La Jolla, Calif. said Research has not shown in any convincing way that electromagnetic fields common in homes can cause health problems, and extensive laboratory tests have not shown that EMFs can damage the cell in a way that is harmful to human health.[19]

EMF Standards

The White Paper states:

> Electric utilities have a variety of methods for reducing EMF exposures when they upgrade or install transmission and distribution lines. The main methods for mitigating EMF include increasing distance from the line, using phase cancellation, shielding, and limiting voltage and current flow levels.[20]

The White Paper continues:

> Currently there are no federal or state *health-based* exposure standards for magnetic fields. This is due to the fact that there is inadequate scientific evidence to develop a health-based standard. References to safe/unsafe magnetic field levels in studies are not health-based standards; they are arbitrary exposure cut off points used by researchers, and they provide no scientific basis to evaluate or estimate potential health risks."31

On the basis of the most current information available and the expert advice of the Interagency workgroup on EMF lead by the Minnesota Department of Health, the EQB has not established any standard or regulatory limit on magnetic fields from HVTLs.

6.5.2 *Stray Voltage*

Stray voltage is defined as a small electric current that can be found between two contact points in an animal confinement area where electricity is used. Electrical systems, including farm systems and utility distribution systems, must be grounded to the earth by code to ensure continuous safety and reliability. Inevitably, some current flows through the earth at each point where the electrical system is grounded and a small voltage develops. This voltage is called neutral-to-earth voltage (NEV). When a NEV is measured between two objects that may be

[19] National Academy of Science, National Research Council, Stevens, et al, 1999, Possible Exposure to Residential Electric and Magnetic Fields pg. 132
[20] "White Paper" pg. 2

simultaneously touched by an animal, it is frequently called stray voltage. Stray voltage is not electrocution, ground currents, EMF or earth currents.

Stray voltage can be a concern on some dairy farms because it can impact milk production. Problems are usually related to the distribution and service lines directly serving the farm or the wiring on a farm. In those instances when transmission lines have been shown to contribute to stray voltage, the electric distribution system directly serving the farm or the wiring on a farm was directly under and parallel to the transmission line. These circumstances are considered in installing transmission lines and the potential for a stray voltage problem can be readily eliminated. The proposed transmission line will not run parallel to any existing distribution line for long distances. Therefore, no stray voltage issues are anticipated with this transmission line.

6.5.3 Radio and TV Interference

Corona on transmission line conductors can generate electromagnetic noise at the frequencies at which radio and television signals are transmitted. This noise can cause interference (primarily with AM radio stations and the video portion of TV signals) with the reception of these signals depending on the frequency and strength of the radio and television signal. However, this interference is often due to weak broadcast signals or poor receiving equipment. If interference occurs because of the power line, the electric utility is required to remedy problems so that reception is restored to its original quality.

6.6 Land Use

The proposed HVTL takes advantage of existing transmission right-of-way (ROW). The route proposed by Xcel Energy follows the ROW of an existing transmission line. Choosing a route parallel to the existing 345 kV transmission line is consistent with the State's nonproliferation policy for selecting transmission line routes[21].

The route proposed by Xcel Energy and the three alternatives route do not contain any prohibitive sites, including:

- National Parks;
- National historic sites and landmarks;
- National historic districts;
- National wildlife refuges;
- National monuments;
- National wild, scenic, and recreational river ways;
- State wild, scenic, and recreational rivers and their land use districts;
- State parks;
- Nature conservancy preserves;
- State Scientific and Natural Areas; and,

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

- State and national wilderness areas.

6.61 Zoning and Displacement

The area along the HVTL route is zoned by the City of Shakopee as an R1B-Urban Residential. A zoning map of the area is illustrated in **Figure 10** The Project will not require the displacement of any occupied residences or businesses. The nearest residential area lies approximately 200 feet west of the proposed HVTL route.

6.6.2 Aesthetics and Visual Impacts

The transmission line will utilize single steel poles spaced approximately 600 feet apart and 110 feet high located adjacent to existing structures. The transmission line will parallel an existing HVTL ROW and, as with the existing lines, the new transmission lines will be visible from a few nearby residences, local roads and US Highway 169.

6.7 Noise

Construction Noise

Noise will be generated by the construction of the HVTL; the construction noise will be predominantly intermittent sources originating from diesel engine driven construction equipment. Potential noise impacts will be mitigated by proper muffling equipment fitted to construction equipment and restricting activities conducted during nighttime hours.

