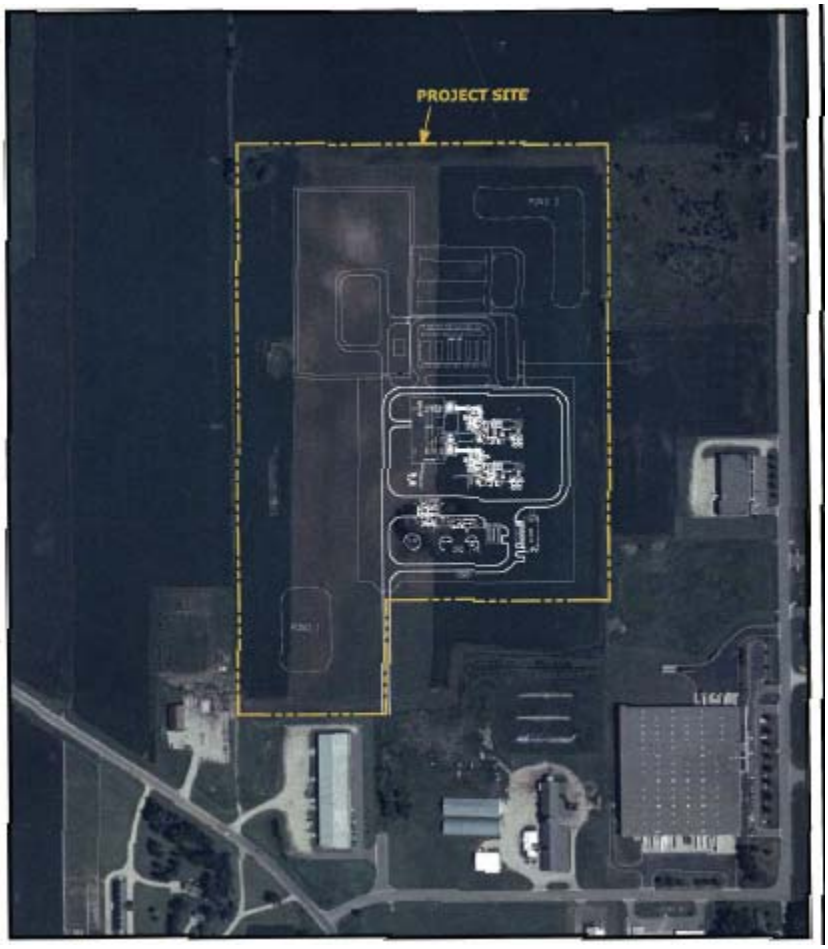
# ENVIRONMENTAL ASSESSMENT

## CANNON FALLS ENERGY CENTER
## CANNON FALLS, MINNESOTA
## EQB DOCKET NUMBER 04-85-PPS-CANNON FALLS EC




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

**November 2004**

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## OVERVIEW

***The Project.*** Invenergy Cannon Falls, LLC is proposing to develop, construct, and operate a natural gas-fired simple cycle power plant to be called the Cannon Falls Energy Center. The facility, which is scheduled to begin operation on or before May 2006, will be capable of generating approximately 357 megawatts (MW) of electricity. The two combustion turbines will be used to generate electricity during periods of peak demand, and Invenergy expects that the turbines will be used no more than 4,000 hours per year.

***Certificate of Need.*** Invenergy has committed all of the electricity generated to Northern States Power through the bidding process approved by the Minnesota Public Utilities Commission (MPUC) in that utility's resource planning process. An electric power plant selected in a bidding process approved by the MPUC is exempt from the certificate of need process (Minn. Stat. § 216B.2422, subd. 5). Invenergy, therefore, will not be required to file for a CON from the MPUC for the Cannon Falls Energy Center.

***Permits.*** Invenergy 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).

The owners/operators of any new transmission line will also be required to obtain a Route Permit from the EQB once the interconnection option has been chosen and the owner/operators have been identified.

It is anticipated that Northern Natural Gas Company (NNG) will be the owner/operator of the natural gas supply line. NNG is a FERC regulated interstate pipeline and therefore a separate Pipeline Routing Permit from the EQB would not be required. Additional pipeline options currently being considered are a pipeline owned/operated by either Invenergy, Xcel Energy or other third party. In either of these cases the pipeline would be required to follow the Minnesota pipeline routing rules (Minnesota Rules Chapter 4415).

***Environmental Assessment.*** As part of its review of an application for a Site 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 site proposed by the applicant and at possible alternative sites 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.

***Major Decisions.*** The EQB must determine whether to grant a Site Permit to Invenergy for the construction of a large electric power generating plant (LEPGP) at the proposed site. The only site under review in this proceeding is the proposed site in the Business Park North area of Cannon Falls.

The EQB could include conditions in any Site Permit it issues for the Cannon Falls Energy Center if certain conditions are necessary and appropriate. Also, the other permits that Invenergy 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.

***Public Hearing.*** The Environmental Quality Board is required to hold a public hearing on the application for a site permit (Minn. Stat. § 116C.575, subd. 6). The hearing is scheduled for December 2, 2004, in Cannon Falls. A member of the EQB staff 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 record. The hearing examiner shall ensure that the record created at the hearing is preserved and transmitted to the board. The hearing examiner shall not prepare a report or make any recommendation to the board unless the chair or the board requests the hearing examiner to do so.

The final decision on the issuance of the permit 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 in January, 2005.

# 1.0 INTRODUCTION

On August 25, 2004, Invenergy Cannon Falls , LLC (Invenergy), filed a Site Permit application with the Minnesota Environmental Quality Board (EQB). The application is for the construction of a 357 megawatt (MW), simple cycle, natural gas fueled large electric power generating plant (LEPGP) in Cannon Falls, Minnesota. The facility has been named the Cannon Falls Energy Center (CFEC) by the applicant. Invenergy also requested that the site permit application be reviewed under the alternative permitting process pursuant to Minnesota Rules 4400.2000 through 4400.2950.

On August 30, 2004, the EQB Chair notified the applicant in writing of the acceptance of the application as substantially complete and that the application will be reviewed in accordance with the alternative permitting review procedures.

The EQB docket number for this proceeding is 04-85-PPS-Cannon Falls EC.

## 1.1 PURPOSE AND NEED

The Minnesota Public Utilities Commission ("PUC") approved the resource planning process proposed by Northern States Power Company d/b/a Xcel Energy, in Docket E-002/RP-00-787, *In the Matter of Northern States Power Company's Application for Approval of its 2000-2014 Resource Plan,* Order Approving Xcel Energy's 2000-2014 Resource Plan. A part of this approved process included a solicitation of proposals to increase Xcel Energy's supply portfolio by 1,000 MW. To meet this objective, Xcel Energy issued an All Source Request for Proposals ("RFP") dated December 6, 2001. The RFP outlined the baseload and peaking supply needs of Xcel Energy's supply portfolio beginning in 2005 and extending into the year 2009.

In response, Invenergy submitted a proposal on March 15, 2002, to supply approximately 357 MW of peaking capacity. Xcel Energy selected the Invenergy project. In June of 2004, Xcel Energy and Invenergy Cannon Falls executed a purchased power agreement ("PPA"). The terms of the PPA require Invenergy Cannon Falls to develop and construct a combustion turbine power plant with a capability of 357 MW prior to May 2006.

Invenergy has committed all of the electricity generated from the Cannon Falls Energy Center project to Xcel Energy. An electric power plant selected in a bidding process approved by the PUC is exempt from the certificate of need process (Minn. Stat. § 216B.2422, subd. 5). Invenergy, therefore, will not be required to file for a certificate of need from the Public Utilities Commission for the CFEC.

## 1.2 REGULATORY REQUIREMENTS

The Minnesota Legislature has established a state policy to locate large electric power generating plants in an orderly manner compatible with environmental preservation and the efficient use of resources. The EQB has the responsibility for siting power plants over 50 MW. The legislature directed the EQB to designate sites that minimize adverse human and environmental impact

while ensuring continuing electric power system reliability and integrity and ensuring that electric energy needs are met and fulfilled in an orderly and timely fashion.

A site permit from the EQB is required to construct a LEPGP. A LEPGP is a power plant and associated facilities capable of operating at a capacity of 50 MW or more (Minnesota Statutes Section 116C.52, subd. 5).

Associated facilities are defined by the EQB to "mean buildings, equipment, and other physical structures that are necessary to the operation of a large electric power generating plant" (Minnesota Rules part 4400.0200, subpart 2a). Associated facilities include but are not limited to coal piles, cooling towers, ash containment, fuel tanks, water and wastewater treatment systems, and roads.

An alternative permitting process is available for certain smaller-sized power plants identified in Minnesota Statutes Section 116C.575. This alternative process does not require the preparation of an Environmental Impact Statement (a shorter Environmental Assessment is required) or the holding of a contested case hearing conducted by an administrative law judge (a hearing conducted by the agency is required) or the identification of an alternative site. This alternative permitting process must be completed within six months from the time the application is accepted.

During the alternative permitting process, the EQB is required to prepare an environmental review document called an Environmental Assessment (EA), analyzing the potential site specific impacts of the project (Minn. Rules chapter 4400.2750).

On September 22, 2004, a public meeting was held by the MEQB staff at the Cannon Falls city hall to discuss the CFEC 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 September 30, 2004, to submit written comments.

After consideration of the public comments, the Chair of the EQB issued a Scoping Order on October 4, 2004. The EQB received four comment letters. (**Appendix A**).

Much of the information contained within this document was provided by the applicant or the applicant's representatives (URS Corporation) in the form of the Application for a Site Permit, Cannon Falls Energy Center and subsequent correspondence.

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/)
- Minnesota Department of Commerce
- Minnesota Public Utilities Commission (http://www.puc.state.mn.us/index.htm )

- 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/)
- EQB Docket No. 02-48-PPS-FEP (http://www.eqb.state.mn.us/Docket.html?Id=3217)
- U. S. Department of Energy, Energy Information Administration (http://eia.doe.gov/)

# 2.0 PROJECT DESCRIPTION

## 2.1 General

The CFEC will be located in Cannon Falls, Minnesota, in Goodhue County (**Figure 1**). The site consists of approximately 55 acres in the Business Park North area. The proposed property boundaries are located 600 feet west of Cannon Industrial Boulevard, 850 feet north of Holiday Avenue, and approximately 300 feet northwest of County Highway 29 (**Figure 2**). The site shares its western boundary with the boundary separating Goodhue County and Dakota County. The property is located within Township 112 North, Range 17 West, in the northwestern ¼ of Section 6.

Prior to submitting its proposal to Xcel Energy, Invenergy screened potential sites for a large electric power generating plant (LEPGP) based on several criteria. Potential alternatives sites were screened on the following screening criteria:

- Sufficient land available to construct and operate a generating facility of this size;
- Distance to and availability of infrastructure (gas, water, electric transmission);
- Avoidance of environmentally sensitive areas;
- Compatibility with surrounding land uses and existing zoning; and
- Community acceptance and support.

Since the proposed CFEC qualifies for the alternative permitting process, Invenergy is not required to propose alternative sites. However, Invenergy considered several regional areas in addition to the Cannon Falls area.

The All Source RFP included a map of existing electrical substations and their potential to handle additional power. Invenergy targeted the most favorable substations for interconnection, then contacted state and local economic development officials to identify suitable areas around these substations for development of the proposed LEPGP project. Areas within or around Chisago County, Kohlman Lake, Red Rock, Gleason, Parker Lake, and the Cannon Falls area were considered. The Cannon Falls area was selected because it met all of the screening criteria.

