3.0 THE PROPOSED ACTION

NRC

"The report must contain a description of the proposed action, including the applicant's plans to modify the facility or its administrative control procedures… .This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment…." 10 CFR 51.53(c)(2)

Nuclear Management Company, LLC (NMC) proposes that the U.S. Nuclear Regulatory Commission (NRC) renew the operating license for the Monticello Nuclear Generating Plant (MNGP) for the maximum period currently allowable under the Atomic Energy Act and NRC's regulations (10 CFR 54.31). This action would provide the option to operate MNGP up to 20 years beyond the current operating license expiration date of September 8, 2010. Renewal would thereby enable the State of Minnesota, Northern States Power (NSP)[1], NMC, and other participants in the wholesale power market to rely on MNGP to meet future electric power needs through the license renewal period.

In the following sections of Chapter 3, NMC presents a description of the MNGP site and activities relevant to assessments presented in Chapter 4 of this Environmental Report (ER). Section 3.1 provides a general description of selected plant design and operating features. Sections 3.2 through 3.4 address potential changes that could be required to support MNGP operation during the license renewal term.

3.1 GENERAL PLANT INFORMATION

General information about the design and operational features of MNGP from an environmental impact standpoint is available in several documents. Among the most comprehensive sources are the Final Environmental Statement (FES) prepared by NRC's predecessor agency, the U.S. Atomic Energy Commission (AEC) and the Updated Safety Analysis Report (USAR). In 1972, the AEC issued an FES that addressed the construction and operation of MNGP (AEC 1972). In compliance with NRC requirements, NMC routinely updates the USAR for MNGP to reflect current plant design and operating features (NMC 2003).

The major structures, housed facilities, and nearby areas are shown in Figure 3.1-1. Major site buildings include the following:

- Reactor Building housing the nuclear steam supply system, and the reactor, refueling and reactor servicing equipment, new and spent fuel storage facilities and other reactor auxiliary systems and service equipment;

[1] Northern States Power is a wholly owned utility operating subsidiary of Xcel Energy Inc.

- Turbine Building housing the turbine generator, main condensers, and other components of the power conversion system;

- Radwaste Building housing the plant radioactive waste control systems for the plant's two liquid radwaste systems (MNGP currently processes all liquid radwaste with no release to the River) and the solid radwaste facility; and

- Diesel Emergency Generator Building housing the standby diesel generators and portions of the power distribution system.

The site's exclusion zone has been designated as being within the Owner Controlled Area Fence. Structures and facilities of interest to this ER within the Owner Controlled Area include the Monticello Substation, Discharge Canal, Off-gas stack, and two mechanical draft cooling towers (see Figure 3.1-1). The Off-gas stack is 328 feet in height and its diameter tapers from 34 feet at the foundation to approximately 8 feet at the top. The two cooling towers are 9-cell, induced-draft, cross-flow towers with one 26-foot diameter fan per cell (NMC 2003, Sections 2.2.1, 11.6, 12.2.2).

3.1.1 REACTOR AND CONTAINMENT SYSTEMS

MNGP uses a single cycle, forced circulation, low power density boiling water reactor (BWR). General Electric Company (General Electric) designed and manufactured the nuclear steam supply system, the initial reactor fuel, and turbine-generator unit and its related systems. This General Electric design is identified as a BWR-3 (NMC 2003, Section 1.1.1). The reactor vessel was designed, fabricated, and erected by the Chicago Bridge and Iron Company. General Electric contracted with the Bechtel Corporation for architectural engineering services and construction of the plant (AEC 1972, Section III.C). MNGP was originally designed for operation at power levels up to 545 megawatt-electric (1,670 megawatt thermal). A power uprate in 1998, authorized by Amendment No. 102 to MNGP's Operating License No. DPR-22, increased power levels by approximately 6.3 percent to 1,775 megawatt thermal [approximately 600 megawatts electrical (MWe)] (NSP 1971, Section I.C.1; NRC 1998).

The reactor coolant system (reactor primary system) consists of the reactor vessel, a 2-loop reactor coolant recirculation system with its pumps, pipes and valves; the main steam piping up to the main steam isolation valves; safety/relief valves; and the reactor auxiliary systems piping (NMC 2003, Section 4.1). Water serves as both the moderator and coolant for the reactor core. Water enters the bottom of the core and flows upward through the fuel assemblies where the boiling produces steam. Water separated from the steam by the steam separator and dryer assemblies within the reactor is recirculated within the reactor mixing with incoming feed water then entering at the bottom of the reactor vessel (NSP 1971, Section I.C.1).

The primary containment for the reactor consists of a drywell, a steel structure that encloses the reactor vessel, recirculation pumps and related piping, a pressure suppression chamber containing a large volume of water, a connecting vent system between the drywell and the suppression chamber, and isolation valves (NMC 2003, Section 5.1).

The concrete reactor building, which houses the primary containment, serves as a radiation shield and fulfills a secondary containment function. The reactor building provides primary containment protection when the drywell is opened for maintenance and refueling outages. The reactor building is maintained under a slight negative pressure, with the building exhaust monitored prior to release to the atmosphere through the reactor building ventilation exhaust stack. Radiation monitors on the exhaust stream can isolate the ventilation system in the event of a process upset that could release excess radioactivity to the environment. A standby gas treatment system is provided to filter and hold up exhaust before discharging it to the off-gas stack (NMC 2003, Section 5.3).

Energy generated in the reactor as pressurized saturated steam is converted to electricity by the turbine generator. The turbine utilizes all the steam generated by the reactor (except for a small portion that is used directly by the condenser air ejectors and the offgas recombiners), but is equipped with automatic pressure-controlled bypass valves that can discharge excess steam directly to the condenser. The system is set to allow 14 percent of the rated steam flow to pass to the condenser before signaling a process disruption. Exhaust steam from the turbine-generator flows from the low pressure turbines to a single pass, dual-pressure, deaerating type condenser (NMC 2003, Sections 9.3, 11).

The Turbine Building houses the turbine-generator and other components of the power conversion system. The building is a combination of reinforced concrete and structured steel construction. Its interior reinforced concrete walls are oriented so as to protect personnel against radiation emanating from the turbine and auxiliary systems. Radioactive sources enter the turbine building with the steam from the reactor. Most of this activity goes to the off-gas system with the remaining being treated by the condensate demineralizers. The Turbine Building radioactive equipment drainage system discharges to the liquid radwaste system (NMC 2003, Section 12).

3.1.2 NUCLEAR FUEL

MNGP is licensed for low-enriched uranium-dioxide fuel with enrichments below 5.0 percent by weight Uranium-235 and fuel burn-up levels less than 70,000 megawatts days per metric ton uranium (MWd/MTU). The uranium-dioxide fuel is in the form of high-density ceramic pellets. Fuel rods used in the reactor consist of Zircaloy tubes with fuel pellets stacked inside and sealed with welded end plugs. The fuel rods are

fabricated into assemblies designed for loading into the reactor core. The MNGP reactor core is comprised of 121 core cells, each consisting of a control rod surrounded by four fuel assemblies, for a total of 484 fuel assemblies (NMC 2003, Sections 3.4.2.1 and 3.4.2.2). Refueling of the reactor is performed every 22 to 24 months with approximately 30 percent of the fuel being replaced during each refueling outage.