Corona Noise

Transmission conductors produce noise under certain conditions. The level of noise or its loudness depends on conductor conditions, voltage level, and weather conditions. Generally, noise levels during operation and maintenance of transmission lines is minimal.

Noise impacts from the proposed construction are incremental and not significant. Noise emission from a transmission line occurs during heavy rain and wet conductor conditions. In foggy, damp, or rainy weather conditions, power lines can create a subtle crackling sound due to the small amount of the electricity ionizing the moist air near the wires. During heavy rain the general background noise level, rain falling and wind blowing, is usually greater than the noise from the transmission line.
In these conditions, very few people are out near the transmission line. For these reasons audible noise is not noticeable during heavy rain. During light rain, dense fog, snow, and other times when there is moisture in the air, the proposed transmission lines will produce audible noise higher than rural background levels but similar to household background levels. During dry weather, audible noise from transmission lines is a barely perceptible, sporadic crackling sound.

6.8 Transportation

Traffic near the proposed HVTL will increase during construction. Local motorists would be temporarily inconvenienced by the increase in large construction vehicles on the roadways and possible delays in traffic. This impact is expected to last during the construction period of 12 months. Traffic due to the construction workers could be expected to produce local impacts over a thirty-minute period at the beginning and end of the day and each time a change in shift occurs.

6.9 Water Resources

Transmission structures are generally designed for installation at existing grades, therefore, structure sites will not be graded or leveled, unless it is necessary to provide a reasonably level area for construction access and activities. Once construction is completed, any graded area will be restored to its original contour to the extent practicable.

The steel structures will be supported by a drilled concrete pier foundation that will require an excavation 15 to 20 feet deep and four to six feet in diameter. Any excess soil will be removed from the site unless otherwise requested by the landowner.

6.9.1 Surface Water

Natural drainage in the area has been altered by development

There are no DNR Public Waters, as defined by Minnesota Statutes, Section 103G.005, subd 15., within the HVTL route proposed by Xcel Energy or the three alternative routes.

Floodplain data was obtained from the Federal Emergency Management Agency (FEMA) and Flood Insurance Rate Maps (FIRM).[22] The HVTL route is not within a recognized floodplain. The HVTL route is situated at an elevation of approximately 750 feet above sea level.

6.9.2 Groundwater

Quaternary sediments of sand and gravel extend approximately twenty-five below grade to the top of the Prairie Du Chien formation. The near-surface or water table aquifer is approximately twelve feet below grade[23]. The transmission line support structure foundations will be set in the ground approximately 15 to 20 feet below grade. Groundwater, in the near surface water bearing zone or water-table aquifer, may be encountered during construction excavation. Dewatering for construction may require a MDNR General Permit (i.e., 97-0005). This general permit authorizes temporary water appropriations for construction dewatering, landscaping, dust control, and hydrostatic testing of pipelines, tanks, and wastewater ponds.[24]

[22] http://www.msc.fema.gov/
[23] Minnesot Department of Health, County Well Index (CWI)
[24] Department of Natural Resources, General Permit for Temporary Water Appropriations. June, 1997.

6.9.3 Wetlands

The vicinity around the BLGP and proposed HVTL was reviewed by Barr Engineering for the presence of potential wetland sites (**Table 9** and **Figure 13**). Two probable wetland areas (ID321 and ID 322) were identified along the HVTL route. If possible these areas will be avoided in the placement of the support structures.

Once the transmission line structure locations are finalized, potential wetland sites will be precisely delineated and applications for the wetland permits will be submitted, if necessary. Federal regulations provide a definition for wetlands. Although not anticipated for this project, a permit from the US Army Corps of Engineers must be obtained for any dredging or filling activities in regulated wetlands.

7.0 Acronyms, Abbreviations and Definitions

ADT	average daily traffic
ANSI	American National Standard Institute
BACT	Best Available Control Technology
BLGP	Blue Lake Generating Plant
BMPs	Best Management Practices
Btu/kWhr	British thermal units per kilowatt-hour
CAA	Clean Air Act
CERCLA	Federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended
CESQG	Conditionally Exempt Small Quantity Generator
CFR	Code of Federal Regulations
CGTs	Combustion gas turbines
CMP	Crop Management Program
CO	Carbon monoxide
CO_2	Carbon dioxide
CON	Certificate of Need
CT	Combustion Turbine
CY	Cubic yards
dBA	A-weighted decibel
DLN	Dry Low-NO_X
DOC	Department of Commerce
DSM	Demand Side Management
EA	Environmental Assessment
ECS	Ecological Classification System
EIS	Environmental impact statement
EMF	Electromagnetic field
EPA	U.S. Environmental Protection Agency
EQB	Environmental Quality Board
ELCR	Excess Lifetime Cancer Risk
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FEP	Faribault Energy Park
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
GE	General Electric
GHG	Greenhouse gas emissions
GISB	Gas Industry Standards Board
gpd	Gallons per day
HCP	Habitat Conservation Plan
HRSG	Heat Recovery Steam Generator
HVTL	High Voltage Transmission Line
IES	Illuminating Engineering Society