Invenergy will use the CFEC's capability for peak demand periods. The new units will be operated from the facility's central control center. Each 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 CFEC will utilize natural gas as its primary fuel and low sulfur distillate fuel oil as a backup.

An existing 161 kV transmission line runs along the western boundary of the proposed site. This line, the Spring Creek – Cannon Falls line, is owned by Great River Energy (GRE). The line runs approximately 2 miles southwest of the proposed site to the NSP Cannon Falls Substation.

A Northern Natural Gas Company (NNG) 30-inch interstate pipeline, which travels southwest to northeast, is located just west of Farmington, Minnesota, approximately 12 miles northwest of the proposed site.

Invenergy will be limited, by air permit, to a total of 4,292 unit-hours per year of operation combined, corresponding to an annual capacity factor of 2 - 10 percent. The units will have at least a 30-year operating life. The combustion turbine generators (CTGs) are expected to be in the range of 32 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 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.

## 2.2 Description of Power Generating Equipment and Processes

A simple cycle combustion turbine generator (CTG) 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 the mixture is 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 CTGs at the CFEC will be approximately 75 feet tall.

Invenergy proposes to construct two General Electric 7FA CTGs, each with a nominal capacity of 175 MW. The two simple-cycle, duel fuel CTGs and associated auxiliary equipment will be operated for peak electrical service. The CTGs will be equipped with dry low $NO_x$ combustors to control the concentration of $NO_x$ exiting the CTG emission stacks while operating on natural gas. Distillate fuel oil with a sulfur content not in excess of 0.05 percent by weight will be available as a backup fuel supply. Combustor water injection will be used to control the formation of nitrogen oxides ($NO_x$) when combusting fuel oil.

The model 7FA CTG has a maximum firing capacity of approximately 2,000 MMBtu/hr (higher heating value or HHV) at low temperature ambient conditions. When firing distillate fuel oil, the CTG has a maximum firing capacity of 2,100 MMBtu/hr (HHV) at low temperature ambient conditions.

Steam injection may also be used to provide power augmentation for the CTG. When high ambient temperatures result in the greatest peak demands, a simple cycle combustion turbine may suffer power output losses of 15 to 20 percent. The lower inlet air density associated with high ambient temperatures, the lower the mass flow through the combustion turbine resulting in lower power production capability. Injecting steam into the combustor increases the total mass through the combustion turbine, thus increasing the maximum power production capability.

The CFEC will use a proposed 9 MMBtu/hour natural gas-fired water bath gas heater to preheat the natural gas before it enters the combustion chamber. The natural gas is preheated prior to combustion as the equipment manufacturer requires a minimum level of superheat (degrees above the natural gas dew point temperature) which is not met by the natural gas delivered by NNG. The heater will operate only when a combustion turbine is operating on natural gas.

Associated equipment and facilities will include the following:

- Plant Buildings;
- One 750,000 gallon distillate fuel oil aboveground storage tanks;
- Transformers and Switchyard;
- One natural gas conditioning system; and
- One fire protection system including diesel fire pump.

The CFEC will have an administration control building that will house operation, warehousing, maintenance, and management functions. The building will likely be a pre-engineered structure supported on reinforced concrete foundations and with approximately 6,000 square feet of floor space. Approximately 10 parking stalls for employees and visitors will be located next to the building.

A Mechanical/Electrical ("M/E") building will be constructed to house the balance of plant equipment. The M/E building will provide weather protection for the control system and motor control centers. The building will have approximately 2,100 square feet of floor space.

A generation building to be located around the CTGs will provide an appearance more closely resembling a manufacturing facility than a combustion turbine plant. The building will provide additional shelter from the elements for the equipment and operation and maintenance crews, but is not necessary for the safe and reliable operation of the facility. The generation building will enclose the generator, the combustion turbine, and some auxiliary equipment.

Each CTG will be connected to a step-up transformer. The CTGs will generate electricity at 18 kiloVolts ("kV"), and the step-up transformer will increase the voltage to the transmission voltage, 115 kV or 161 kV, depending on the transmission connection option.

An auxiliary transformer will be connected to the collector bus to provide auxiliary power to the facility. The auxiliary transformer will convert the 115 kV or 161 kV of electricity to 4.16 kV, which will power the facility's auxiliary equipment.

Each transformer will be equipped with a breaker on the high side (115 or 161 kV) of the transformer. The high side breaker will control the connection of each transformer to the collector bus. The collector bus will aggregate the output of the two CTGs for delivery to the

transmission system. The collector bus will terminate with an A-frame type dead end structure. The interconnection provider's interconnection facilities will connect to the dead end structure.

The collector buses, circuit breakers, disconnect switches, and relay and metering equipment will be installed in the facility's switchyard. The CFEC's switchyard will be a fenced area approximately 125 feet wide by 250 feet long.

The CFEC will be equipped with a centrifugal electric pump, a jockey pump, and a back-up diesel-fueled fire water. The header will supply water to yard hydrants and installed sprinkler deluge systems. If required, a jockey pump will maintain water pressure in the fire water distribution header.

A 290-horsepower diesel-fired emergency fire water pump will operate the plant's fire equipment in emergencies when the electric fire water pump cannot operate. However, the diesel fire water pump will be operated (typically only a few hours) on a monthly basis to maintain the integrity and operational readiness of the equipment. Invenergy expects to operate the water pump under non-emergency conditions less than 100 hours per year. Small amounts of air pollutants will be released from the pump's exhaust pipe.

The CFEC will store diesel fuel for the emergency fire water pump and the emergency generator in aboveground storage tanks with secondary containment. These tanks will have a storage capacity of less than 1,000 gallons.

The backup fuel oil storage tank will be of the "tank-within-a-tank" design. The outer tank will provide secondary containment greater than the capacity of the inner tank. Secondary containment provided by the annular space will, in the event of a break in the inner tank wall, prevent any contamination from reaching the surrounding environment. The annular space between the inner and outer tank walls will be equipped with sensors to alert plant personnel in the event of a breach of the inner tank wall. The tank will be filled by tanker truck from one of two truck unloading stations. Fuel oil from the storage tanks will be pumped to the combustion turbines as needed. The unloading area will have a containment capacity greater than 110% of the capacity of a tanker truck to safely contain any oil spills from the delivery tanker trucks.

To minimize rainwater or snowmelt in the containment area, Invenergy will construct a canopy over the unloading facilities. Any rainwater or snowmelt falling within the unloading area will be routed to the CFEC's oil-water separator before being discharged to the city sewer system. Invenergy will comply with all applicable state and federal requirements governing aboveground storage and spill control.

Low sulfur fuel oil is available from a supply terminal operated by Flint Hills Resources near Hastings, Minnesota. Flint Hills or other fuel suppliers will transport fuel to the facility using their own fleets or independent tanker lines. Tanker truck access to the site will be from either State Highway 20 or County Highway 29 via a new or improved site access road to be developed as part of the proposed project.

## 2.3 Air Emissions Control Equipment

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, which significantly reduces peak flame temperature and thermal $NO_X$ formation. Conventional combustors are diffusion controlled, injecting fuel and air 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 $NO_X$ from the two new units combined will be at or below 246.8 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).

## 2.4 Water Use

The operation of the CFEC will require service water for general maintenance activities such as washing equipment and facility areas, demineralized-water for compressor washing and combustion injection, and potable water for domestic use and eye wash stations. Process water requirements will be limited to the water needed for steam injection for power augmentation, for water injection while combusting fuel oil, and for evaporative inlet cooling.

**Figure 3** shows a water balance flow diagram for the CFEC.

The City of Cannon Falls will provide water to the CFEC from its existing water system. The City of Cannon Falls draws its municipal water supply from wells in the Prairie du-Chien bedrock aquifer. The city's water system includes a 12-inch diameter supply line that runs along Holiday Avenue approximately 1,000 feet south of the proposed project site's southern boundary. Water lines also extend north along Cannon Industrial Boulevard, approximately 900 feet due east of the site (**Figure 4**). A lateral service line connection to the city's water lines will be constructed to supply potable water to the facility.

When the CTGs are operating at full load on natural gas, the facility will require less than 90,000 gallons per day for the operation of the evaporative coolers and domestic uses. The CFEC will require, at maximum output, 720,000 gallons of water per day when operating with injecting steam for power augmentation or injecting water to control $NO_x$ (when operating on fuel oil). Additionally, when the facility is operating on natural gas and at part load, it will require water only for domestic purposes. For domestic uses only, the plant will require less than 3,000 gallons per day. As a peaking unit, much of the CFEC's operation is expected to be at part load

while following the system electrical demand. With the capacity to supply 4.3 million gallons per day of water and current water usage averaging approximately 600,000 gallons per day, the City is expected to have adequate capacity to meet the facility's water supply needs.

To produce the required demineralized water, Invenergy Cannon Falls will contract with a water treatment company to supply mobile demineralization trailers. Water received from the City of Cannon Falls will be piped into the demineralization trailers where it will be treated further with an ion-exchange process prior to using it for power augmentation, water injection, and compressor water wash activities. After a trailer's capacity is exhausted, the water treatment company will return the trailer to an offsite facility for regeneration of the resin. Having the resin regenerated offsite allows CFEC to avoid onsite use and storage of resin regeneration chemicals.

A demineralized water storage tank will be constructed onsite to provide conditioned water for facility operations during periods when the mobile demineralization trailers are being regenerated. This storage tank will have a capacity of approximately 750,000 gallons, enough to supply the CFEC for approximately 24 hours at full load operation with either steam injection or water injection.

## 2.5 Wastewater

Wastewater generated by the CFEC will be discharged to the City of Cannon Falls' sanitary sewer and then treated by the City's wastewater treatment plant (WWTP). Water collected in the fuel oil containment area will be collected in a sump and sent to the oil water separator prior to discharge to the sanitary sewer. Rain water collected in transformer and equipment containment basins where oil contamination is unlikely will be pumped to the oil water separator prior to discharge to the sanitary sewer or will be administratively controlled and discharged to the ground. Administratively controlling the discharge of collected rain water requires an operator to inspect the collected rain water for an oil sheen prior to opening a valve to discharge collected rainwater to the ground. Most of the facility's sewer discharge will be sanitary waste, blow-down from the evaporative cooler, and rainwater collected from containment basins.

The Cannon Falls WWTP treats approximately 500,000 gallons of wastewater per day and has the capacity to treat 1 million gallons per day. The WWTP has sufficient capacity for handling the volume and composition of wastewater generated by the facility.

An existing 8-inch sanitary sewer line runs in the same right-of-way as the water line that would serve the proposed facility (**Figure 4**). A lateral service line connection with capacity to handle discharges from the facility will be required. The WWTP, which operates under a National Pollutant Discharge Elimination System (NPDES) Permit MN0022993, is located approximately two miles southeast of the proposed site. All discharges to the WWTP will be authorized by the City of Cannon Falls and subject to any appropriate discharge limits and monitoring requirements.

## 2.6 Hazardous Materials, Solid and Liquid Waster Generation

As a simple cycle generating facility, the CFEC will use and store on site a small number of chemicals. **Table 1** lists the chemicals a simple cycle generating facility typically uses. The chemicals include mineral oil and sulfur hexafluoride for insulating transformers and switchyard equipment, lubrication oil for lubricating CTG bearings, diesel fuel for operating the fire water pump, and various liquid detergents for washing the CTGs.