3.1.3 COOLING AND AUXILIARY WATER SYSTEMS

3.1.3.1 Water Use Overview

Water used at the plant for condenser cooling, service water cooling, screen wash, and fire protection is withdrawn from the Mississippi River (MPCA 2002). Domestic water supply relies on groundwater via on-site wells. Station surface-water and groundwater withdrawals are governed by water appropriation limits set by the Minnesota Department of Natural Resources (MNDNR). Under Water Appropriations Permit Number 66-1172, MNGP may withdraw a maximum of 645 cubic feet per second (cfs) [approximately 290,000 gallons per minute (gpm)] of water from the Mississippi River. Special operating conditions are applicable if the river flow at MNGP is less than 860 cfs, and further restrictions apply if river flow is less than 240 cfs (see Section 3.1.3.3) (MNDC 1970). Under Water Appropriations Permit Number 67-0083, MNGP may withdraw up to a total of 20 million gallons per year (38 gpm) of groundwater via two on-site wells for the domestic water system (see Section 3.1.3.5) (MNDNR 2003). The domestic water system supplies raw water to the reverse-osmosis/make-up demineralizer system used to produce purified water for the plant primary systems and seal water to pumps located at the plant intake structure. The domestic water system also supplies the water for potable use, including drinking water, lavatories, and showers at the plant (NMC 2003, Section 10.3.5).

3.1.3.2 Circulating Water System

Heat is removed from the condenser by the circulating water system where water is drawn and discharged to the Mississippi River. MNGP is also equipped with two mechanical draft cooling towers enabling complete or partial recirculation of the cooling water when conditions require (NMC 2003, Section 11.1-11.3, 11.5; NSP 1971, Section I.C.4). The principal components of the circulating water and cooling tower systems are the intake structure, circulating water pumps, main condenser, discharge structure, cooling tower pumps, two induced-draft cooling towers, and Discharge Canal (see Figure 3.1-1).

River water is withdrawn through an approach channel excavated to elevation 896 feet mean sea level (msl). The approach channel, angled at 81° to the shoreline, is formed by sheet pile structures that are 98 feet apart and extend 59 feet into the River (Amish et al. 1978; NMC 2003, Section 11.5.2). The width of the approach is reduced

to approximately 63 feet, and water enters the intake over a 62.67-foot wide concrete sill at 899 feet msl, which is equipped with a 12.5-foot wide stop log section in the center of the sill. The sill serves as a sediment barrier and during very low river levels, the stop log can be removed to allow unobstructed water flow onto a concrete apron at 895.5 feet msl, which extends across the width of the approach and 16 feet upstream of the bar rack (Amish et al. 1978). After entering over the sill, the water passes through a bar rack equipped with a motor-operated bar rack raker that prevents large debris from entering the intake structure. The bar rack raker is used to lift debris into a trash hopper located above the bar rack to prevent debris from re-entering the River. Traveling screens (0.375-inch mesh) are positioned approximately 10 feet behind the bar racks to remove fine debris (Amish et al. 1978). The traveling screens are normally rotated and rinsed every 12 hours and run continuously when river temperature is above 50°F. The debris is rinsed into a common sluiceway which extends to the River down stream of the intake and returns impinged organisms to the River (Amish et al. 1978).

After passing through the bar rack, water is divided into two separate streams. Each stream passes through the two parallel traveling screens described above, the service water pump bay and two parallel motor-operated sluice gates before reaching the circulating water pumps (AEC 1972, page III-8). The plant Service Water System consists of three 6,000-gpm capacity service water pumps. Under normal operating conditions, two of these pumps supply 10,000 gpm to meet all nonreactor requirements.

The Circulating Water System utilizes two half-capacity (140,000 gpm rated at 27.8 feet total discharge head) circulating water pumps mounted over each suction chamber of the intake structure. These pumps are designed to circulate 292,000 gpm of cooling water through the main condenser. Effluent from the condenser and the Service Water System is piped approximately 600 feet via two 108-inch steel pipes to the discharge structure.

The discharge structure is located approximately 700 feet east of the Intake Structure (see Figure 3.1-1). It is constructed of reinforced concrete and measures approximately 50 feet by 54 feet and 38 feet high and is equipped with two isolation and two sluice gates. The roof of the structure is approximately 5 feet above grade, and the lower floor (898 feet msl) supports two cooling tower pumps (NMC 2003, Section 12.2.2.7.3). Motor-operated sluice gates to the Discharge Canal are provided to isolate the Discharge Structure from the Discharge Canal. During open-cycle operation, the sluice gates are open and the circulating water is returned to the River via the Discharge Canal. The Discharge Canal abuts the main Discharge Structure at 900 feet msl. It is laid on a 0.25 percent slope in an easterly direction and extends approximately 1,000 feet where it enters the River. The south bank of the canal has provisions to receive discharges from the cooling towers. In 1980, an overflow weir was added to the Discharge Canal that permits the normal outflow of cooling water, re-establishes the previously existing shoreline of the River, and inhibits fish from entering the canal. The

discharge weir consists of an earth filled dike and a vertical sheet-pile overflow section. The top of the dike (920 foot msl) is 22 feet wide, and the sides of the dike have a 3 to 1 slope (NMC 2003; Section 12.2.2.7.3).

The crest level of the 54-foot wide weir structure is at 910 feet msl. The water elevation in the Discharge Canal is at 912.5 feet msl; therefore, the height of the overflow is 2.5 feet. When the water is at this level, the overflow section discharges at a rate of 645 cfs to the River. To prevent scouring below the discharge, a 20-foot long concrete apron was built on the downstream side of the sheetpile wall, and a 50-foot long rip-rap apron was built downstream of the concrete apron. The top of the concrete apron and the rip-rap section are at 897 feet msl (NMC 2003).

MNGP utilizes two induced-draft cooling towers, as needed, to meet surface water appropriation limits and thermal discharge limits. Two half-capacity (145,000 gpm rated at 57.5 feel total discharge head) cooling tower pumps located at the Discharge Structure are used to divert cooling water to the towers. The pumps are designed to operate in series with the circulating water pumps, delivering 151,000 gpm to each tower. The crossflow, induced-draft towers use 26-foot diameter fans to direct outside air horizontally as heated water falls in a spray of small droplets across the air stream and tower packing. The water loses heat by evaporation (latent heat transfer) and by exposure to cooler air (sensible heat transfer). Each tower has two 60-inch diameter risers that convey water to the headers and water distributing system. With the aid of gravity, the water distributors spray hot inlet water evenly over the tower packing. The packing is essentially a series of polyvinyl chloride fill arranged to produce as much wetted surface as possible and maximize heat transfer.

During closed-cycle operation, the River is isolated from the main intake structure and the discharge structure by control gates, and cooled effluent from the towers flows by gravity from the cooling tower basins to the suction chambers of the circulating water pumps. Blowdown overflows through weirs at the cooling tower basins and is piped to the Discharge Canal. Two 14,000-gpm makeup pumps located at the intake structure deliver makeup water to the circulating water pump basins at the intake structure during closed-cycle operation to replace water lost to evaporation, drift, and blowdown. Approximately 5-6 percent of the total cooling water flow must be replaced with makeup water.