ISTS	Individual Septic Treatment System
kV	Kilovolt
LAER	Lowest Available Emission Rate
LEPGP	Large Electric Power Generating Plant
LOS	Level-of-service
LUG	Local Unit of Government
MW	Megawatts
MDH	Minnesota Department of Health
MDNR	Minnesota Department of Natural Resources
MDOT	Minnesota Department of Transportation
MMPA	Minnesota Municipal Power Agency
MPCA	Minnesota Pollution Control Agency
NAAQS	National Ambient Air Quality Standards
NET	National Emission Trends
NEPA	National Environmental Policy Act
NH3	Ammonia
NTI	National Toxics Inventory
NNG	Northern Natural Gas
NOx	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
OAHP	Office of Archaeology and Historic Preservation
PAH	Polycyclic aromatic hydrocarbons
Pb	Lead
PEMA	Palustrine emergent temporarily flooded
PEMC	Palustrine emergent seasonally flooded
PFOA	Palustrine forested temporarily flooded
PESCP	Permanent Erosion and Sediment Control Plan
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
POWHX	Palustrine open water permanently flooded excavated
ppb	Parts per billion
ppm	Parts per million
PSD	Prevention of Significant Deterioration
psi	Pounds per square inch
PSS	Potential Site Study
PUC	Public Utility Commission
SARA	Federal Superfund Amendments and Reauthorization Act of 1986, as amended
SCR	Selective catalytic reduction
SDS	State Disposal System
SIL	Significant Impact Levels
SO_2	Sulfur dioxide
SPCC	Spill Prevention Control and Countermeasure

STG	Steam turbine generator
USFWS	U.S. Fish and Wildlife Service
TESCP	Temporary Erosion and Sediment Control Plan
TSP	Total Suspended Particulate Matter
UHC	Unburned Hydrocarbon
USACE	United States Army Corp of Engineers
VOC	Volatile organic compounds

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TABLES

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TABLE 1 SOLID & LIQUID WASTES

WASTE	PHASE	DESCRIPTION	GENERATION RATE	DISPOSITION METHOD
Evaporative Cooler Blowdown	Liquid	Water containing concentrated dissolved solids present in the raw water source	56 gpm <0.4 mgy	On-site storage & trucked to POTW
Pressure Filter Blowdown	Liquid	Water containing concentrated dissolved solids present in the raw water source	200 gpm <0.04 mgy	On-site storage & trucked to POTW
RO Reject Water	Liquid	Water containing concentrated dissolved solids present in the raw water source	10 gpm <0.14 mgy	On-site storage & trucked to POTW
Service Water	Liquid	Equipment wash water	Present levels	On-site storage & trucked to POTW
Sanitary Wastewater	Liquid	Domestic Wastewater	5000 gpy	Existing ISTS
Oil/Grease	Solid	Lubricants, Hydraulic fliud, etc.	<20 barrels/yr	Manage used oil w/ outside firm
Maintenance Materials	Solid	Oily & greasy rags, materials packaging, office waste, domestic-type solid wastes, cleaning solvents	<2 tons/yr	Per Federal, State & local solid and hazardous waste regulations

gpm – gallons per minute; mgy – million gallons per year; ISTS – Individual Sewage Treatment System;
Source: Certificate of Need Blue Lake Generating Expansion Project. January 16, 2004