All chemical storage areas will have appropriate secondary containment (i.e., concrete floors, concrete curbing, etc.). Areas that have the potential for oil or lubrication spills will also be protected by containment structures (i.e., concrete floors, concrete curbing, etc.). Lockable drain valves will be used where appropriate. Where present, floor drains will be directed to an oil/water separator, holding tanks or chemical collection/treatment facilities.

Invenergy will privately contract with local waste haulers for collection and disposal of all non-hazardous solid wastes generated at the facility. In the unlikely event that wastes generated during maintenance activities are determined to be hazardous as defined by the Resource Conservation and Recovery Act (RCRA)[1], they will be managed in accordance with applicable requirements. It is anticipated that the CFEC will be categorized as a very small quantity generator (VSQG) under Minnesota Rules Chapter 7045. To be eligible for VSQG classification the facility must generate less than 220 lbs of non acute hazardous waste per month. This type of generator can not accumulate more than 1,000 kg or 2,200 lbs of waste on-site before delivering the waste to a permitted Treatment, Storage and Disposal (TSD) Facility.

## 2.7 Fuel Supply

Natural gas will be the primary fuel used to generate electricity in the two CTG units. Natural gas will be supplied by NNG via an interconnection with its 30-inch interstate pipeline located approximately 12 miles northwest of the proposed site (**Figure 5**).

The pipeline lateral will be designed to deliver up to 95 million cubic feet (MMcf) of natural gas per day at a nominal operating pressure of 500 to 900 pounds per square inch gauge (psig). Each CTG is expected to combust approximately 1.74 MMcf of natural gas per hour.

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.

## 2.8 Construction

Upon approval of the necessary permits, construction will begin. The first construction activity will be mobilization and establishment of field offices, security fencing, and construction entrances.

[1] http://www.pca.state.mn.us/waste/hw_mnrules.html

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. 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 CFEC.

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.

## 2.9 Electrical Interconnection

The CFEC will be interconnected to the transmission system with one of two possible configurations. The two configurations are described as follows:

- Configuration 1 – The 161 kV Spring Creek – Cannon Falls line (**Figure 6**) would be reconfigured to loop into a switching station that GRE would build at the project site. The existing line would be broken and connected to the new switching station built at the project site. The switching station would contain the needed breakers and isolation to interconnect the CFEC to the transmission system. With this option, a new transmission line between the CFEC and the Cannon Falls substation would not

likely be needed; however reconductoring a portion of the existing 161 kV line and upgrading the Cannon Falls substation might be necessary.

- Configuration 2 – A 115 kV transmission line would be constructed parallel to the existing Spring Creek – Cannon Falls line and travel parallel to the existing line southwest into the Cannon Falls Substation where it would interconnect to the 115 kV bus in the substation. Further analysis will determine whether the existing right-of-way will be wide enough to accommodate the new transmission line. Modifications to the Cannon Falls Substation will likely be required to interconnect the new 115 kV transmission line into Xcel Energy's transmission system.

The transmission line owner/operator (i.e., either Xcel Energy or GRE) will construct the interconnection facilities and obtain the necessary approvals and permits.

## 2.10 Pipeline

As stated in Section 2.7, Northern Natural Gas Company (NNG) will supply natural gas via an interconnection with its interstate pipeline located northwest of the proposed site. The pipeline lateral will originate at the existing 30-inch NNG mainline near Farmington, Minnesota, and extend approximately 12 miles southwest to the proposed facility.

It is anticipated that Northern Natural Gas Company (NNG) will be the owner/operator of the natural gas supply line. Since NNG is a FERC regulated interstate pipeline, a separate pipeline routing permit from the EQB would not be required.

If a pipeline moves gas across state lines (i.e., interstate), the Federal Energy Regulatory Commission (FERC) rules apply to the routing of that pipeline. If the gas crosses no state line, state rules regulate it. In most cases, interstate natural gas pipeline companies are required under Section 7c of the Natural Gas Act of 1938 to obtain a certificate of public convenience and necessity before constructing pipeline facilities. However, interstate natural gas companies may utilize blanket certifications obtained from FERC for the construction and operation of certain pipelines. Northern Natural Gas will utilize a blanket certification in the routing, construction and operation of this pipeline.

Blanket certification can be used for relatively small projects. A blanket certificate approves a series of similar actions in one authorization. For instance, construction of small additions to a natural gas pipeline may be authorized by a blanket certificate, provided the total cost does not exceed some threshold level and other eligibility criteria are met.

The Federal Energy Regulatory Commission (FERC) is the regulatory agency that oversees the U.S. interstate natural gas pipeline industry. It does so under the authority of the Natural Gas Act (NGA), the Natural Gas Policy Act (NGPA), the Outer Continental Shelf Lands Act (OCSLA), the Natural Gas Wellhead Decontrol Act and the Energy Policy Act (EPAct).

The Commission regulates both the construction of interstate natural gas pipelines and the transportation of natural gas in interstate commerce. The FERC process is designed to assure

that pipeline facilities benefit consumers, are compatible with the environment and minimize interference with the public and landowners along pipeline rights-of-way.[2]

FERC itself is a five-member commission, each of whom is nominated by the President and confirmed by the U.S. Senate. FERC's review of the application and determination of need involves the balancing of the project's adverse impact against its benefits. The FERC's environmental analysis of the application under the National Environmental Policy Act of 1969 (NEPA) is part of that balancing. Public participation is a key element in FERC's environmental analysis.[3]

Additional pipeline options currently being considered are a pipeline owned and operated by Invenergy, Xcel Energy or other third party. In either of these cases the pipeline would be required to follow the Minnesota Pipeline Routing rules (Minnesota Rules Chapter 4415).

A pipeline route permit from the Minnesota Environmental Quality Board is required for the construction of certain pipelines (Minnesota Statutes 116I.015). The EQB has jurisdiction over pipelines with a diameter of six inches or more that are designed to transport hazardous liquids like crude petroleum and those that are designed to carry natural gas and be operated at a pressure of more than 275 pounds per square inch.

The procedure to be followed in considering a permit for a pipeline depends on the size and type of the pipeline. An applicant may apply for a partial exemption from the complete procedural requirements if the project is not expected to have significant environmental impacts. In such a case, the process of public review normally takes from 60 to 120 days from submission of the application. For more controversial projects with expected significant environmental impacts, a more complex process is required. It can take up to nine months to complete. The procedures are explained in detail in the pipeline routing rules adopted by the EQB (Minnesota Rules Chapter 4415).

[2] http://www.ferc.gov/for-citizens/my-rights/process.asp
[3] Ideas for Better Stakeholder Involvement In the Interstate Natural Gas Pipeline Planning Pre-Filing Process. FERC. December 2001

# 3.0 ENVIRONMENTAL SETTING

Goodhue County is in the southeast triangle of Minnesota. There are several irregularities in its boundary lines, but, generally speaking, it has Dakota County on the northwest, Wisconsin on the northeast, Wabasha County on the southeast, Dodge and Olmsted Counties on the south, and Rice County on the west. The Mississippi River and its enlargement, Lake Pepin, form its northeastern border and separate it from the State of Wisconsin. The total area of the county is 764 square miles.

Cannon Falls is located mid-way between the Twin Cities and Rochester. The proposed site is located approximately twenty-five miles west of the Mississippi River.

## 3.1 Air Quality

The U.S. Environmental Protection Agency (EPA) and the Minnesota Pollution Control Agency (MPCA) have established air quality standards for a number of common pollutants, called criteria air pollutants.[4] The criteria air 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.[5] The criteria air 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 in microns), carbon monoxide (CO), ozone ($O_3$), and lead (Pb).

A power plant of the type proposed here, burning natural gas with a fuel oil back up, will emit tons of certain criteria pollutants into the atmosphere. These pollutants will be emitted out a stack approximately 75 feet above grade and will disperse over a large area in prevailing winds. A discussion of Minnesota's air quality and various air quality indexes will help to put the impact of these additional emissions into perspective.

### *National Ambient Air Quality Standards (NAAQS)*

The National Ambient Air Quality Standards (NAAQS) for these pollutants are shown in **Table 2**.[6] The state standards are nearly identical, although Minnesota has a one-hour sulfur dioxide standard.[7] There are two types of air quality standards, primary-standards and secondary-standards. Primary standards are intended to protect public health, including the health of sensitive populations like asthmatics, children, and the elderly. Secondary standards are intended to protect public welfare, by preventing decreased visibility and damage to crops, animals, vegetation, and buildings.

Areas of the country that do not meet national ambient air quality standards are designated non-attainment areas for the particular pollutant or pollutants for which the standard or standards are

[4] http://www.pca.state.mn.us/air/air_rulesregs.html
[5] http://www.epa.gov/air/urbanair/6poll.html
[6] http://www.epa.gov/oar/oaqps/greenbk/index.html
[7] http://www.pca.state.mn.us/air/air_mnrules.html

not met. The Cannon Falls area presently meets all federal and state ambient air quality standards.

Air quality in the Cannon Falls 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 Cannon Falls area, should be classified as meeting the new 8-hour ozone standard.

### *Air Quality Index (AQI)*

The Air Quality Index (AQI) was developed by the EPA to provide a simple, uniform way to report daily air quality conditions. The EPA calculates the AQI for the five criteria air pollutants regulated by the Clean Air Act: ground-level ozone ($O_3$), particle pollution (also known as particulate matter, or $PM_{2.5}$), carbon monoxide (CO), sulfur dioxide ($SO_2$), and nitrogen dioxide ($NO_2$).

The AQI translates each pollutant measurement to a common index, with an index of 100 set to reflect where health effects might be expected in sensitive populations. An AQI value of 100 generally corresponds to the National Ambient Air Quality Standard for the pollutant, which is the level the EPA has set to protect public health.[8]

The pollutant with the highest index value is used to determine the overall AQI. The AQI uses numbers from 0 to 500 to describe the air quality conditions and their possible effects on human health. Readings of 0-50 are described as Good, 51-100 as Moderate, 101-150 as Unhealthy for Sensitive Groups, 151-200 Unhealthy, 201-300 Very Unhealthy, and 301 and above Hazardous.

In large cities (more than 350,000 people), state and local agencies are required to report the AQI to the public daily. When the AQI is above 100, agencies must also report which groups, such as children or people with asthma or heart disease may be sensitive to the specific pollutant. If two or more pollutants have AQI values above 100 on a given day, agencies must report all the groups that are sensitive to those pollutants. Many smaller communities also report the AQI as a public health service.

The MPCA determines the AQI around the state by measuring four pollutants: ozone, sulfur dioxide ($SO_2$), fine particulate matter ($PM_{2.5}$) and carbon monoxide. Not all pollutants are monitored at each location. The pollutant with the highest value determines the AQI for that hour. The MPCA takes hourly measurements of these pollutants at air quality sites located throughout the state. Ozone levels, which are only elevated in warm weather, are measured from April through September in Minnesota. While the AQI in Minnesota cities rarely reaches the "Unhealthy" level (AQI >200), many citizens are affected by air quality in the "Unhealthy for Sensitive Groups" level (AQI >100).

[8] Air Quality Index. A Guide to Air Quality and Your Health. August 2003. http://www.epa.gov/airnow/aqi_cl.pdf

The Stanton monitoring station is located at the Stanton Air Field, approximately 4 miles southwest of the proposed site. AQI values are reported hourly on the MPCA's Web site.[9] Each weekday, you may also hear a recorded message of the daily AQI for the Twin Cities metro area by dialing 651-297-1630.