A 36-inch de-icing line runs from the condenser discharge line to the intake structure skimmer boom. When temperatures approach the freezing point, relatively warm condenser effluent can be delivered through this line to the intake structure to keep the area free of ice. Steam is also available at the intake structure from 1-inch hose connections (NMC 2003, Section 11.5.2). Hot water for the Intake Canal De-icing Sparger is supplied by two lines from the discharge structure.

3.1.3.3 Circulating Water System Operating Modes

The Circulating Water System operational modes include once-through circulation of river water, recirculation in a closed cycle with cooling towers, and several variations of these two basic modes. A plant computer chooses the optimal operating mode based on prevailing river flow, river temperature, and status of critical plant equipment. This ensures safe and efficient plant operation as well as compliance with state water-use permits and the National Pollutant Discharge Elimination System (NPDES) Permit discharge limits. The Surface Water Appropriations Permit dictates that cooling towers must be operated in partial recirculation mode when river flow is between 860 and 240 cfs or closed-cycle mode when river flow is less than 240 cfs and in accordance with allowable thermal discharge limits set forth by Minnesota Pollution Control Agency (MPCA) in the NPDES Permit. The NPDES permit specifies that the maximum daily average temperature at the end of the Discharge Canal cannot exceed the following limiting temperatures.

Date Range	Temperature (°F)
April – October	95
November and March	85
December – February	80

However, the NPDES permit does specifically state that discharge of heated effluent in excess of these temperature limits is allowed on a limited basis when required to operate in partial recirculation or closed cycle to meet the Surface Water Appropriations Permit limitation. The four operating modes are described in the following paragraphs.

Open cycle or once-through – In this mode, water is withdrawn from and discharged directly to the Mississippi River. Open cycle operation is used when river flow exceeds 860 cfs and cooling of the circulating water effluent is not required to keep the Discharge Canal temperature below permitted limits. In this mode of operation, circulating water is taken from the River via the intake structure, pumped through the condenser, and returned directly to the River via the main discharge line, the discharge structure, and the Discharge Canal. The gates at both the intake and discharge structures are open, and the cooling tower basin gates are closed. This gate configuration maximizes circulating water flow through the main condenser.

Helper Cycle – In this mode, cooling towers are operating, and cooled water is discharged from the towers to the River. Helper cycle operation is used whenever upstream river temperatures consistently are at or above 68°F or when the Discharge Canal temperature approaches the permitted temperature limits. In this mode of

operation, circulating water is taken from the River via the intake structure, pumped through the condenser, and conveyed to the discharge structure where water is directed to the Discharge Canal or pumped to the cooling towers by one or both of the cooling tower pumps. The effluent collects in the tower basins and overflows the side weir into the Discharge Canal, which conveys the cooled water back to the River. The positioning of the gates at the intake and discharge are open under the helper cycle operation.

Partial recirculation – In this mode, cooling towers are operating, and a portion of the cooled water recirculated to the intake and the remainder is discharged to the River. When river flow is less than 860 cfs, a maximum of 75 percent of the river flow at the intake may be withdrawn in accordance with allowable limits set forth by MNDNR. Partial recirculation may be used to comply with this restriction. In this mode of operation, which is a variation of the helper cycle mode, the quantity of water recirculated to the intake structure is controlled by the number of cooling tower pumps in operation and by specific positioning of the gates at the cooling tower basins. The gates permit control of the volume of effluent that is returned to the intake and the volume of effluent that is allowed to overflow the cooling tower basins and enter the Discharge Canal. The gates at both the intake and the discharge structures remain fully open throughout this cycle.

Closed cycle – In this mode, cooling towers are operating; and all cooled water is recirculated to the intake except for cooling tower blowdown, evaporation, and drift. Closed cycle operation is employed whenever river flow is at or below 240 cfs or when river temperatures are elevated. In this mode of operation, the gates are closed at the intake structure and in the main discharge structure to isolate the system from the River. The gates in the return line from the cooling tower basins to the intake structure are fully open. The circulating pumps and cooling water pumps maintain flow through the system. Blowdown water overflowing the cooling tower basin weirs is routed directly to the Discharge Canal. Makeup water for replenishing blowdown and operational losses is supplied by two makeup pumps. Cooling towers are normally used from May through September (when river temperatures have historically exceeded 68°F) or during periods of extremely low flow when State minimum flow standards for the Mississippi River limit the plant's cooling water withdrawal. Occasionally, one tower is used during the winter if suspended ice is present in the River.

The MNGP Circulating Water System is primarily operated in a once-through cooling mode. MNGP plant operating history indicates that the Circulating Water System has operated in the once-through mode or helper mode approximately 98 percent of the time. Water supplied by the condenser de-icing line and the intake canal de-icing sparger is not considered recirculation.

3.1.3.4 Biofouling and Scale Control

Both the MNGP circulating water system and service water systems are vulnerable to fouling from microbiological organisms. Through applications at the service water and circulating water pump bays, NMC uses approved biocides [sodium hypochlorite, sodium bromide, (Bulab 6040 or equivalent) coupled with a dispersant (Nalco 7348)] to control biofouling. During warm summer months, based on the Ryzner Index, application of an anti-scalant (Bulab 7016) is used to control scale build-up in the condenser tubes. Through applications at the service water header, NMC uses an approved non-oxidizing biocide (Nalco 9210) to control biofouling in several intermittently operated service water systems (Residual Heat Removal Service Water, Emergency Diesel Generator Service Water, and Fire Water Protection). Biocide and scale control chemicals are consumed in accordance with all use and discharge requirements, including provisions of the NPDES permit issued to the MNGP site, as well as provisions established in plant-specific requests that are approved by MPCA under the NPDES permit (MPCA 2002). Compliance with NPDES permit limits for discharge of these biocides and associated residuals is ensured through controlled application protocols and monitoring so as to protect riverine aquatic life.

3.1.3.5 Domestic Water Supply and Sanitary Wastewater Treatment

NMC operates four groundwater wells to meet the domestic water needs of the MNGP site. Two of the wells are manifolded together, each equipped with a 100-gpm pump, are regulated by the MNDNR under a single water appropriations permit with a withdrawal limit of 200 gpm and 20 million gallons per year (MNDNR 2003; Xcel 2004). These wells provide domestic water to kitchens, lavatories, and showers in the Plant Administration Building, raw water to the reverse-osmosis/make-up demineralizer system, as well as seal water to pumps at the plant intake structure (NMC 2003, Section 10.3.5). Actual usage averaged less than 13.5 million gallons per year from 1998 to 2000 (NSP 1999, NSP 2000, NSP 2001), corresponding to less than 30 gpm. The two other wells, serviced by 45-gpm pumps, provide domestic water on an as-needed basis to a warehouse and the Site Administration Building. Annual usage for these wells is less than one million gallons per year or less than 1.9 gpm; therefore, water appropriation permits are not required by MNDNR (MN 2003).

The sanitary sewer system at MNGP removes wastewater from lavatories, showers, and sinks in on-site buildings and carries it to the City of Monticello sanitary sewage disposal system. Originally, the plant utilized an on-site septic tank soil absorption system for the treatment and disposal of sewage. A lift station and forced main were installed in 1983 to connect the plant to the City of Monticello's sanitary sewer system, and the septic tank and drain field were closed.