TABLE 2 NATURAL GAS & FUEL OIL OPERATIONAL SUMMARY

	Proposed Blue Lake Expansion Project **Natural Gas-Fired Simple Cycle**	**Oil-Fired Simple Cycle**
Capacity	324 MW	340 MW
Annual Capacity Factor	8 percent	8 percent
Typical Availability	>90 percent	>90 percent
A. Land Requirements	Approx. 20 acres on existing Blue Lake Plant site	Approx. 20 acres on existing Blue Lake Plant site
B. Traffic	100 truck loads/year wastewater	100 truck loads/year wastewater
E. Water Use Max. Pumping Rate	750 gpm (intermittent)	750 gpm (intermittent)
Annual Appropriation	1.0 million gallons	18 million gallons
Annual Consumption	3.2 acre-feet	54 acre-feet
F. Discharges to Water	Water containing dissolved solids present in the raw water source except at a greater concentration to POTW	Water containing dissolved solids present in the raw water source except at a greater concentration to POTW
G. Radioactive Releases	None	None
H. Solid Wastes Produced	Water treatment solids	Water treatment solids
I. Noise	No significant change from current levels	No significant change from current levels
J. Work Force	2-3 FTE	2-3 FTE
K. Transmission Requirements	Met by existing facilities with addition of short new 230 kV interconnection	Met by existing facilities with addition of short new 230 kV interconnection

Source: Certificate of Need Blue Lake Generating Expansion Project. January 16, 2004

TABLE 3 NATURAL GAS & FUEL OIL DATA

Item	Proposed Blue Lake Expansion Project Natural Gas-Fired Simple Cycle	Oil-Fired Simple Cycle
Capacity	324 MW	340 MW
Fuel Type	Natural Gas	No. 2 fuel oil
C (1). Fuel Source	Northern Natural Gas Pipeline	Flint hills Resources Pine Bend Refinery or other refinery source
C (2). Fuel Requirement	2.2 million SCF/hr/unit	100,000 lb/hr/unit
C (3). Heat Input Rate	1,616 million Btu/hr/unit	1,900 million Btu/hr/unit
C (4). Higher Heat Value	1,000 Btu/SCF	18,300 Btu/lb
C (5). Fuel Composition		
(a.) Sulfur	2,000 grains/million SCF	<0.05 percent
(b) Ash	None	Trace
(c) Moisture	0.9 lbs./10,000 Btu	0.9 lbs./10,000 Btu
Total Cost (2003 $/kW-hour)[1]	0.116	0.149
Source: Certificate of Need Blue Lake Generating Expansion Project. January 16, 2004 1 - Total capacity cost (2003 $/kW-hour) + Total Energy Cost (2003 $/kW-hour)		

TABLE 4 NATURAL GAS & FUEL ESTIMATED AIR EMISSIONS DATA

Pollutant	Estimated Emission Rates (lbs./MWh)	
	Proposed Blue Lake Expansion Project Natural Gas-Fired Simple Cycle	Oil-Fired Simple Cycle
SO_2	0.003	0.027
NO_X	0.036	0.17
PM_{10}	0.005	0.009
CO	0.019	0.030
Source: Certificate of Need Blue Lake Generating Expansion Project. January 16, 2004		

TABLE 5 NATURAL GAS & FUEL ESTIMATED AIR EMISSIONS DATA

Pollutant	Ambient Air Quality Standard (ug/m^3)	Estimated Contribution to Ground-level Concentrations	
[redacted]		Proposed Blue Lake Expansion Project Natural Gas-Fired Simple Cycle (ug/m^3)	Oil-Fired Simple Cycle (ug/m^3)
SO_2 (Annual)	80	<0.1	Higher
SO_2 (24-hour)	365	<1	Higher
SO_2 (3-hour)	1300	<1	Higher
SO_2 (1-hour)	1300	<1	Higher
NO_X (Annual)	100	<1	Similar
NO_X (24-hour)	None	<1	Higher
PM_{10} (Annual)	50	<1	Higher
PM_{10} (24-hour)	150	<0.1	Higher
CO (24-hour)	None	<1	Similar
CO (1-hour)	40,000	<1	Similar
CO (8-hour)	10,000	<1	Similar

Source: Certificate of Need Blue Lake Generating Expansion Project. January 16, 2004

TABLE 6 ALTERNATIVE ROUTES COMPARISON SUMMARY

	Proposed Route	**Alternative A**	**Alternative B**	**Alternative C**
Length (feet)	4,000	3,400	12,000	6,300
Approx. required additional ROW (acres) (*excluding* Xcel Energy property and U.S. Hwy 169 ROW)	2-3	2-3	10-20	4-6
Approx. property parcels crossed (excluding Xcel Energy properties and road ROW)	1	1	10	4
Approx. length through Parcel No. 75	1,200	1,500	0	200
Approx. Tree Clearing Required (acres)	2	2	5	3
Residences within 200 feet	0	>10	0	>10
Land Use Zoning	Lt. Ind./Urban Res.	Lt. Ind./Urban Res.	Lt. Ind./H. Ind./Office Bus./Hwy Bus.	Lt. Ind./Urban Res./ Commercial
Commercial buildings within 200 feet	0	0	4	1
Estimated construction cost ($ million)	1.5	1.3	4.5	2.5
Source: Correspondence: Xcel Energy Blue Lake Generating Expansion Project, MnDOT Parcel 75. April 28, 2004				