### *Criteria Air Pollutants*

#### *Sulfur Dioxide.*

Sulfur dioxide belongs to the family of sulfur oxide gases ($SO_x$). These gases are very soluble in water. Sulfur is common in raw materials, including crude oil, coal, and ores that contain common metals like aluminum, copper, zinc, lead, and iron. $SO_x$ gases are formed when fuel containing sulfur, such as coal and oil, is burned, and when gasoline is extracted from oil or metals are extracted from ore. $SO_2$ dissolves in water vapor to form sulfuric acid, and interacts with other gases and particles in the air to form sulfates and other products that can be harmful to people and the environment, including the formation of acid rain.

Sulfur dioxide causes a wide variety of health and environmental impacts because of the way it reacts with other substances in the air. Sulfur dioxides affects the respiratory system in humans, particularly those of sensitive groups like people with asthma who are active outdoors and children, the elderly, and people with heart or lung disease.[10]

Nationwide, about 20 million tons of sulfur dioxide are emitted by numerous sources each year. Over 65% of this amount, or more than 13 million tons per year, comes from electric utilities, especially those that burn coal. Other sources of $SO_2$ are industrial facilities that derive their products from raw materials like metallic ore, coal, and crude oil, or that burn coal or oil to produce process heat.

The Minnesota Pollution Control Agency has estimated that in 1994, statewide $SO_2$ emissions were estimated at about 142,000 tons. Data shows that fuel combustion, mainly by electric utilities, was the major contributor to $SO_2$ emissions in Minnesota. Fuel combustion accounted for an estimated 87 percent (123,000 tons) of Minnesota's $SO_2$ emissions. Within this category, electric utilities were the dominant source, accounting for about 62.3 percent (89,000 tons) of total $SO_2$ emissions. Ninety-nine percent of electric utility emissions are attributed to coal combustion.

From 1985 to 1994, total $SO_2$ emissions in Minnesota decreased by 7.3 percent, or 12,000 tons; 153,000 tons of $SO_2$ were emitted in 1985, compared to 142,000 tons in 1994. From 1985 to 1994, $SO_2$ emissions from electric utilities decreased from 99,000 tons to 89,000 tons, a 10-percent decline.[11] Xcel Energy has recently proposed a ten year plan to reduce emissions of sulfur dioxide (and other pollutants) from its three biggest coal-fired power plants in the Twin Cities by switching to natural gas at one (Riverside plant in Minneapolis), by building a new

[9] http://aqi.pca.state.mn.us/hourly/
[10] How sulfur dioxides affects the way we live and breathe. 2000. US EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711 EPA-456/F-98-005
[11] http://www.pca.state.mn.us/air/emissions/emissearch.cfm

natural gas plant to replace another (the High Bridge plant in St. Paul), and installing modern control equipment on a third (Allen S. King plant near Stillwater).

The long-term trends in Minnesota's $SO_2$ emissions and ambient air concentrations indicate steady improvement. Over the past several years, the number of $SO_2$ non-attainment areas in Minnesota has dropped. In 1990, four areas of the state were designated non-attainment for $SO_2$ – a portion of the Twin Cities, the Pine Bend area around the Koch Refinery, the St. Paul Park area near the Ashland Refinery, and the City of Rochester. Continued progress in reducing ambient $SO_2$ concentrations has been possible because new large utility plants have installed sulfur-removal equipment; and utility, commercial, residential and industrial users continue to shift to lower-sulfur fuels. One additional factor contributing to lower $SO_2$ concentrations is the lower sulfur content in today's diesel motor fuels.[12]

### *Nitrogen Oxides*

Nitrogen oxides**,** or NOx, are the generic terms for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. Various compounds and derivatives make up the family of nitrogen oxides, including nitrogen dioxide (($NO_2$), nitric acid (HNO3), nitrous oxide (N2O), nitrates (NO3), and nitric oxide (NO).[13]

Many of the nitrogen oxides are colorless and odorless. However, one common pollutant, nitrogen dioxide ($NO_2$), along with particles in the air, can often be seen as a reddish-brown layer (smog) over many urban areas. Nitrogen oxides also contribute to acid rain and lead to the formation of ozone upon chemical reaction with volatile organic compounds in the atmosphere.

Nitrogen oxides form when fuel is burned at high temperatures, as in a combustion turbine process. The primary sources of NOx are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels.

Nitrogen oxides cause a wide variety of health and environmental impacts and can attack the respiratory system and cause lung damage.

Background concentrations of nitrogen oxide (NO) and $NO_2$ are approximately 0.5 and 1 part per billion (ppb), respectively. In urban areas, one-hour average concentrations of NO may reach 1-2 parts per million (ppm), with maximum $NO_2$ levels of about 0.5 ppm. Atmospheric levels of NO and $NO_2$ show daily variations related to the human transportation/work cycle. Maximum concentrations of NO are observed in early morning hours (6 a.m. to 8 a.m.), followed by a second peak later in the day (4 p.m. to 6 p.m.). High morning concentrations of NO are followed several hours later by peak levels of $NO_2$ produced by oxidation of NO. Seasonal trends can also be observed. Emissions of NO increase in winter months, when there is higher consumption of heating fuel. The warm and sunny days of summer bring higher $NO_2$ levels, due to photochemical oxidation of NO.[14]

[12] Ibid
[13] How nitrogen oxides affect the way we live and breathe 1998.US EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711 EPA-456/F-98-005
[14] http://www.pca.state.mn.us/air/emissions/emissearch.cfm

There are no non-attainment areas for nitrogen oxides in the state.

### *Carbon Monoxide*

Carbon monoxide, or CO, is a colorless, odorless gas that is formed when carbon rich fuel is incompletely combusted. It is a component of motor vehicle exhaust, which contributes about 56 percent of all CO emissions nationwide. Other non-road engines and vehicles (such as construction equipment and boats) contribute about 22 percent of all CO emissions nationwide. Higher levels of CO generally occur in areas with heavy traffic congestion. In cities, 85 to 95 percent of all CO emissions can come from motor vehicle exhaust. Other sources of CO emissions include industrial processes (such as metals processing and chemical manufacturing), residential wood burning, and natural events such as forest fires. Carbon monoxide can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues.[15]

Data provided on the MPCA web-site indicate that transportation sources, mainly highway vehicles, are the major source of CO emissions in Minnesota. Statewide CO emissions in 1994 are estimated to have been 1.7 million tons. The CO emissions decreased statewide between 1985 and 1994. Long-term trends in ambient air concentrations and emissions of CO reflect steady improvement. These improvements closely correlate with reduction in highway vehicle emissions. However, vehicle miles traveled (VMT) per year in the Twin Cities metropolitan area have almost doubled since 1980. VMT have also increased statewide and show no sign of leveling off. Along with consequent congestion, the Minnesota Pollution Control Agency forecasts that this increase in VMT may overwhelm the air quality improvement made as a result of lower emissions from individual vehicles.[16]

### *Particulate Matter*

Particulate matter, or PM**,** is the term used to describe particles found in the air (dust, soot, smoke, and liquid droplets). Particles can be suspended in the air for long periods of time. Some particles are large or dark enough to be seen as soot or smoke, while others are microscopic. The larger groups of particles are identified as “coarse,” and by definition have a size range from 2.5 to 10 microns ($PM_{10}$). The smaller groups of particles are identified as “fine,” and by definition have a size smaller than 2.5 microns ($PM_{2.5}$). For comparison, a human hair is usually greater than 10 microns in thickness, in the range of 10 to 100 microns.

Particulate matter can be directly emitted into the air or be formed in the air from the physical and chemical transformation of other vaporous or gaseous pollutants such as $NO_X$, $SO_X$, VOC and ammonia. The latter are indirectly formed when gases from burning fuels react with sunlight and water vapor. These can result from fuel combustion in motor vehicles, power plants, and in industrial processes.

[15] How carbon monoxides affects the way we live and breathe. 2000. US EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711 EPA-456/F-98-005
[16] http://www.pca.state.mn.us/air/emissions/emissearch.cfm

Particulate matter causes a wide variety of health and environmental impacts. Many scientific studies have linked breathing PM to a series of significant health problems, including cardiovascular problems, throat and nose irritation, lung damage, and bronchitis.[17]

In the 1970's the ambient air quality standard for particulate matter applied to particles larger than 10 microns. In 1997, however, the EPA announced new standards for the smaller (fine) particles, those 2.5 microns or less in diameter ($PM_{2.5}$). The new ambient standards were set at 15 micrograms per cubic meter ($ug/m^3$) on an annual basis and 65 $ug/m^3$ for a 24-hour period. Evidence from hundreds of studies has shown that these tiny particles are chiefly responsible for the most serious adverse health impacts associated with air pollution. When inhaled, $PM_{2.5}$ penetrates deep into the human lung, where the particles and the toxic materials attached to them remain lodged.[18]

Monitored annually for the past three years to determine whether Minnesota attains the NAAQS, average concentrations of fine particulates in the Twin Cities typically range from 11 $ug/m^3$ to 14 $ug/m^3$. Atmospheric $PM_{2.5}$ reached alert levels twice in 2002 in Minnesota.[19]

### *Ozone*

Ozone ($O_3$) is a gas composed of three oxygen atoms. Ozone naturally exists high in the atmosphere, where it shields the earth against harmful ultraviolet rays from the sun. Ground-level (i.e., near the earth's surface) ozone is a product of reactions between oxides of nitrogen ($NO_x$) and volatile organic compounds (VOC) in the presence of heat and sunlight. Ozone has the same chemical structure whether it occurs miles above the earth or at ground level; its location in the atmosphere determines whether it represents a problem. In the earth's lower atmosphere, at ground-level, ozone is considered harmful. Sunlight and hot weather cause ground-level ozone to form in harmful concentrations in the air. As a result, it is known as a summertime air pollutant. Many urban areas tend to have high levels of ground-level ozone, but even rural areas are also subject to increased ozone levels because wind carries ozone and pollutants that form it hundreds of miles away from their original sources. Ground-level ozone even at low levels can adversely affect everyone. It can also have detrimental effects on plants and ecosystems.[20]

Ozone can cause breathing problems in sensitive populations. It can also damage plants and trees. Ozone can also reduce visibility. Ground-level ozone concentrations are rising in the Minnespolis/St. Paul region. Increasing population and congestion will likely lead to further increases in ozone levels.

A study commissioned by the MPCA and published in October, 2002 showed that the annual average peak of 1-hr and 8-hr ground-level ozone concentrations are increasing at all monitoring

[17] How particulate matter affects the way we live and breathe. 2000. US EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711 EPA-456/F-98-005
[18] *Reanalysis of the Harvard Six Cities Study and the American Cancer Society Study of Particulate Air Pollution and Mortality.* A Special Report of the Institute's Particle Epidemiology Reanalysis Project. July 2000. http://www.healtheffects.org/pubs-special.htm
[19] Minnesota Energy Planning Report 2002. Appendix A
[20] How ground-level ozone affects the way we live and breathe. 2000. US EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711 EPA-456/F-98-005

sites surrounding the Minneapolis/St. Paul region. Only at sites to the far distant north (Ely and Mille Lacs) show ground level ozone trends improving. Thus, overall trends in ozone show that the numbers of occurrences of higher ozone concentrations are on the rise. While the 1-hr ozone NAAQS level of 0.12 ppm has only been reached twice in the last ten years, the 8-hr NAAQS level of 0.08 ppm is reached on average twice per year at one or more sites. Note that during some years 8-hr ozone levels do not reach 0.08 ppm while in other years 8-hr ozone reaches that level 4 or 5 times. Increasing population and congestion will likely lead to further increases in ozone levels in the future.[21]

#### *Lead*

Lead levels in the environment have decreased dramatically since lead in gasoline was banned by the Environmental Protection Agency in 1978. The only places where lead is still found in concentrations of concern is in the inner cities, where years of exhaust from motor vehicles burning leaded gasoline have resulted in high levels in the soil in such areas.