3.1.4 TRANSMISSION SYSTEM

The MNGP generator produces power at 22 kilovolts (kV) that is stepped up to 345 kV at the Monticello Substation located on the south side of the plant site. The Substation includes four switchyards, one each to serve the 345-, 230-, 115-, and 13.8-kV transmission systems. The 13.8-kV portion of the switchyard is provided to establish reliable power sources to various plant equipment (NMC 2003, Section 8.2.1). Additional information on the substation and transmission system is provided in Section 8.2 of the Updated Safety Analysis Report. The MNGP transmission system is owned by NSP, which is a wholly owned utility operating subsidiary of Xcel Energy.

Currently, there are seven transmission lines emanating from the Monticello Substation (see Figure 3.1-1). One 345-kV transmission line is routed to connect into the 345-kV loop around the Twin Cities Metropolitan Area at the Elm Creek Substation (Line #0978). The other 345-kV line connects to the 345-kV transmission system at Sherburne County Substation (Line #0991). The 230-kV portion of the Substation establishes an interconnection with the transmission system of Great River Energy (GRE) via two transmission lines (NMC 2003, Section 8.2.1). One 230-kV line (GRE Line #EO) connects to the Elk River Substation and the other (GRE Line #MR) connects to the Benton County Substation. Three 115-kV transmission lines connect into the 115-kV transmission system, one at Lake Pulaski Substation (Line #0883) and another at Hassan Substation (Line #0827 to the south), and the third 115-kV line connects to the St. Cloud Industrial Park Substation (Line #0827 to the north) (NMC 2003, Section 8.2.1). Table 3.1-1 provides detailed information on each of these transmission lines.

NRC defines the transmission corridors of concern for license renewal as those constructed for the specific purpose of connecting the plant to the transmission system [10 CFR 51.53(c)(3)(ii)(H)]. NRC further elaborates in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) and guidance that the corridors to be addressed are those between the plant's substation and their connection with the existing transmission system and reviewed as part of the construction permit for the plant (NRC 1996, Section 4.5, page 4-59; NRC 2000, Section 4.13). Transmission lines installed as a direct result of initial construction and operation of MNGP are the Monticello-Coon Creek 345-kV line and the Monticello-Parkers Lake 345-kV line (AEC 1972, page III-1).

At the time that MNGP was constructed, the plant and the 345-kV transmission system were early steps taken in a plan to loop the Minneapolis and St. Paul Metro Area with a 345-kV transmission system with large generation plants on four sides of the city. 345-kV to 115-kV transformations were planned to deliver the power to a 115-kV network, which would deliver power to the load serving substations of the Minneapolis/St. Paul metro area. All but one of the plants were eventually constructed. The replacement for

the plant planned for the southwest side of the Minneapolis/St. Paul metro area was ultimately added to the northwest near MNGP (the Sherburne County Generating Plant). Since MNGP began operating, generation and substations have been connected to these lines so that they are now load-serving lines and part of the metropolitan high voltage loop rather than solely an outlet for MNGP generation. Therefore, the Monticello Substation is now an integral part of the transmission grid. Table 3.1-1 discusses the changes that have occurred to the lines emanating from the Monticello Substation.

The seven Xcel Energy transmission lines leave the Monticello Substation through three separate rights-of-way: Sherburne County line corridor; St. Cloud line corridor; and a common corridor for the Elm Creek, Lake Pulaski, and Hassan lines. 345-kV Line #0991 to Sherburne County exits the substation to the northeast along with Line #0985 (Sherburne County to Coon Creek line) and the GRE 230-kV lines. The 345-kV lines continue to the northeast to the Sherburne County Substation on a 240-foot wide easement (the Sherburne County corridor). The 115-kV Line (#0827) exits the substation and the MNGP site to the north on a 75-foot easement (the St. Cloud Corridor). The 115-kV lines to Lake Pulaski and Hassan (Line #0883 and #0827, respectively) and the 345-kV Line (#0978) to Elm Creek exit the substation to the southeast on a 240-foot easement along the 345-kV Line #0985 (Sherburne County to Coon Creek) for a distance of 2.8 miles (the common corridor). Then Line #0883 continues to the southwest on a 75-foot easement, and the others continue on to the southeast for approximately 13 miles where Line #0827 continues easterly on a 75-foot easement and the 345-kV lines continue on a 150-foot easement. Xcel Energy controls these corridors through permanent easements purchased from land owners at the time of construction. These easements prohibit uses of the property that could adversely affect the safe and reliable operation of the transmission lines.

Xcel Energy implements specific programs for ensuring continued safe and reliable operation of their transmission lines, continued compatibility of land uses on the transmission corridors, and environmentally sound maintenance of the corridors. The following paragraphs provide general descriptions of these programs.

The Xcel Energy program for conductor and tower maintenance includes monthly fixed-wing aerial patrols for the 345-kV lines and annual helicopter patrols on all lines in the system. These patrols include surveillance for system anomalies and land use changes that could impact design assumptions.

The objective of Xcel Energy's transmission line vegetation management program is to keep the rights-of-way clear of trees, brush, and other tall-growing vegetation that could come into close proximity with the conductors and cause line outages, thus reducing line reliability. Xcel Energy achieves this objective by selectively removing tall-growing trees and brush from the transmission rights of way while encouraging the growth of

lower-growing trees, shrubs, and grasses. Qualified line-clearance tree trimmers manually cut and prune using approved mechanical equipment, such as hydro axes, and selective application of approved herbicides to remove all tall-growing trees and tall-growing brush from the complete width of the right of way. Stumps are treated with approved herbicides to prevent re-growth. Maintenance efforts target vegetation that has the potential to grow closer than the minimum clearance specified for a specific voltage (for the lines associated with MNGP clearance no less than 20 feet). Vegetation that Xcel Energy allows to remain on the right of way includes trees that provide for aesthetic screening and trees whose mature height will not exceed 20 feet. Selective management with herbicides is typically used on foliage of 10 feet or less. All other low-growing grasses, shrubs, and woody plants may be left on the right of way. Only approved herbicides are applied in strict compliance with all federal, state, and local laws and regulations.

Trees posing hazards are commonly referred to as danger trees. These trees are typically located just off the right of way have a high probability for failure and are of sufficient height to contact the conductors and/or structures if they were to fall. All danger trees are appropriately pruned or cut.

Xcel Energy uses a variable vegetation control cycle on its transmission lines, depending on the voltage, the vegetation conditions, and the type of right of way. Typical cycles vary from 2 to 8 years. Air and foot patrols are conducted regularly. Xcel Energy staff use the information collected from these patrols, in addition to historical records, to determine the appropriate time for scheduling a line for vegetation control. The lines identified as being associated with the operation of MNGP are on a 4-year cycle for vegetation control.

3.2 REFURBISHMENT ACTIVITIES

NRC

"...The report must contain a description of...the applicant's plans to modify the facility or its administrative control procedures.... This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment…."
10 CFR 51.53(c)(2)

"...The incremental aging management activities carried out to allow operation of a nuclear power plant beyond the original 40-year license term will be from one of two broad categories: (1) SMITTR actions, most of which are repeated at regular intervals, and (2) major refurbishment or replacement actions, which usually occur fairly infrequently and possibly only once in the life of the plant for any given item…." (NRC 1996, Section 2.6.3.1, Page 2-41.) ["SMITTR" is defined at GEIS Section 2.4, Page 2-30, as surveillance, on-line monitoring, inspections, testing, trending, and recordkeeping.]