TABLE 7 ESTIMATED AIR EMISSIONS

Pollutant	Emission Factor[1] (lbs/hr per CTG)	Emissions[2] (tons/yr)
General		
SO_2	5.5	3.7
NO_X	59	39.5
PM_{10}	9.0	6.0
CO	30	20
VOCs	2.8	1.9
Hazardous Air Pollutants (HAPS)		
1,3-Butadiene[3]	[redacted]	0.0005
Acetaldehyde		0.043
Acrolein		0.007
Benzene		0.013
Ethylbenzene		0.036
Formaldehyde		0.77
Naphthalene (POM)		0.0014
PAHs[4] (also POM)		0.0024
Propylene Oxide		0.031
Toluene		0.14
Xylene		0.069

Source: Application for a Site Permit Blue Lake Generating Expansion Project. February 10, 2004
1Emission factors for the general pollutants from manufacturer data.
2Based on 1339 combined operating hours
3Emission factor is based on one-half the detection limits. Expected emissions are lower than the presented numbers.
4 PAH is polycyclic aromatic hydrocarbon. POM is polycyclic organic matter.

TABLE 8 ESTIMATED MAXIMUM CONTRIBUTIONS - AMBIENT AIR QUALITY

Pollutant	Existing Plant Contribution to Ground-level Concentrations (μg/m3)	Future Plant Contribution to Ground-level Concentrations (μg/m3)	Ambient Standards (μg/m3)
SO2 (Annual)	0.010	0.010	80
SO2 (24-hour)	63	63	365
SO2 (3-hour)	138	138	1,300
SO2 (1-hour)	174	174	1,300
NO2 (Annual)	0.20	0.20	100
PM10 (Annual)	0.006	0.006	50
PM10 (24-hour)	19	19	150
CO (1-hour)	202	202	40,000
CO (8-hour)	84	84	10,000

Note: Modeling was conducted to demonstrate potential ambient air impacts associated with the Project. Modeling is not required by air quality regulations. Short-term (1-24 hour) concentrations based on hourly maximum emission rates. Annual modeled impacts from the existing plant based on 2000 actual emissions. Annual modeled impacts from the future plant based on 2000 actual emissions from the existing plant plus emissions based on 1,339 operating hours from each new CTG.
Source: Application for a Site Permit Blue Lake Generating Expansion Project. February 10, 2004

TABLE 9 STATE of MINNESOTA NOISE STANDARDS

Noise Area Classification	Daytime (dBA)		Nighttime (dBA)	
	L_{50}	L_{10}	L_{50}	L_{10}
1 (Residential)	60	65	50	55
2 (Commercial)	65	70	65	70
3 (Industrial)	75	80	75	80

dBA = decibels, A-weighted scale; L_{10} = sound pressure level which is exceeded 10% of the time period; L_{50} = sound pressure level which is exceeded 50% of the time period.

TABLE 10 AMBIENT NOISE LEVEL MONITORING RESULTS

Location	Time	Measured Sound Levels (dBA)[1]			
		Leq[2]	L_{90}[3]	L_{50}[4]	L_{10}[5]
Transmission Line Easement (east of Classics at Waybridge sub-division)	08:30 – 09:29	56.8	54.9	56.6	57.7
	11:30 – 12:29	57.6	55.2	56.4	59.8
	16:00 – 17:00	62.9	60.4	62.9	63.9
North End of Hartley Drive (within Classics at Waybridge sub-division)	11:08 – 12:07	64.4	62.1	64.1	65.8
	12:50 – 13:49	65.1	61.0	64.0	68.0
	15:08 – 16:07	68.1	67.0	68.0	69.0
	16:24 – 17:23	69.0	67.6	68.9	70.4
Eddington Circle (within Classics at Waybridge sub-division)	08:30 – 08:29	58.2	54.0	57.0	61.0
	14:52 – 15:51	59.5	55.0	58.0	60.0
200 feet east of Plant (north of U.S. Highway 169)	09:53 – 10:52	62.8	62.8	62.7	64.7
	11:53 – 12:52	61.7	61.7	60.3	63.1
	13:53 – 14:52	61.2	61.2	60.4	63.3
Gateway Drive (approx. 1000 feet west of Plant and north of U.S. Highway 169)	10:09 – 11:08	57.3	57.3	56.9	59.2
	12:09 – 13:08	56.7	56.7	55.9	59.9
	14:09 – 15:08	53.6	53.6	52.4	56.0

1 dBA – Decibels A-weighted
2 L_{eq} – Equivalent sound level. This is the average sound level over the sample period.
3 L_{90} – The sound level that was exceeded 90% of the time during the sample period.
4 L_{50} – The sound level that was exceeded 50% of the time during the sample period.
5 L_{10} – The sound level that was exceeded 10% of the time during the sample period.
Source: Application for a Site Permit Blue Lake Generating Expansion Project. February 10, 2004 Data collected November 11, 2003.