#### *Greenhouse Gases*

Another group of air pollutants has risen in importance. Although greenhouse gases (GHG) do not necessarily directly harm human health, their increase in concentration can lead to global climate change. Global climate change poses risks to human health and to ecosystems. Important economic resources such as agriculture, forestry, fisheries, and water resources also may be affected. The principal GHG is carbon dioxide ($CO_2$).

The EPA's Acid Rain Program applies to any new fossil fuel fired utility, constructed after November 15, 1990, with an electrical output of 25 MW or more. The proposed project will be subject to the Acid Rain provisions.

### *Toxic Air Pollutants*

The burning of natural gas and fuel oil can also result in the emission of non-criteria pollutants of concern. EPA refers to certain chemicals that cause health and environmental hazards as "hazardous air pollutants (HAPs)" 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.[22]

## 3.2 Land Use

The proposed site is approximately 55 acres in size and is zoned for restricted light industry uses. The site is currently used as farmland. Several commercial/industrial facilities are located along Holiday Avenue and Cannon Industrial Boulevard, including an environmental services company, a hunting products manufacturer, a fertilizer supplier, and a costume manufacturer and

[21] Preliminary Assessment of Ozone Air Quality Issues in the Minneapolis/St. Paul Region. Sonoma Technology, Inc. October 10, 2002. http://www.pca.state.mn.us/publications/reports/ozonestudy2002.pdf
[22] http://www.epa.gov/ttn/atw/

wholesaler. The Spring Creek – Cannon Falls transmission line runs along the western boundary of the site (**Figure 7**).

## 3.3 Natural Resources

The Ecological Classification and Inventory (EC&I) is part of a nationwide mapping initiative, initially established by the US Forest Service, developed to improve the ability to manage natural resources on a sustainable basis. The central concept of the EC&I is the integration of biotic and abiotic environments. This method of classification not only facilitates understanding of the natural environment and the distribution of complex ecological systems, but also allows aggregation and desegregation of data and information for multi-level analysis and planning purposes. This is done by integrating climatic, geologic, hydrologic, topographic, soil, and vegetation data. Three of North America's ecological regions, or biomes, converge in Minnesota: prairie parkland, eastern broadleaf forest and laurentian mixed forest. The occurrence of three biomes in one non mountainous state is rare, and accounts for the diversity of ecological communities in Minnesota.[23] The eastern broadleaf forest province bridges the transition zone between prairie to the west and true forest to the east.

The eastern broadleaf forest province has several subsections; the proposed site lies within the St. Croix Moraine & outwash plains subsection of this province. The northern boundary of this subsection consists of a Superior Lobe end moraine complex (St. Croix Moraine). To the west, terraces associated with the Mississippi River separate this subsection from the Anoka Sand Plain subsection. The south boundary consists of the southern edge of the Rosemount Outwash Plain.

St. Croix Moraine & outwash plains subsection is a small unit that continues into Wisconsin. Although it is topographically low in comparison to other areas in the state, this subsection is dominated by a large moraine and areas of outwash plain. It encompasses much of the seven county urban area and therefore has much urban development within.

### *Topography/Landform*

As stated previously, this subsection is dominated by a Superior Lobe end moraine complex. South of this moraine is a series of outwash plains. There are some areas of loess plain over bedrock or till in the southeastern portion of the unit. Topography is rolling to hummocky on the moraine (steep, short complex slopes) and level to rolling on the outwash.

The elevation of the proposed site is approximately 870 feet mean sea level (msl). The closest surface water body is Pine Creek, an intermittent stream northeast of the property. The Cannon River is located approximately one mile south of the proposed project site.

The land area within the proposed project site is relatively flat over the approximately 55 acres. Four small depression areas are present on the proposed site (**Figure 8**). Depression Area 1 is located in the west central portion of the site and drops approximately 3 feet in elevation. Scrub

[23] Albert, Dennis A. 1995. Regional landscape ecosystems of Michigan, Minnesota, and Wisconsin: a working map and classification. Gen. Tech. Rep. NC-178. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station.

vegetation is present in this area. The second depression (Area 2) is in the northwest corner of the site and is filled with heavy brush and trees. The third depression (Area 3) is located in the south central portion of the site and has sparse vegetation. Depression Area 4 is located approximately 1,500 feet due south of Area 1. These depression areas were evaluated by Invenergy's consultant (i.e., URS) for wetland characteristics (**Appendix B**) on June 30, 2004. None of these depressions meet the definition of a wetland under the State of Minnesota's Wetland Conservation Act.

***Geology/Soils/Hydrology***

Two primary types of glacial features characterize this landscape. Steep, short slopes of the large St. Croix Moraine in the north are rolling to hummocky, and strewn with lakes, while outwash areas further south are level to rolling. Limestone, sandstone, and shale bedrock lie beneath drift and are often exposed along highly eroded stream valleys in the east.

Glacial drift is generally less than 100 feet thick within the St. Croix Moraine & outwash plains subsection, with maximum drift thickness of about 200 feet. Ordovician and Devonian dolomite (some limestone, sandstone, and shale) is locally exposed, especially in the dissected stream valleys at the eastern edge of the subsection. Precambrian bedrock is exposed along and under the St. Croix River.[24]

Soils in the St. Croix Moraine & outwash plains subsection are primarily Alfisols (soils formed under forested vegetation). Areas of Mollisols (soils formed under prairie vegetation) can be found on the outwash plains. Parent materials are mixed on the moraines (mixtures of clay loams, loams, sandy loams, and loamy sands). The outwash plains have sandy parent materials.

The United State Department of Agriculture Soil Conservation Service published a soil survey for Goodhue County in 1976. In the survey, the soil underlying the proposed project site is mapped as Biscay loam, Dickinson sandy loam (0-2% slope and 2-6% slope), Fairhaven silt loam (0-3% slopes), and Waukegan silt loam (0-3% slopes). **Figure 9** shows the soil types present at the site.

Soil borings completed on the proposed site by Invenergy's consultant, as part of a pre-development geotechnical study found that a surficial layer of topsoil about 1.5 feet thick was present. This layer consisted of dark brown clayey silt with organics and roots. Underlying the topsoil was a layer of firm to stiff, brown silty clay to clayey silt. This layer extended to a depth of approximately 3 feet below grade. Underlying the clayey silt were granular soils consisting of brown fine to medium sand, sand with gravel, and silty sand extending to the termination depth of the borings. Groundwater was present at depths of 14 feet below grade.

The drainage network is poorly developed throughout most of the St. Croix Moraine & outwash plains subsection. This is due to the nature of the landforms. The Mississippi River cuts through the center of this subsection. There is a well developed flood plain associated with the Mississippi. The end moraines in the northern third have an undeveloped drainage network. The

[24] Minnesota Geological Survey Goodhue County Atlas C-12, Parts A & B. 1998

St. Croix River forms the east boundary (as well as the boundary between Minnesota and Wisconsin) and flows into the Mississippi southeast of the Twin Cities.

Local well boring logs (County Well Index data base) indicate that the depth to the uppermost bedrock formation in the vicinity of the proposed site is located near the surface, ranging from 10 feet below grade to 58 feet below grade. The top bedrock layer consists of the Prairie du Chien Group and the St. Peter Sandstone. The Prairie du Chien consists of dolostone formations with a few thin sandstone beds and sandstone at the base of the formation. The Prairie du Chien has a thickness of approximately 260 feet. The St. Peter Sandstone consists of medium to fine-grained massive well-sorted quartz sandstone. A thin clay layer at the base retards vertical water movement.

### *Flora*

There was a mosaic of vegetative communities across the St. Croix Moraine & outwash plains subsection. Oak and aspen savannas were the primary communities, but areas of tallgrass prairie and maple-basswood forest were common. Tallgrass prairie was concentrated on level to gently rolling portions of the landscape. Bur oak savanna grew on rolling moraine ridges at the western edge of the subsection and in dissected ravines at the eastern edge. Maple-basswood was restricted to the portions of the landscape with the greatest fire protection, either in steep, dissected ravines or where stream orientation reduced fire frequency or severity.[25]

Urban development is the primary land use. There are small areas of forest present in the eastern portion of the St. Croix Moraine & outwash plains subsection, although this is becoming scarce as the urban development continues. There is significant recreational activity along the Mississippi and St. Croix River corridors.

The proposed site is already disturbed by agricultural activities and the vegetation lost due to the proposed project will include the cultivated field and surrounding vegetation (prairie and wetland grasses, deciduous Maple-Basswood, and shrubs) lining the depressions, drainage-ways and property lines.

### *Fauna*

Much of the land on and surrounding the proposed site has already been disturbed by agricultural activities. The agricultural and natural habitats within the proposed site are used by a variety of mammals including the eastern cottontail, striped skunk, whitetail deer, raccoon, fox, mice and squirrels.

Sandhill crane, heron, waterfowl, common grackle, red-winged blackbird, warblers (blue-winged and Cerulean), kestrel, red-tailed hawk, tufted titmice, and blue-gray gnat catchers are a few of the birds that would be expected around the proposed site.

[25] Albert, Dennis A. 1995. Regional landscape ecosystems of Michigan, Minnesota, and Wisconsin: a working map and classification. Gen. Tech. Rep. NC-178. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station.

Amphibians and reptiles expected to be located within the proposed site include the garter snake, gray tree frog, American toad and chorus frog.

***Rare & Unique Natural Resources***

The proposed site is located primarily on what was historically native prairie land and Maple-Basswood forest. As a consequence the area provides a suitable habitat for some species listed by the MDNR as threatened or endangered.

The U.S. Fish and Wildlife Service (USFWS), Region 3, has reviewed the location and description of the proposed project (**Appendix C**). The USFWS has determined that the CFEC activities are unlikely to adversely affect any federally listed or proposed threatened or endangered species or adversely modify their critical habitat.[26]

The MDNR (Minnesota Natural Heritage and Nongame Research Program) maintains a list of plants and animals considered rare in the state. A list of those found in Goodhue County is contained in **Appendix C.**[27] MDNR searched the Minnesota Natural Heritage database for known occurrences of rare species and natural communities within a one-mile radius of the proposed site (**Appendix C**). Although MDNR found six such occurrences, none of the six is located on the proposed site and none is likely to be adversely affected by the CFEC activities.

One scientific and natural area (i.e., the River Terrace Prairie SNA) is located four miles east of the proposed site. This gravel prairie community was formed of glacial outwash atop an isolated Cannon River terrace, now 30 feet above the surrounding lower terraces. Even from a mile away, this prairie is a striking feature on the landscape. Gravel prairie communities are rare in the state, and this is the only example in Goodhue County. One of the largest known populations of the rare kittentail occurs here, along with other native prairie forbs and grasses.

***Recreation Areas***

Several parks and outdoor recreation areas are located within a 10 miles radius of the proposed site (**Figure 10**).

The Cannon Valley Trail is a 19.7-mile long trail that runs from downtown Cannon Falls to Red Wing, Minnesota. The trail is open year round for bicycling, walking, and other wheeled recreational devices. The proposed site is approximately 1.5 miles from the nearest point on the trail.