The GEIS identifies examples of major refurbishment activities that utilities might perform for license renewal (NRC 1996, Section 2.6 and Appendix B, Table B.2). Such major activities involve substantial refurbishment or replacement of facility structures or components. The GEIS analysis assumed that an applicant would begin any major refurbishment work shortly after NRC granted a renewed license and would complete the activities during five outages, including one major outage at the end of the 40th year of operation. The GEIS refers to this as the refurbishment period.

GEIS Table B.2 lists major license renewal refurbishment activities that NRC anticipates utilities might undertake. In identifying these activities, the GEIS is intended to encompass actions that typically take place only once in the life of a nuclear power plant, if at all. The GEIS analysis assumed that a utility would undertake these activities solely to extend plant operations beyond 40 years and would undertake them during the refurbishment period. The GEIS indicates that many licensees will have undertaken various major refurbishment activities at their facilities to support the current license period as part of their ongoing maintenance programs. However, the GEIS also indicates that some licensees might only perform such tasks in support of extended plant operations through the license renewal process.

The integrated plant assessment that NMC has conducted under 10 CFR 54 and included as part of this application has not identified a need to undertake any major refurbishment or replacement actions associated with license renewal. In addition, there are no planned facility modifications associated with license renewal that would affect the environment or plant effluents.

3.3 PROGRAMS AND ACTIVITIES FOR MANAGING THE EFFECTS OF AGING

NRC

"...The report must contain a description of...the applicant's plans to modify the facility or its administrative control procedures....This report must describe in detail the modifications directly affecting the environment or affecting plant effluents that affect the environment…."
10 CFR 51.53(c)(2)

"...The incremental aging management activities carried out to allow operation of a nuclear power plant beyond the original 40-year license term will be from one of two broad categories: (1) SMITTR actions, most of which are repeated at regular intervals, and (2) major refurbishment or replacement actions, which usually occur fairly infrequently and possibly only once in the life of the plant for any given item…." (NRC 1996, Section 2.6.3.1, Page 2-41.) ["SMITTR" is defined at GEIS Section 2.4, Page 2-30, as surveillance, on-line monitoring, inspections, testing, trending, and recordkeeping.]

In accordance with NRC regulation 10 CFR 54, NMC has included in the MNGP License Renewal Application an integrated plant assessment that identifies how NMC would manage the effects of aging on systems, structures, and components. In some cases, existing MNGP programs adequately address aging effects with no license renewal modification. In other cases, NMC has identified necessary modifications/enhancements to existing programs, or has identified the need to develop and implement new programs.

Appendix A of the NMC License Renewal Application includes a supplement to the plant USAR. In accordance with NRC requirements [10 CFR 54.21(d)], the supplement contains descriptions of the programs and activities for managing the effects of aging. In addition to describing existing programs, the supplements describe proposed modifications (enhancements) to existing programs and proposed programs and activities. Other than implementation of the programs and activities in Appendix A, there are no planned modifications of MNGP's administrative control procedures associated with license renewal.

3.4 EMPLOYMENT

3.4.1 CURRENT WORKFORCE

NMC employs a permanent workforce of approximately 414 employees and approximately 105 long-term contractors at the MNGP site, a number that is below the GEIS estimate of 600 to 800 personnel per reactor unit (NRC 1996, Section 2.3.8.1). Approximately 41 percent of the permanent workforce live in Wright County, 32 percent live in Sherburne County, 7.5 percent live in Hennepin County, and 7.5 percent live in Stearns County. The remaining employees (approximately 12 percent) live in various other locations.

NMC refuels MNGP at intervals of approximately 22 to 24 months. During refueling outages, site employment increases by as many as 600 workers for temporary (30 to 40 days) duty, and NMC expects that similar increases would occur for refueling outages during the license renewal term. This is within the range of 200 to 900 additional workers per reactor outage cited by NRC in the GEIS.

3.4.2 LICENSE RENEWAL INCREMENT

NRC assumes in the GEIS that a renewed nuclear power plant operating license would be issued for a maximum of 20 years past the current license expiration date (NRC 1996, Section 2.6.2.7). The GEIS analysis further assumes that the utility would initiate surveillance, on-line monitoring, inspections, testing, and recordkeeping (SMITTR) activities when a renewed license is issued, and would continue to conduct license renewal SMITTR activities for the life of the plant. Some of these activities would occur during full-power operation, but most commonly during normal refueling outages and 5-year and 10-year in-service inspection outages (NRC 1996, Section B.3.1.3).

NMC has determined that the GEIS scheduling assumptions are reasonably representative of MNGP incremental license renewal workload scheduling. Although some MNGP license renewal SMITTR activities would be one-time efforts, others would be recurring, periodic activities that would continue for the life of the unit.

Performing the SMITTR activities described in Section 3.3 of this ER suggests an increase in MNGP site staff workload by some increment, the size of which would be a function of the schedule within which NMC must accomplish the work. In the GEIS, NRC estimates that 20 to 60 additional personnel per reactor would be needed to perform additional inspection, surveillance testing, and maintenance tasks during the license renewal term. NRC uses the upper value of this range, 60 workers, as a conservative estimate of additional permanent workers needed per unit for license renewal SMITTR activities. GEIS Section C.3.1.2 was written using this approach in

order to "...provide a realistic upper bound to potential population-driven impacts…." (NRC 1996).

NMC expects that existing "surge" capabilities would enable MNGP to perform the increased SMITTR workload without additional staff. However, for the purpose of performing its own bounding analysis in this ER, NMC is adopting NRC's GEIS approach. As a reasonably conservative high estimate, NMC assumes that if needed MNGP would require no more than a total of 60 additional permanent workers to perform license renewal SMITTR activities.

In addition to directly creating jobs at the MNGP site, adding full-time employees to the plant workforce during the license renewal period would have the indirect effect of creating additional jobs and related population growth in the community. Using the Regional Input-Output Modeling System (RIMS II), the U.S. Bureau of Economic Analysis calculated a regional employment multiplier appropriate for the electric services (utilities) sector for the region of interest, Wright and Sherburne Counties (DOC 2004). NMC used this value (2.2366) to estimate the number of jobs supported by a potential addition of 60 MNGP employees. Applying this multiplier, NMC estimates that a total of 134 (60 × 2.2366) new jobs would be created in an area with a current labor force of over 91,825 workers (see Section 2.6). These 134 new direct and indirect jobs represent less than 1 percent of the current total employment in the Wright and Sherburne combined-county area. In summary, NMC assumes that 60 additional permanent direct workers during the license renewal period would create an additional 74 indirect jobs in the community.

Conservatively assuming that each direct and indirect job is filled by an in-migrating worker, these 134 new jobs (60 direct and 74 indirect) could result in a population increase of 385 persons in the area [134 jobs multiplied by 2.87 average number of persons per household in the Wright and Sherburne combined county area] (Census 2001a,b). This increase represents less than 0.2 percent of the Census Bureau's estimated population in year 2002 (169,554 persons) for the combined area of Wright and Sherburne Counties (Census 2004).