TABLE 11 POTENTIAL WETLANDS SUMMARY

Identification No. (Fig. 13)	Approximate Cowardin Clssification[1]	Field Determination [2]	Acres
322	PFOB	PW	7.0
185	PEMB	W	6.1
325	PFOB/7	PW	2.1
1	PEM/FOB	UNK	1.4
186	PFOBd	PW	1.2
321	PEM/FOB	PW	0.9
328	OSSB	PW	0.7
327	PEMB	UNK	0.7
319	PEMB	PW	0.7
22	PEMB	W	0.5
329	PFOB	UNK	0.5
331	PEMB	W	0.1

1 Cowardin et al., 1979. Classifications of Wetlands and Deepwater Habitats of the United States
2 W = Wetland, PW = Probable wetland, UNK = Unknown

Source: Application for a Site Permit Blue Lake Generating Expansion Project. February 10, 2004

TABLE 12 PLANT SPECIES NATIVE VEGETATION REMNANTS

Plant Community	Common Name/ Latin Name
Dry Oak Savanna (Southeast) Barrens Subtype	
	bur oak *Quercus macrocarpa* northern pin oak *Quercus ellipsoidalis* leadplant *Amorpha canescens* prairie willow *Salix humilis* prairie rose *Rosa arkansana*
Emergent Marsh	
	river bulrush *Scirpus fluviatilis* cattails *Typha spp.* lake sedge *Carex lacustris* wild rice *Zizania aquatica* bur reed *Sparganium eurycarpum* bluejoint grass *Calamagrostic canadensis* rice cut grass *Leersia oryzoides* broad-leaved arrowhead *Sagittaria latifolia* water plantain *Alisma subcordatum* sweetflag *Acorus calamus* water parsnip *Sium suave* wild mint *Mentha arvensis* American water-horehound *Lycopus americanus*
Lowland Hardwood Forest	
	basswood *Tilia americana* black ash *Fraxinus nigra* green ash *Fraxinus pennsylvanica* American elm *Ulmus americana* hacberry *Celtis occidentalis* bur oak *Quercus macrocarpa* sugar maple *Acer saccharum* cleavers *Galium spp.* Virginia waterleaf *Hydrophyllum virginainum* wood nettle *Laportea canadensis* eastern narrowleaf sedge *Dcarex amphibola*
Oak Forest (Big Woods) Mesic Subtype	
	red oak *Quercus rubra* white oak *Quercus alba* northern pin oak *Quercus ellipsoidalis* bur oak *Quercus macrocarpa* basswood *Tilia americana* sugar maple *Acer saccharum* ironwood *Ostrya virginiana* bitternut hickory *Carya coridformis* black cherry *Prunus serotina* big-toothed aspen *Populus grandidentata* gooseberries *Ribes spp.* honewort *Cryptotaenia canadensis* lopseed *Phryma leptostachya* sweet cicely *Osmorhiza claytonii* white snakeroot *Eupatorium rugosum*
Oak Woodland-Brushland (Big Woods)	
	pin oak *Quercus ellipsoidalis* bur oak *Quercus macrocarpa* white oak *Quercus alba* paper birch *Betula papyrifera* eastern red cedar *Juniperus visginaian* quaking aspen *Populus tremuloides* basswood *Tilia americana* big-toothed aspen *Populus grandidentata* American hazel *Corylus americana* chokecherry *Prunus virginiana* prickly ash *Zanthoxylum americanum* smooth sumac *Rhus glabra* gray dogwood *Cornus racemosa* hog-peanut *Amphicarpaea bracteata* chining bedstraw *Galium concinnum* Pennsylvania sedge *Carex pensylvanica*
Wet Meadow	

	lake sedge *Carex lacustris* tussock sedge *Carex stricta* bluejoint grass *Calamagrostic canadensis* bur reed *Sparganium eurycarpum* cattails *Typha spp.* hardstem bulrush *Scirpus acutus* aquatic sedge *Carex aquatilis* red-osier dogwood *Cornus stolonifera* pussy willow *Salix discolor* swamp-loosestrife *Lysimachia thrysiflora* spotted joe-pye weed *Eupatorium maculatum* northern marsh fern *Thelypteris palustris* American water-horehound *Lycopus americanus*