There are four parks within the downtown Cannon Falls area: East Side Park; Hannah's Bend Park; Minnieska Park; and Riverside Park. All of these parks are within one to two miles of the proposed site. Two other parks within the vicinity of the proposed site are the Lake Byllesby Regional Park and the Goodhue County Park, both of which are located adjacent to Lake Byllesby, approximately two miles to the southwest.

[26] United States Department of the Interior communication, August 8, 2002.
[27] http://files.dnr.state.mn.us/ecological_services/nhnrp/endlist.pdf

## 3.4 Visual Aesthetic

The area immediately surrounding the proposed site is characterized by light density industrial development (**Figure 7**). Views to the immediate south and east are dominated by several commercial and industrial facilities, with farm and commercial traffic visible on County Highway 29, Holiday Avenue, and Cannon Industrial Boulevard. Other features visible in the surrounding area include flat farmland to the north and west, and an electric transmission line running north to south on the west side of the proposed site.

## 3.5 Archaeological and Historic Resources

The Minnesota Historical Society State Historic Preservation Office ("SHPO") was requested to determine the effect of site development on cultural resources, including historic or archaeological resources, for compliance with Minnesota Statutes, Section 138.40, Subdivision 3. After reviewing information on historic places listed on national and state registers and on known or suspected archaeological properties, the SHPO concluded that the CFEC will not affect archaeological or historic properties (**Appendix C**).

## 3.6 Transportation

The Business Park North area is served by State Highway 20 and County Highway 29; the proposed site would be serviced by secondary roads-Holiday Avenue and Cannon Industrial Boulevard (**Figure 2**).

According to the Minnesota Department of Transportation (MnDOT), traffic volume on State Highway 20 just north of the junction with County Highway 29 averages 3,500 vehicles per day. County Highway 29 averages 2,300 vehicles per day, based on traffic volume information published in the Goodhue County Transportation Plan for 2004.[28]

The nearest major airport is the Minneapolis-St Paul International Airport, approximately 35 miles north of the proposed site. Other local or regional airports include the Stanton Airfield, in Stanton, Minnesota, approximately 4 miles southwest of the site and the Faribault Municipal Airport, located approximately 25 miles southwest of the site.

## 3.7 Socioeconomics

Socioeconomics refers to the economic, social, and demographic characteristics of a region. The existing socioeconomic characteristics of Goodhue County, the State of Minnesota and the Twin Cities Metropolitan area were reviewed by the EQB staff.

Goodhue County comprises a land area of 764 square miles in the southeast portion of Minnesota, approximately 50 miles south of the cities of Minneapolis and St. Paul.

[28] http://www.co.goodhue.mn.us/comp/transportation.html

Goodhue County is basically rural; its largest city is Red Wing with a population of 16,116. The northeastern area of the county is characterized by rolling hills and small woods, with sparsely located farms. The main crops include corn, soybeans, and wheat. In addition to Cannon Falls and Red Wing, there are eight small cities and twenty-one townships.

The 2000 census reports Goodhue County's population at 44,127 and the City of Cannon Falls with a population of 3,557. The population of Goodhue County increased at a rate just under the population increase throughout Minnesota. The region experienced a positive net migration. The Twin Cities metropolitan area contains over half the State's total population.[29]

**Table 3** presents the recent population figures for Goodhue County, the Twin Cities and the State of Minnesota.

## 3.8 Noise

Noise is comprised of a variety of sounds, of different intensities, across the entire frequency spectrum. Humans perceive sound when sound pressure waves encounter the auditory components in the ear. These components convert the pressure waves into perceivable sound. Noise is measured in decibels (dB).

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 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 area classification 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.[30]

**Table 4** sets forth the Minnesota Noise Standards for the appropriate land use areas.

Noise area classifications apply at the location of the noise receptor, not at the property boundary of the noise source. Further, the noise rules require that a municipality with authority to regulate land use prevent new land uses defined in the NAC categories from being established where the noise standards shown in Table 4 would be exceeded if the new land use is permitted.

[29] Minnesota Planning Agency, State Demographic Center (http://www.mnplan.state.mn.us/demography/index.html)
[30] http://www.pca.state.mn.us/programs/noise.html

Current ambient noise detectable on the proposed site consists of intermittent traffic along the local roads, traffic from County Highway 29 and State Highway 20, sounds from the nearby industrial and commercial establishments, operation of agricultural equipment, small aircraft, and birds and insects.

The CFEC will be located in an area zoned for restricted light industry land use. Most of the noise receptors in the immediate vicinity of the proposed site would be classified as either NAC 2 or 3. As shown in **Figure 11**, the nearest sensitive noise receptor is a residence located approximately 1,400 feet southwest of the proposed site. Additional residential properties lie to the southeast of the site, near State Highway 20.

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# 4.0 HUMAN & ENVIRONMENTAL IMPACTS

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.

## 4.1 Air Quality

As both a requirement of federal law (the Clean Air Act) and state law (Minn. Stat. §116.07), the CFEC is required to obtain an air permit from the Minnesota Pollution Control Agency. The kind of review the MPCA will conduct and the conditions that are included in any air permit that is issued will depend on the quantity and type of pollutants that will be emitted during operation of the facility.

On August 26, 2004, Invenergy applied for a total facility operating permit (i.e., air quality permit) from the MPCA for the CFEC.

The permit application requests that emissions from the CFEC once operational be limited to 248.6 tons per year (tpy) NOx, 144.8 tpy CO, 57.3 tpy $SO_2$, 74.8 tpy $PM_{10}$ and 12.1 tpy VOC.[31] Because the $NO_X$ emissions will be limited to a level below the PSD (40 CFR Section 52.21) new source threshold of 250 tons per year for any regulated pollutant, the proposed CFEC will not trigger PSD applicability. This will effectively limit operation of the CFEC to just over 4,292 unit-hours per year.

To demonstrate compliance with the emission limitations that will be contained in the air quality permit, the CFEC will maintain records on the quantity of fuel combusted (natural gas and distillate fuel oil) in each piece of equipment on a daily basis. Emission estimates will be calculated based on the quantity of fuel combusted, operating conditions and predefined emission factors. Predefined emission factors will be established, by the MPCA based on initial stack testing.

### *Criteria Air Pollutant Emissions*

The CFEC will employ two General Electric 7FA CTGs, each with a nominal capacity of 175 MW. The two simple cycle, dual-fuel capable CTGs and associated auxiliary equipment will be operated for peaking service. Distillate fuel oil with sulfur content not in excess of 0.05 percent by weight will be used as a backup fuel supply.

The CFEC will potentially emit the following regulated air pollutants: nitrogen oxides ($NO_x$), carbon monoxide (CO), sulfur dioxide ($SO_2$), particulate matter ($PM/PM_{10}$), volatile organic compounds (VOC) and hazardous air pollutants (HAP). The emission estimates are based on firing natural gas at an operating load of 100%, 4,292 hours of operation per year, and an

[31] Air Permit Application to Construct Proposed Electric Generating Plant Cannon Falls Energy Center, Section 5, pp 29. August 26, 2004

ambient temperature of 45° F. **Table 5** summarizes the potential air pollutant emissions of criteria air pollutants for the proposed facility.

Since the proposed facility is to operate as a "peaking plant," the potential air pollutant emission rates will be limited to levels that are below the applicable threshold levels associated with the Prevention of Significant Deterioration (PSD) provisions of the Clean Air Act regulations (45 FR 52675). However, a voluntary air quality impact assessment was performed by Invenergy to determine the effect of air emissions from the CFEC on ambient air quality.

### *NAAQS Modeling*

The emissions of $NO_x$, CO, $PM_{10}$, and $SO_2$ expected from the CFEC were modeled with the use of representative databases, the ISCST3 dispersion model, and with five years of hourly meteorological data. The predicted maximum concentrations of each pollutant, in combination with representative background levels, were compared against the National Ambient Air Quality Standards (NAAQS) to show whether the proposed facility would cause or contribute to an exceedance of the NAAQS. The results predicted concentration levels well below the established NAAQS (**Table 6**).

### *Hazardous Air Pollutants*

In addition to criteria pollutants, the proposed facility will generate small amounts of hazardous air pollutants (HAPs). The EPA has developed National Emission Standards for hazardous air pollutants (i.e., NESHAP) for numerous source categories. However, the proposed CFEC will not involve any of the categories proposed or promulgated under the provisions of the Clean Air Act.

To determine the types and quantities of HAPs emitted by the facility, Invenergy used the EPA's AP-42 emission factors.[32] An emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant.

The Clean Air Act Amendments of 1990, established a new and fairly complex program to regulate emissions of 188 hazardous air pollutants from particular industrial sources. The amendments required the EPA to regulate emissions of these HAPs by developing and promulgating technology-based standards. New sources are subject to these requirements if they have the potential to emit HAPs in "major" amounts (i.e., 10 tons or more of an individual pollutant or 25 tons or more of a combination of pollutants). The proposed facility will not have the potential to emit regulated HAPs in quantities greater than or equal to 10 tons per year of any individual HAP or 25 tons per year of combined HAPs. Therefore, the proposed facility does not trigger the NESHAP provisions of the Clean Air Act.

Facility-wide potential HAP emissions are presented in **Table 7**.

[32] http://www.epa.gov/ttn/chief/

### *Air Emission Risk Analysis*

In September, 2003, the MPCA released a guidance document establishing an Air Emissions Risk Analysis (AERA) process.[33] The AERA process is designed to quickly estimate potential incremental cancer risks and non-cancer hazard indices related to air emissions from a given source.

For carcinogens, an excess lifetime cancer risk (ELCR) is determined. The ELCR estimate is an upper-bound probability that an individual exposure during a lifetime to a contaminant could result in cancer. If the ELCR for each contaminant evaluated is less than or equal to one in one hundred thousand ($1 \times 10^{-5}$or 1.0e-05), the Minnesota Department of Health (MHD) considers the risk negligible.[34]

For non-carcinogenic health effects the EPA has stated that it is believed that an exposure level exists below which no adverse health effects would be expected. The hazard quotient is expressed as the ratio of the estimated intake to the reference dose. The value is used to evaluate the potential for non-cancer health effects, such as organ damage, from chemical exposures. If the hazard quotient is less than or equal to one ($\leq$1.0), then no adverse health effects are expected as a result of exposure.[35]

Invenergy prepared an AERA that includes an assessment of cancer risks and non-cancer hazard indices associated with emissions from the proposed facility. The assessment follows the MPCA's AERA Guidance, Version 1.0 and was limited to air toxic emissions from combustion of distillate fuel oil in the CTGs.

The AERA process involves:

- Generating a list of chemicals emitted from the facility and identify the toxicity values (**Table 8**);
- Estimating emissions for chemicals emitted (**Table 9**);
- Estimating the risks (**Tables 10 through 12**).

Results obtained showed acceptable levels of cancer risks and non-cancer risk hazard indices for those chemicals identified.

### *Other Sources of Air Pollution*

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.

[33] Facility Air Emissions Risk Analysis Guidance, version 1.0. MPCA September 2003.
[34] http://www.health.state.mn.us/divs/eh/risk/cancerrisk.html
[35] http://www.epa.gov/ttn/atw/nata/gloss.html

## 4.2 Land Use

As described in Section 3.2, the City of Cannon Falls has designed the proposed site and surrounding area for restricted light industrial development (**Figure 12**).

### Zoning and Displacement

The CFEC 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.

Several commercial/industrial facilities are located adjacent to the proposed site's southern boundary, including a hunting products manufacturer, a fertilizer supplier, and a costume manufacturer and wholesaler. At the southwest corner of the proposed site is Newscapes Landscape Supply. To the east along Cannon Industrial Boulevard are several small industrial sites.