TABLE 3.1-1
TRANSMISSION LINES FROM MONTICELLO SUBSTATION

Monticello–Elm Creek – Parkers Lake (345 kV; Xcel Energy Line #0978)
Extends approximately 43.3 miles southeastward on steel-lattice towers and wood h-frames and connects to Xcel Energy's Elm Creek Substation at Maple Grove, Minnesota. The Elm Creek substation was installed in 1996. This line continues 11.0 miles from Elm Creek Substation to Parkers Lake Substation located in Plymouth, Minnesota (see Figure 3.1-2). The line was originally constructed to connect Monticello directly to Parkers Lake and energized in 1971. NRC addressed this action in its environmental review for the initial MNGP operating license application.
Monticello–Sherburne County – Coon Creek (345 kV; Xcel Energy Line #0991 and #0992)
Line #0991 extends 5.9 miles northwestward on steel lattice towers to the Sherburne County Substation located in Becker, Minnesota. Line #0992 emanates from the Sherburne County Substation and extends approximately 43.3 miles to the southeast to connect to Coon Creek Substation (see Figure 3.1-2). The original Monticello to Coon Creek Line was modified in 1975 to connect the Sherburne County Generating Plant to the 345-kV system. NRC addressed the configuration directly from Monticello to Coon Creek Substation in its environmental review for the initial MNGP operating license application.
Monticello-Benton County (230 kV; Great River Energy Line #MR)
Extends 20.0 miles northeastward on wooden h-frame structures to the Great River Energy-owned Benton County Substation in St. Cloud, Minnesota. This line was constructed and energized in 1970.
Monticello-Elk River (230 kV; Great River Energy Line #EO)
Extends 17.0 miles eastward on wooden h-frame structures to the Great River Energy-owned Elk River 14 Substation. This line was constructed and energized in 1970 to connect Monticello to Elk River.
Monticello–Lake Pulaski (115 kV; Xcel Energy Line #0883)
Extends 12.0 miles southward on steel lattice towers and wood h-frame structures to Xcel Energy's Lake Pulaski Substation at Buffalo, Wright County, Minnesota. This line was constructed and energized in 1968 to connect the Monticello Substation to Crow River. The Lake Pulaski Substation was added in 1969.
Monticello–Hassan (115 kV; Xcel Energy Line #0827)
Extends 16.2 miles southeastward on steel lattice towers and wood h-frame structures to the Hassan Substation outside the City of Rogers in Hassan Township, Hennipin County, Minnesota. This line was constructed and energized in 1953 to connect the St. Cloud Substation directly to West Coon Rapids Substation. Since the construction of MNGP, three substations have been added to the portion of Line #0827 extending south of MNGP ultimately to West Coon Rapids.
Monticello–St. Cloud (115 kV; Xcel Energy Line #0827)
Extends 21.8 miles northwestward on primarily wood h-frame structures to the St. Cloud Substation located in St. Cloud, Minnesota. As noted above, this is part of the original St. Cloud to West Coon Rapids line energized in 1953. Since construction of MNGP, one additional substation has been added to the portion of Line #0827 extending north of MNGP.

FIGURE 3.1-1
POWER BLOCK

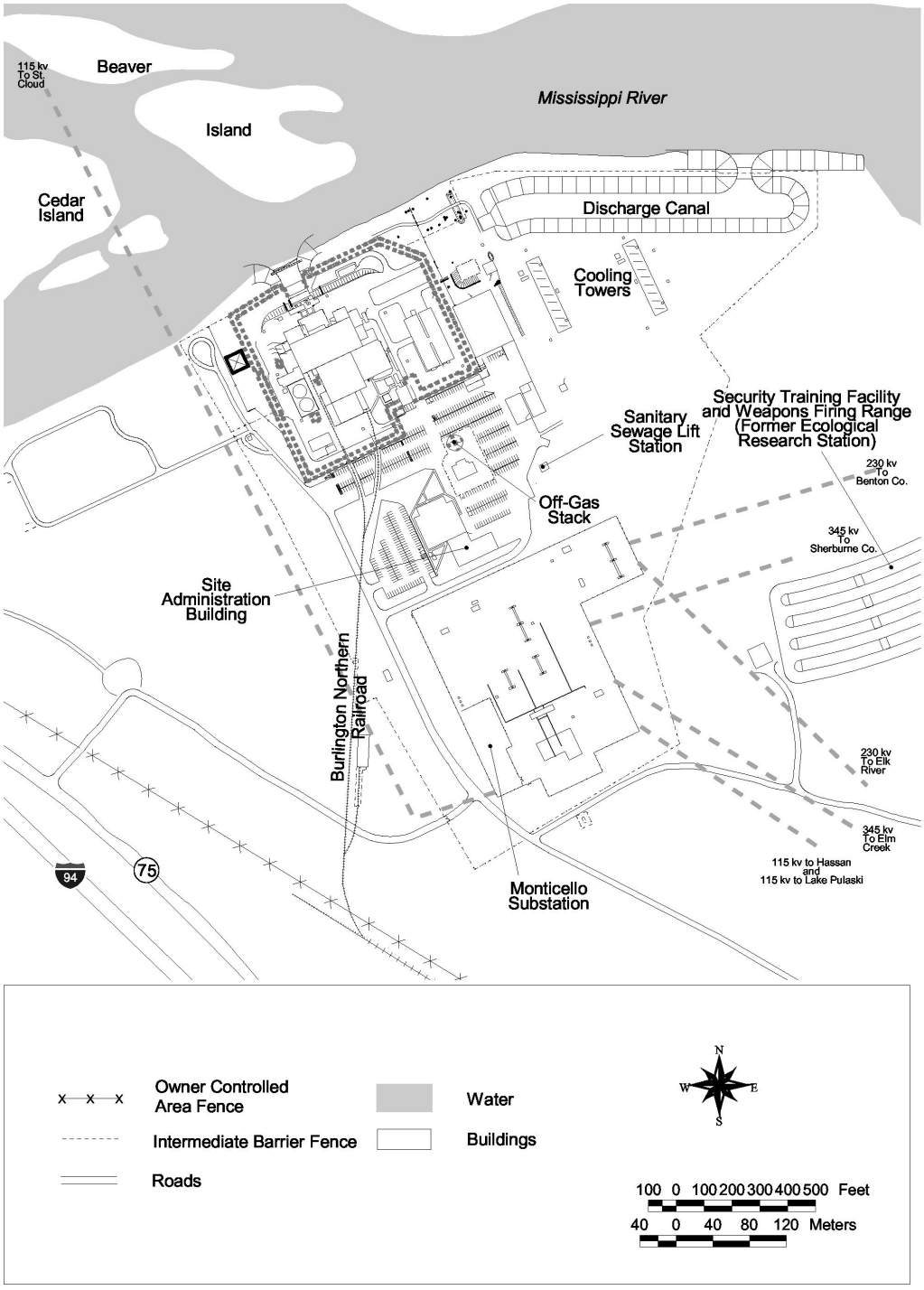
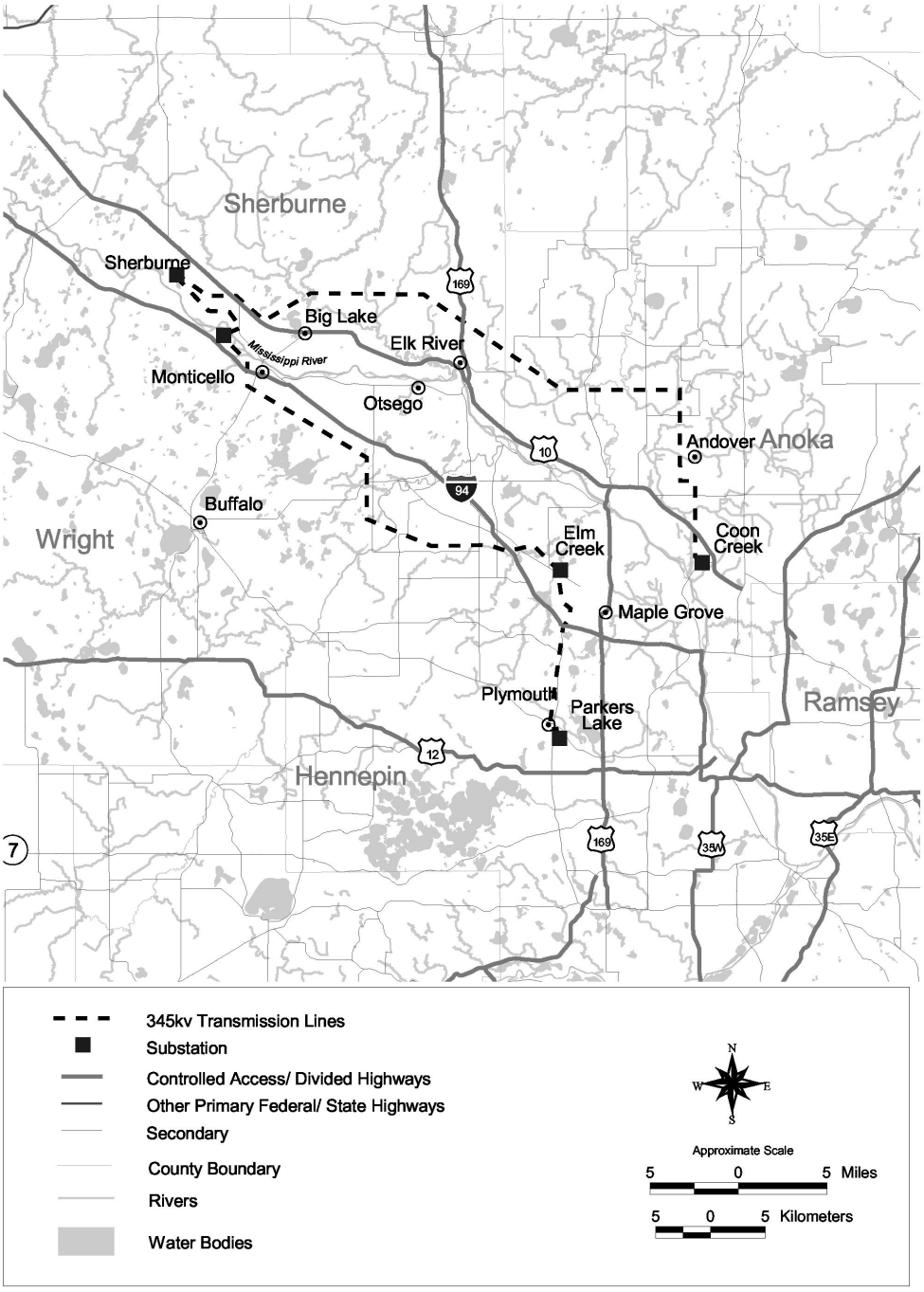