TABLE 13 WILDLIFE SPECIES – MINNESOTA RIVER VALLEY

Plant Community	Common Name/ Latin Name
Oposum, Shrews, Moles	
	Virginia oposum *Didelphis virginiana* masked shrew *Sorex cinereus* arctic shrew *Sorex arcticus* pigmy shrew *Microsorex hoyi* shorttail shrew *Blarina brevicauda* eastern mole *scalopus aquaticus* starnose mole *Condylura cristata*
Bats	
	little brown myotis *Myotis lucifugus* keen myotix *Myotis keenii* silver-haried bat *Lasionycteris noctivagagns* eastern pipistrel *Pipistrellus subflavus* big brown bat *Eptesicus fuscus* red bat *Lasiurus borealis* hoary bat *Lasiurus cinereus*
Rabbits, Rodents	
	eastern cottontail *Sylvilagus floridanus* whitetail jackrabbit *Lepus townsendii* woodchuck *Marmota monax* richardson ground squirrel *Citellus richardsoni* thirteen-lined ground squirrel *Citellus tridecemlineatus* Franklin ground squirrel *Citellus franklinii* eastern chipmunk *Tamias striatus* eastern gray squirrel *sciurus carolinensis* eastern fox squirrel *Sciurus carolinensis* red squirrel *Tamiasciurus hudsonicus* southern flying squirrel *Glaucomys volns* plains pocket gopher *Geomys bursarius* plains pocket mouse *Perognoathus flavescens* beaver *Castor canadensis* western harvest mouse *Reithrodontomys megalotis* deer mouse *Peromyscus maniculatus* white-footed mouse *Peromyscus leucopus* Gapper's red-backed vole *Clethrionomys gapperi* meadow vole muskrat *Ondatra zibethica* Norway rat *Rattus norvegicus* house mouse *Mus musculus* meadow jumping mouse *Zapus hudsonicus*
Coyote/Fox	
	coyote *Canis latrans* red fox *Vulpes fulva* gray fox *Urocyon cinereoargenteus*
Raccoon, Weasel, Skunk, Otter	
	Raccoon *Procyon lotor* ermine/shorttail weasel *Mustela ermina* least weasel *Mustela rixosa* longtail weasel *Mustela frenata* mink *Mustela vision* badger *Taxidea taxus* spotted skunk *Spilogale putoris* striped skunk *Mephitis mephitis* river otter *Lutra canadensis*
Deer	
	whitetail deer *Odocoileus virginianus*
Turtles	
	snapping turtle *Chelydra serpentina* map turtle *Graptemys geographica* false map turtle*Graptemyspseudogeographics* painted turtle *Chrysemys picta* Blanding's turtle *Emydoidea blandingi* smooth softshell *Trionys muticus* spiny softwhell *Trionys spiniferus*