The closest residential dwelling is located approximately 1,400 feet southwest of the planned location of the CFEC's power generating equipment. The nearest residential subdivision lies approximately one-mile to the southeast.

### *Agriculture and Farmland*

The construction of the proposed project will convert agricultural land to an industrial land use. This means that approximately 55 acres of farmland currently used for growing soybeans will be lost as a source of agricultural production. A number of adjacent properties have previously been converted for industrial land use.

The proposed site will not be subject to the prime farmland exclusion rule contained in Minnesota Rules 4400.3450 Subpart 4, which provides that "no large electric power generating plant site may be permitted where the developed portion of the plant site covers more than 0.5 acres of prime farmland per megawatt of net generating capacity." The provision of the prime farmland exclusion rule does not apply to areas located within home rule charter cities. Since the City of Cannon Falls is a home rule charter city and the proposed site occupies an area within the City, the farmland exclusion rule does not apply.

Not withstanding the above exclusion, if the developed portion of the proposed site is conservatively assumed to be 35 acres and the net generating capacity is assumed to equal the planned nominal generating capacity of 357 MW, the developed portion will occupy no more than 0.1 acres of prime farmland per megawatt of net generating capacity. This is less than the number of acres of prime farmland per megawatt that the farmland exclusion rule allows for development of a generating facility.

## 4.3 Natural Resources

The construction and operation of a new generating facility would be expected to have some impact on the natural environment.

The proposed site was cleared and cultivated for farmland use over 50 years ago. The effect of the construction and operation of the CFEC on wildlife and vegetation is expected to be minimal. As cultivated land is removed from production, food sources for various mammal and bird species will be eliminated. Following construction, only a portion of the proposed site will be covered by impervious surfaces. The remaining portions of the site would be reseeded with vegetation that could serve as a food source for wildlife.

***Flora***

The construction of the CFEC will require the removal of vegetation in the area to be developed. The site will be cleared of vegetation to be able to allow the movement of the equipment needed to construct the necessary foundations and structures associated with the proposed project. Additional vegetation will be removed to prepare the area for construction worker parking and temporary construction equipment and material storage (laydown). It is anticipated that the construction, worker parking area and the laydown areas will be re-vegetated upon completion of construction and as needed to control soil erosion.

The vegetation removed will include that occurring in the cultivated field.

***Fauna***

There is a potential for impacts to wildlife during both construction and operation of the CFEC. Impacts of construction on wildlife may include loss or modification of habitat; direct loss of wildlife through incidental mortality; and disturbance of adjacent habitat due to increased noise and human activity and the resulting displacement of some wildlife from the immediate area.

Due to the ability of wildlife to move and the proposed project's relatively small area of disturbance, neither direct losses of wildlife nor losses of habitat are expected to be significant.

The anticipated emissions were compared against their corresponding secondary National Ambient Air Quality Standards (NAAQS). The secondary NAAQS were established to protect public health and environmental welfare from any adverse effects of air pollutants (environmental welfare includes the protection of wildlife). Ambient concentrations below the secondary NAAQS should not result in harmful effects for wildlife.

***Rare & Unique Natural Resources***

As described in Section 3.3, no state or federally-listed threatened or endangered species are located on the proposed site. In addition, no habitat for such species was identified on the proposed site.

***Recreation Areas***

As described in Section 3.3, no recreation areas or parks are located on the proposed site. The construction and operation of the CFEC is not likely to affect the use of the Cannon Valley trail

which is located approximately 1.5 miles from the proposed site. Neither is the construction and operation of the CFEC expected to impact any of the six parks identified in Section 3.3.

***Prohibited Sites***

The EQB has identified (Minnesota Rules part 4400.3450) certain areas, termed "Prohibited Sites", in which no LEPGP can be sited. Examples of prohibited sites include national parks, national historic sites and landmarks, state parks, nature conservancy preserves, and state and national wilderness areas. No prohibited sites are found on or in the immediate vicinity of the proposed site.

***Forestry***

The construction and operation of the CFEC will not displace any forestry resources and will therefore not adversely affect the forestry economy.

***Mining***

The proposed site is located on the outer part of a region in which many crushed stone operations are also located. The site itself contains one or more "borrow pits" where minerals (sand or gravel) were previously excavated for use in nearby construction projects. It is unlikely that the site will be used for this purpose once the proposed project is completed.

## 4.4 Visual Aesthetics

The CFEC will be compatible with the visual character of the adjacent light industrial land use by maintaining a low profile, using consistent coloring on equipment and buildings, and maintaining a clean and neat site appearance.

Exterior lighting for the facility will be provided as required for security and safety throughout the facility. Illumination levels will be in accordance with the Illuminating Engineering Society (IES) Handbook and code requirements.[36] To reduce the visibility of the facility, task lighting will be utilized instead of flood or area lighting. Lights will be shielded and/or directed towards the ground as much as practical.

## 4.5 Archaeological & Historic Resources

As described in Section 3.5, no cultural, archaeological or historic resources were identified on the proposed site. The construction and operation of the CFEC will not impact any archaeological or historic properties.

[36] Illuminating Engineering Society of North America. 1993. IES Handbook 8"' Edition. New York: IESNA and Illuminating Engineering Society of North America. 1984. Lighting for Parking Facilities. RP-20. New York: IESNA

## 4.6 Transportation

The primary transportation issue related to the project is traffic on local roads and highways. Railways will not be utilized for the project. Transportation of the primary fuel for the project will be through a future natural gas pipeline infrastructure.

As described in Section 3.5, the proposed site is served by State Highway 20 and County Highway 29. New or at least improved access to the proposed site will probably be required before construction can begin. Other significant roadways within the vicinity of the proposed site include U.S Route 52, less than a mile west of County Highway 29.

During construction of the CFEC, traffic on local roadways (including Holiday Avenue and Cannon Industrial Boulevard) will increase due to movement of construction equipment, workers' vehicles, and deliveries of building materials to and from the project site. If temporary lane closings are necessary to accommodate oversized or slow-moving vehicles, the construction contractor will coordinate these events with both the City of Cannon Falls and the Goodhue County Highway Department. Potential mitigation measures that could be used to minimize potential transportation impacts during construction include the following:

- Scheduling of construction shifts so that much of the construction-related traffic occurs outside of peak commuting hours;
- Staggering of construction shifts start and finish times by trade; and
- Scheduling, to the maximum extent possible, delivery of construction materials outside of peak commuting hours.

During operations, a limited number of service vehicles, tanker trucks, and employee vehicles will be required; therefore, the impact on traffic flows should be minimal.

Invenergy is not expected to need permits from state or federal aviation authorities for any tall structures.

Federal Aviation Administration ("FAA") regulations on obstructions to navigable airspace (14 CFR part 77) require notification of the FAA Administrator of any proposed construction "of more than 200 feet in height above the ground level at its site" (Section 77.13(a)(1)). The regulations also require notifying the Administrator of any proposed structure whose height exceeds an imaginary surface extending 20,000 feet from the nearest airport runway at a slope of 100 feet horizontal to each 1-foot vertical. If the structure is within 10,000 feet of an airport's runway and the airport's longest runway is no greater than 3,200 feet, the slope is reduced to 50 to 1 [Section 77.13(a)(1)(i)]. No structures associated with the proposed project will exceed 200 ft in height and no structure will have a height that exceeds any FAA-defined imaginary surface. Therefore, notification of the FAA will not be necessary.

The Minnesota Statutes Section 360.80 gives MnDOT the authority to control new construction of high structures near airports. A permit is required for new structures over 500 feet in height within one-mile of an airport. The CFEC's exhaust stacks will not exceed 75 feet, therefore Invenergy will not require a high structures permit.

## 4.7 Socioeconomics

The direct socioeconomic impacts of construction will generally coincide with the construction period. These direct impacts include the effects on demographics, employment, income, and community services and facilities.

**Table 13** shows the estimated peak number of workers, by major discipline, required for construction and startup during each quarter of the construction period. The workforce is expected to peak during the fourth quarter of 2005, with an expected peak workforce of 198.[37]

Most of the construction workforce is expected to be hired from within the regional area. Given the close proximity to the Twin Cities metropolitan area, it is anticipated that most of the construction management and support category workers will be hired from the regional area.

**Table 14** shows the total estimated direct salary by crew during construction. An estimated total of $17.6 million in total direct wages will be paid to workers on the construction project.[38]

Invenergy will permanently employ 5 full-time personnel to operate the plant and perform routine maintenance. The remote start capability of the unit means that twenty-four hour staffing will not be required. Administrative staff and routine maintenance personnel will be present eight hours a day, five days a week. **Table 15** shows an estimated breakdown of operating staff during the three shifts.[39]

Personnel required for annual planned maintenance or major forced outage maintenance will be contracted for on a temporary basis directly from a maintenance outage contractor. During the planned outages and any forced outages requiring additional labor, maintenance crews will most likely perform the required maintenance on eight hours shifts with occasional twelve hour shifts, as required.

In addition to the direct employment and earnings impacts, indirect economic impacts will be generated from the construction and operation of the CFEC through economic multiplier, or ripple effects. Generally, multiplier effects refer to the direct and indirect employment and earnings created in a region due to an increase in final demand such as a new investment.

Indirect employment impacts are those created when construction workers spend their income on goods and services and businesses hire more workers to meet this increased demand. Additional jobs will be created as industries producing the plant equipment for the project increase output and hire more workers.

Primary affected industries include the fabricated metal industry, which produces boilers, ductwork, valves, and pipe fittings, the non-electrical machinery industry, which produces turbines, generator sets, blowers, fans, pumps, and compressors, and the electrical and the electronic equipment industry, which produces electric motors, industrial controls, electric

[37] Site Permit Application Cannon Falls Energy Center, Invenergy, LLC.. August 2004.
[38] Ibid.
[39] Ibid.

lighting, and wiring equipment. As these industries increase production, they will demand more inputs from their suppliers. Workers in these industries will also spend their income, further increasing the demand for goods and services. When the total economic repercussions created from the construction of the CFEC have filtered through the economy, the total employment impact will be a multiple of the direct construction employment at the site.

Similar to construction, the operation and maintenance of a power plant has a multiplier effect of 8.9 jobs and $0.2339 in earnings for the same dollar amounts invested.[40]

The total cumulative economic benefit is estimated to be $110 million, as shown in **Table 16**. These calculations assume a 30 year operating period.[41]

Demographic changes to the study area attributable to the construction of the CFEC could consist of population increases from relocating construction workers and families. Workers employed to construct the CFEC, and who are currently living within the regional area, are not expected to relocate. These persons will commute to work, some from significant distances.

The Electric Power Research Institute ("EPRI") report, *Socioeconomics of Power Plants*, indicated that construction workers will travel an average of 73 miles one-way on a daily basis to a jobsite, even up to a maximum of 115 miles one way.[42] The study, which analyzed the commuting patterns of workers on several electric generating facility projects, concluded that the long commuting distances were acceptable to workers due to the temporary nature of construction employment at an electric generating facility site.

A small increase in the local area population attributable to the plant construction can be anticipated.

The operations personnel will not be required until the final months of construction. At approximately that time, they would be selected from the local pool or relocate on a permanent basis.

Given the temporary duration of employment, it is assumed that construction personnel who relocate will rent an apartment or home during employment. The operations personnel and families will most likely purchase living accommodations due to the lengthy expected plant life.