FIGURE 3.1-2
MONTICELLO 345-KV TRANSMISSION CORRIDORS



3.5 REFERENCES

Note to reader: This list of references identifies web pages and associated URLs where reference data was obtained. Some of these web pages may likely no longer be available or their URL addresses may have changed. NMC has maintained hard copies of the information and data obtained from the referenced web pages.

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4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MITIGATING ACTIONS

NRC

The environmental report shall discuss the "…impact of the proposed action on the environment. Impacts shall be discussed in proportion to their significance[.]" 10 CFR 51.45(b)(1) as adopted by 51.53(c)(2)

The report "...should not be confined to information supporting the proposed action but should also include adverse information." 10 CFR 51.45(e)

4.1 BACKGROUND

Chapter 4 presents an assessment of the environmental consequences and potential mitigating actions associated with the renewal of the Monticello Nuclear Generating Plant (MNGP) operating license. This assessment supplements U.S. Nuclear Regulatory Commission's (NRC's) *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), which identified and analyzed 92 environmental issues NRC considers to be associated with nuclear power plant license renewal (NRC 1996). In its analysis and rules, NRC designated each of the issues as Category 1, Category 2, or Not Applicable (NA). NRC has designated the issues as "Category 1" if, after analysis, the following criteria were met:

- The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic; and

- A single significance level (i.e., small, moderate, or large) has been assigned to the impacts that would occur at any plant, regardless of which plant is being evaluated (except for collective offsite radiological impacts from the fuel cycle and from high-level-radioactive waste and spent-fuel disposal); and

- Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely to be not sufficiently beneficial to warrant implementation.

If NRC analysis concluded that one or more of the Category 1 criteria could not be met, NRC designated the issue as Category 2. NRC requires plant-specific analyses for Category 2 issues. NRC designated two issues as "NA," signifying that the categorization and impact definitions do not apply to these issues. NRC rules do not require analyses of Category 1 issues that NRC has resolved using generic findings (10 CFR 51, Subpart A, Appendix B, Table B-1) based on the GEIS (NRC 1996). An applicant may reference the generic findings or GEIS analyses for Category 1 issues.

Attachment A of this MNGP Environmental Report (ER) lists the 92 issues with their NRC-assigned categorizations, notes the applicability of each issue, and identifies the ER and GEIS sections that address each issue, and notes each issue's applicability. Issues not applicable to MNGP are noted and the basis for that designation is provided. The issues are numbered in the same order in which they are listed in Table B-1 of Appendix B to Subpart A of 10 CFR 51, for ease of reference.

4.1.1 CATEGORY 1 LICENSE RENEWAL ISSUES

NRC

"The environmental report for the operating license renewal stage is not required to contain analyses of the environmental impacts of the license renewal issues identified as Category 1 issues in appendix B to subpart A of this part." 10 CFR 51.53(c)(3)(i)

"…[A]bsent new and significant information, the analysis for certain impacts codified by this rulemaking need only be incorporated by reference in an applicant's environmental report for license renewal…." (61 *Federal Register*, Page 28483).

Nuclear Management Company, LLC (NMC) has determined that of the 69 Category 1 issues, six do not apply to MNGP because they apply to design, operational, or location features that do not exist at MNGP. These features are intake and discharge from an ocean, an estuary, or a lake; Ranney wells; use of groundwater in excess of 100 gallons per minute (gpm) and cooling ponds (Attachment A, Table A-1). In addition, because NMC does not plan to conduct any major refurbishment activities, NRC findings for the seven Category 1 issues that apply only to refurbishment do not apply to this application (see Section 3.3; Attachment A, Table A-1).