Lizards and Snakes	
	prairie skink *Eumeces septentrionalis* u northern water snake *Nerodia sipedon* brown (DeKay's) snake *Storeria occiptomaculata* redbelly snake *Storeria occiptomaculata* common garter snake *Thamnophis sirtalis* plains garter snake *Thamnophis radix* western hognose snake *Heterodon nasicus* racer *Coluber constrictor* smooth green snake *Opheodrys vernalis* fox snake *Elaphe vulpina* gopher snake *Pituophis melanoleucus* milk snake *Lamproperltis triangulum*
Salamanders	
	mudpuppy *Necturus maculosus* eastern newt *Notophthalmus viridescens* blue-spotted salamander *Ambystoma laterale* tiger salamander *Ambystoma trigrinum*
Toads and Frogs	
	American toad *Bufo americanus* spring peeper *Hyla crucifer* gray tree frog *Hyla versicolor* striped chorus frog *Pseudacris triseriata* green frog *Rana clamitans* wood frog *Rana sylvatica* northern leopard frog *Rana pipiens*
Birds	
	American crow *Corvus brachyrhynchos* unspecified American goldfinch *Carduelis tristis* unspecified American kestrel *Falco sparverius* unspecified American robin *Turdus migratorius* unspecified Bald eagle *Haliaeetus leucocephalus* unspecified Barn swallow *Hirundo rustica* unspecified Belted kingfisher *Megaceryle alcyon* unspecified Black-capped chickadee *Poecile atricapilla* unspecified Blue jay *Cyanocitta cristata* unspecified Brown-headed cowbird *Molothrus ater* unspecified Canada goose *Branta canadensis* unspecified Common nighthawk *Chordeiles minor* unspecified Cooper's hawk *Accipitier cooperii* unspecified Downy woodpecker *Picoides pubescens* unspecified Eastern bluebird *Sialia sialis* unspecified Eastern phoebe *Sayornis phoebe* unspecified European starling *Sturnus vulgaris* unspecified Great blue-heron *Ardea herodias* unspecified Great egret *Casmerodius albus* unspecified Hairy woodpecker *Picoides villosus* unspecified Hermit thrush *Catharus guttatus* unspecified House sparrow *Passer domesticus* unspecified House wren *Troglodytes aedon* unspecified Killdeer *Charadrius vociferus* unspecified Marsh wren *Cistothorus palustris* unspecified Mourning dove *Zenaida macroura* unspecified Northern Cardinal *Cardinalis cardinalis* unspecified Northern flicker *Colaptes auratus* unspecified Northern Parula *Parula americana* unspecified Purple finch *Carpodacus purpureus* unspecified Purple martin *Progne subis* unspecified Red-headed woodpecker *Melanerpes erythrocephalua* unspecified Red-tailed hawk *Buteo jamaicensis* unspecified Red-winged blackbird *Agelaius phoeniceus* unspecified Ring-billed gull *Larus delawarensis* unspecified Rock dove *Columba livia* unspecified Savannah sparrow *Passerculus sandwichensis* unspecified Song sparrow *Melospiza melodia* unspecified Turkey Vulture *Coragyps atratus* unspecified White-breated nuthatch *Sitta carolinensis* unspecified Wild turkey *Meleagris gallopavo* unspecified Yellow warbler *Dendroica petechia* unspecified Yellow-bellied sapsucker *Sphyrapicus varius*

1 From MN Valley National Wildlife Refuge data, bird data from Source: Application for a Site Permit Blue Lake Generating Expansion Project. February 10, 2004.

TABLE 14 CALCULATED ELECTRIC FIELDS (kV/m) PROPOSED 230/115 kV TRANSMISSION LINE

Line	Voltage (kV)	Distances shown are from centerline of proposed transmission line (ft)														
		300’	250’	200’	150’	100’	50’	25’	0	25’	50’	100’	150’	200’	250’	300’
Existing 345/115kV double circuit	345/115	0.17	0.35	0.91	1.85	1.69	0.74	0.55	0.40	0.27	0.18	0.10	0.06	0.04	0.03	0.03
Existing 345/115kV and proposed 230/115kV	345/115 & 230/115	0.18	0.39	1.00	2.04	1.91	1.37	1.72	0.98	0.42	0.23	0.04	0.02	0.01	0.01	0.01

Measurements1 meter Above Ground
Source: Application for a Site Permit Blue Lake Generating Expansion Project. February 10, 2004

TABLE 15 CALCULATED MAGNETIC FLUX DENSITY (milligauss) PROPOSED 230/115 kV TRANSMISSION LINE

Line	Condition	Amps	Distances shown are from centerline of proposed transmission line (ft)														
			300'	250'	200'	150'	100'	50'	25'	0	25'	50'	100'	150'	200'	250'	300'
Existing 345/115kV double circuit	2005 Peak	164/ 500	1.8	3.0	6.0	13.2	20.5	27.1	22.3	15.6	10.5	7.2	3.9	2.4	1.6	1.1	0.9
	Average	98/ 300	1.1	1.8	3.6	7.9	12.3	16.2	13.4	9.4	6.3	4.3	2.3	1.4	0.9	0.7	0.5
Existing 345/115kV and proposed 230/115kV	2005 Peak w/ 175 MW output	154/ 412	1.5	2.6	5.0	10.7	18.5	22.2	21.7	25.1	20.7	12.1	4.4	2.2	1.4	0.9	0.7
	2005 Peak w/ 515 MW output	154/ 643	2.2	3.4	6.4	12.9	27.0	36.3	41.2	52.8	46.9	28.4	9.8	4.4	2.5	1.6	1.1

Measurements1 meter Above Ground
Source: Application for a Site Permit Blue Lake Generating Expansion Project. February 10, 2004

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FIGURES

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APPENDIX A

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APPENDIX B

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APPENDIX C