The supply of housing in the study area can easily accommodate the small number of relocating workers and families.

Since the population increase during the construction period is expected to be limited, the increased demand for school, hospital, fire and ambulance, police, and utility services will not be significant. Similarly, since the number of employees required after the construction period and during the facility's operational life is small, no significant impact will occur on the demand for other community facilities and services due to relocating personnel.

[40] Socioeconomic Impacts of Power Plants, EPRI, Palo Alto, CA: EA-2228
[41] Site Permit Application Faribault Enerfy Park, LLC. Stanley Consultants, September 2003.
[42] Socioeconomic Impacts of Power Plants, EPRI, Palo Alto, CA: EA-2228

## 4.8 Water Resources

### *Surface Water*

As mentioned in Section 3.3, the closest surface water is Pine Creek, an intermittent stream located just beyond the northern boundary of the proposed site. The Cannon River is located approximately one mile south of the proposed site.

Neither water body will be impacted by the construction and operation of the CFEC.

### *Groundwater*

No groundwater wells will be installed on site to serve the facility. Limited amounts of water will be needed for evaporative inlet cooling, water injection while operating on fuel oil, steam injection during power augmentation, and turbine wash and other maintenance activities. All water, including potable water (for drinking water, showers, toilets, sinks, and other incidental water needs), will be supplied by the Cannon Falls municipal water supply system through a new lateral service line.

### *Wetlands/Floodplains*

No wetlands will be disturbed by construction or operation of the CFEC. An inspection of the proposed site, conducted by Invenergy's consultant, identified four areas with potential wetlands, these areas do not qualify as jurisdictional wetlands under the relevant regulatory standards.

Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps indicate no floodplains within the boundaries of the proposed site (**Figure 13**). The closest floodplain area is approximately one-half mile to the south along the Cannon River.

### *Stormwater Management*

Approximately 75 percent of the 55-acre site will be disturbed during site grading and construction activities. Impervious surfaces will include buildings and structures, power generation equipment, concrete equipment pads, storage tanks, paved areas, and access and service roads, all of which will affect site drainage. There will also be hard-packed gravel surfaces in various places.

Owners and operators of construction activity disturbing one acre or more of land need to obtain a National Pollution Discharge Elimination System and State Disposal System permit (NPDES/SDS). Regulated parties must develop a Storm-water Pollution Prevention Plan (SWPPP).[43] The SWPPP must be completed prior to submitting the permit application and before beginning construction. The plans must:

- Describe the nature of the construction activity,

[43] http://www.pca.state.mn.us/water/stormwater/stormwater-c.html

- Address the potential for sediment and pollutant discharges from the site,
- Identify someone to oversee BMP implementation,
- Identify chain of responsibility for general contractor and owner,
- Identify temporary sediment basins, if more than 10 acres are disturbed and drain to a single point of discharge,
- Identify permanent storm-water management system,
- Identify erosion prevention practices,
- Identify sediment control practices,
- Identify dewatering and basin draining practices,
- Identify inspection and maintenance practices,
- Identify pollution prevention management measures,
- Retain records,
- Describe the timing of BMP installation,
- Location and type of temporary and permanent BMPs,
- Include standard plates and specifications of BMPs,
- Include a site map identifying pertinent data.

A combination of control measures will be implemented to retain sediment from disturbed areas during construction. Erosion/sediment controls to be implemented during initial construction activities are listed as follows:

- Maintain a vegetative buffer zone between disturbed areas and the stormwater outfall;
- Construct and maintain a graveled access road;
- Construct berms and/or ditches and sequence placement of fill in order to contain and/or route runoff from fill areas to the sediment basin; and
- Construct and maintain a silt fence along the toe of the fill area boundary slopes.

When a project replaces vegetation or other pervious surfaces with one or more acres of cumulative impervious surface, the runoff from the new impervious surface must be treated by one of the following methods:[44]
:

- Wet sedimentation basin
- Infiltration/filtration
- Regional ponds
- Combination of practices
- Alternative method, pending MPCA approval.

Erosion/sediment controls to be implemented during later construction activities are listed as follows:

- Contain and/or route stormwater from the fill area to sediment basin; and
- Maintain existing vegetative buffers, inlet protection, and silt fences.

[44] http://www.pca.state.mn.us/water/stormwater/stormwater-c.html

As a permanent stabilization measure to be implemented during construction, vegetative cover will be established on the fill area side slopes by sodding or hydroseeding with mixtures that include native grasses depending on local requirements.

In addition to features that will be installed and maintained to prevent erosion and sedimentation, pollution prevention management measures will be developed and followed. These will include the monitoring of onsite vehicles for leaks and the performance of regular preventive maintenance to ensure proper operation and reduce the chance of leaks. No "topping off" of fuel tanks will be allowed, thus reducing the possibility of spills. Storage tanks and associated loading areas will be protected by secondary containment structures (i.e., impervious pads and berms). Runoff in and around these areas will be directed to a sump to capture any spills.

## 4.9 Noise

Operation of the CFEC is expected to comply fully with noise standards established by the State of Minnesota.

Construction and operation of the CFEC will add new noise sources in and around the site and could affect existing noise levels. During construction, operation of large diesel- and gasoline-powered construction equipment (e.g., backhoes, dozers, delivery trucks, generators, and compressors) will cause noticeable but temporary increases in ambient noise levels. During typical operation of the plant, air flow through the combustion air intakes and exhaust gases discharging from the stacks will be the primary sources of noise. Secondary sources of noise will include low-frequency noise from transformers and noise from auxiliary pumps and ventilation and cooling equipment.

The operation of large diesel- and gasoline-powered equipment will produce the most noticeable changes in ambient noise during the site-clearing and earthmoving phase of construction. Noise levels generated by the large earth moving equipment during this phase could range from 75 to 95 dB(A) as measured near the equipment. Material handling equipment (concrete mixers and cranes, for example) could generate noise at levels as high as 85 dBA. Construction of an industrial facility such as a power plant is typically and unavoidably noisier than operation of the facility. However, the sources of construction noise are generally intermittent and short term, ceasing once the plant is built and fully tested.

The primary sources of noise that will eminent from the CFEC are the air flow through the combustion air intakes and exhaust gases discharging from the stacks. Secondary sources of noise include low-frequency noise from transformers and noise from auxiliary pumps and ventilation and cooling equipment.

The specific type and amount of noise control needed to achieve compliance with the State of Minnesota noise control standards will be selected during the detailed design phase of the proposed project. A successful mitigation program will likely consist of the following components:

- Combustion Turbine Exhaust Silencers;

- Combustion Turbine Air Intake Silencers; and
- Low-Noise Fuel Gas Metering Station.

Noise levels from the proposed project were predicted, by Invenergy's consultant, to evaluate whether the CFEC would affect noise levels at nearby receptors.

A three-dimensional acoustical model (SoundPlan® 6.2) was developed based on site plan and general arrangement drawings to predict noise levels at off-site residential receptors. Sound power levels for all major pieces of equipment were estimated using octave band data from manufacturers, in-house field data, and data from industry-standard prediction algorithms.

Equipment power levels were adjusted for the reduction of sound by distance (geometrical spreading); the molecular absorption of sound by air (air absorption); and the absorption and reflection of sound by the ground (ground effect). Sound power levels were further modified by the effects of shielding, (i.e., tank farms, buildings, equipment, etc.) and by changes in source levels with direction (directivity) to estimate off-site noise levels.

Noise levels from the CFEC are expected to range from about 45 to 50 dBA at the nearest receivers given the proposed acoustical design of the facility (**Table 17**). Although minor changes to the general arrangement of the facility may occur as the detailed design is finalized, significant changes in predicted noise levels are not expected. Therefore, the CFEC noise levels are expected to fully comply with limits established by the State of Minnesota, (60 dBA during daytime hours; 50 dBA during nighttime hours).

## 4.10 Public Services

Public services in the Cannon Falls area will be adequate for the construction and operation of the CFEC. These services include water and sewer, waste collection and disposal and fire and police.

As mentioned in Section 2.4, the City of Cannon Falls is expected to have adequate capacity to supply water and sanitary sewer services to the CFEC.

The CFEC will privately contract with local waste haulers for collection and disposal of all non-hazardous solid wastes generated at the facility. As described in Section 2.6, spent hazardous substances such as oil periodically pumped from the oil/water separators, turbine wash water and periodic chemical cleaning wastes will be removed from the plant by a licensed hauler for disposal at a licensed facility.

The City of Cannon Falls' police force consists of five full-time officers, assisted by 15 reserve members for crowd and traffic control.

The Cannon Falls Volunteer Fire Department provides emergency response for the city. Twenty-three local emergency medical technicians (EMT) staff the two city ambulances. The team, all EMT-certified through the state, answer almost 400 calls per year. A rescue squad consisting of specially trained firefighters also accompanies the EMTs on emergency calls

involving vehicle accidents and major medical emergencies. Invenergy will contact the fire, police and EMTs during construction to review the plans for the CFEC, identify any potential hazards and coordinate emergency responses specific to the facility.

All of the city's emergency services can be reached by dialing 911.

## 5.0 PERMITS

**Table 18** contains a list of the anticipated permits and associated environmental approvals required for the CFEC project. Compliance with the terms of all applicable and relevant regulatory permits and approvals will be a condition of any Site Permit issued by the Board.

# 6.0 UNAVOIDABLE ADVERSE EFFECTS & MITIGATIVE MEASURES

The construction and operation of a new generating facility will unavoidably result in some environmental effects. This section discusses mitigative measures that will be implemented to address unavoidable effects from the CFEC.

### *Air Quality*

The proposed project will have the potential to emit regulated air pollutants, including, $NO_x$, CO, $SO_2$, $PM/PM_{10}$, and VOC. The simple cycle combustion turbines will use dry low $NO_x$ combustors to control $NO_x$ emissions. Firing natural gas will minimize $SO_2$ and $PM/PM_{10}$ emissions. Limitations on fuel use will allow the CFEC to be permitted as minor source of all regulated air pollutants.

### *Loss of Farmland*

The project site would be converted from agricultural land to industrial land. This means that approximately 55 acres of otherwise productive farmland will be lost. The amount of farmland removed from production is small, however, and the land use conversion should generate economic benefits to the surrounding community.

### *Effect of New Noise Source*

Based on the proposed acoustical design of the Project, noise levels from the CFEC are expected to range from approximately 45 dBA to 49.5 dBA at the nearest residential receptors. Since the Minnesota Noise Rules would require that the facility not cause noise levels at the nearest residential receptor to exceed 60 dBA during daytime hours or 50 dBA during nighttime hours, the CFEC is expected to fully comply with the state's established noise standards.

To ensure that the CFEC complies with the standards, the facility will be designed and equipped with exhaust silencers, air intake silencers, and a low-noise gas metering station.

### *Potential for Stormwater Runoff*

With the increase in impervious surface areas resulting from construction of the CFEC, Invenergy and its construction contractor will implement whatever steps are necessary to effectively manage runoff, prevent erosion and sedimentation, and control release of pollutants into stormwater discharges. This includes using best management practices to prevent erosion and to minimize polluted and sediment-laden runoff, restoring construction laydown areas to their original condition after construction is completed, and developing a construction stormwater pollution prevention plan for erosion control. Following construction, the CFEC will implement a stormwater pollution prevention plan for industrial activities.

## 7.0 Acronyms, Abbreviations and Definitions

| | |
|---|---|
| ADT | average daily traffic |
| ANSI | American National Standard Institute |
| BACT | Best Available Control Technology |
| 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 |