Table A-1 found in Attachment A also lists Category 1 issues that NMC has determined to be applicable to MNGP, as well as 2 "NA" issues for which NRC came to no generic conclusion. The table includes findings codified by 10 CFR 51.53 and references to the supporting GEIS analysis. NMC has identified no new and significant information, or become aware of any such information that would make NRC findings inapplicable to MNGP. Therefore, NMC adopts by reference NRC findings for the 56 Category 1 issues NMC determined to be applicable to MNGP.

4.1.2 CATEGORY 2 LICENSE RENEWAL ISSUES

NRC

"The environmental report must contain analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for those issues identified as Category 2 issues in Appendix B to Subpart A of this part…." 10 CFR 51.53(c)(3)(ii)

"The report must contain a consideration of alternatives for reducing adverse impacts, as required by § 51.45(c), for all Category 2 license renewal issues…." 10 CFR 51.53(c)(3)(iii)

NRC designated 21 issues as Category 2. As in the case of Category 1 issues, some Category 2 issues (three) are not applicable to MNGP due to design, operational, or geographical features that do not exist at MNGP (Attachment A, Table A-1). These issues including their bases for exclusion are listed below:

Issue	Basis for Exclusion
33. Groundwater use conflicts (potable, service water, and dewatering; plants that use greater than 100 gpm)	Not applicable because MNGP uses less than 100 gpm (see Section 3.1.3.5).
35. Groundwater use conflicts (Ranney wells)	Not applicable because MNGP does not use Ranney wells.
39. Groundwater quality degradation (cooling ponds at inland sites)	Not applicable because MNGP is not equipped with cooling ponds.

Sections 4.2 through 4.17 of this ER address the remaining 18 Category 2 issues applicable to MNGP, including the four issues that apply to refurbishment activities. Each section begins with a statement of the issue and an explanation as to why NRC was not able to generically resolve the issue. If the issue does not warrant detailed analysis (as is the case for the four Category 2 issues relating to refurbishment), NMC explains the basis for inapplicability.

For those Category 2 issues determined to be both applicable and warranting detailed analysis (i.e., those not related to refurbishment), the section provides both details on the issue and the required detailed analysis. These analyses include conclusions regarding the significance of the impacts relative to renewal of the operating license for MNGP and discuss potential mitigative alternatives, when applicable and to the extent required. For each, NMC has identified the significance of the impacts associated with the issue as either small, moderate, or large, consistent with the criteria that NRC established at 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3, as follows:

> SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, NRC has concluded that those impacts that do not exceed permissible levels in NRC's regulations are considered small.
>
> MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attribute of the resource.
>
> LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

In accordance with National Environmental Policy Act (NEPA) practice, NMC considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts that are small receive less mitigative consideration than do impacts that are large).

4.1.3 "NA" LICENSE RENEWAL ISSUES

NRC determined that its categorization and definitions of impact did not apply to two issues. Applicants currently are not required to submit information on chronic effects from electromagnetic fields (10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 5) because no consensus has been reached by appropriate Federal health agencies that there are adverse health effects from electromagnetic fields. Likewise, applicants are not required to submit analyses regarding environmental justice, as NRC will address the issue in a site-specific review (10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 6). However, NRC has indicated that applicants include pertinent information in the ER to support an environmental justice review by NRC (NRC 2000, Section 4.22). Therefore, NMC has included demographic information in Sections 2.5.2 and 2.5.3 of this ER for transient, minority, and low-income populations found in the 50-mile area.

4.2 SURFACE WATER AND GROUNDWATER USE CONFLICTS

NRC

"If the applicant's plant utilizes cooling towers or cooling ponds and withdraws make-up water from a river whose annual flow rate is less than 3.15×10^{12} ft^3/year (9×10^{10} m^3/year), an assessment of the impact of the proposed action on the flow of the river and related impacts on instream and riparian ecological communities must be provided. The applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow." 10 CFR 51.53(c)(3)(ii)(A)

"The issue has been a concern at nuclear power plants with cooling ponds and at plants with cooling towers. Impacts on instream and riparian communities near these plants could be of moderate significance in some situations." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 13

"Water use conflicts may result from surface water withdrawals from small water bodies during low flow conditions which may affect aquifer recharge, especially if other ground-water or upstream surface water users come on line before the time of license renewal." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 34

NRC categorized surface water and groundwater use conflicts addressed in this section as Category 2 issues for plants located on a small river because the significance of impacts of cooling tower makeup water withdrawals on aquatic biota (Issue 13) and alluvial aquifers (Issue 34) could not be determined without site-specific information. Consultations with regulatory agencies by NRC indicated that surface water use conflicts represented by Issue 13 were a concern at two closed-cycle plants (Limerick and Palo Verde) and could present a future problem at other plants. In particular, NRC indicates in the GEIS that some plants equipped with cooling towers and located on small rivers are susceptible to droughts or competing water uses (NRC 1996, Section 4.3.2.1). Additionally, the consumptive water loss resulting from operation of these plants may represent a substantial proportion of the river flow, with consequent potential for adverse impact on aquatic and riparian ecological communities (e.g., by reducing available aquatic habitat or dewatering riparian zone wetlands through lowered water levels). Similarly, these flow reductions could result in indirect groundwater use conflicts by reducing availability of groundwater in associated alluvial aquifers (NRC 1996, Section 4.8.1.3).

Information to be ascertained for the analysis includes: (1) Mississippi River low flow characteristics, (2) present and reasonably foreseeable future consumptive use of river water by MNGP and other competing water users, and (3) resulting impacts to instream and riparian ecological communities and alluvial aquifers.

MNGP has a closed-cycle cooling system equipped with cooling towers available that provide operational flexibility to operate with the towers in helper cycle mode or partial to full re-circulation modes. Makeup water for this system is withdrawn from the Mississippi River (see Section 3.1.3 of this ER). As indicated in Table 2.2-2, the annual

average flow of the Mississippi River at the MNGP site is 7,217 cubic feet per second (cfs; or 2.28 x 10^{11} cubic feet per year), which meets NRC's annual flow criterion for classification as a small river. The water use conflict issues pertaining to "small rivers" applicable to MNGP are addressed in the following subsections.

4.2.1 IMPACT ON MISSISSIPPI RIVER FLOWS AND WATER LEVELS

The Mississippi River at the MNGP site has a drainage area of 13,700 square miles. In Section 2.2.1 of this ER, U.S. Geological Survey (USGS) flows were scaled from nearby gaging stations to the site for the 1940 to 1970 period (see Table 2.2-1) and for the 1971 to 2001 period (see Table 2.2-2). For the more recent 1971 to 2001 period, the annual average Mississippi river flow was 7,217 cubic feet per second (cfs), whereas, monthly mean flows varied between 4,135 cfs in February to 14,140 cfs in April. A one-in-10-year, 7-day duration low flow (7Q10) based on this 31-year historical period was 1,294 cfs.

The MNGP has a water appropriations permit that authorizes the pumping of water from the Mississippi River at a rate varying up to 645 cfs for a maximum total annual appropriation of 467,000 acre feet (MNDC 1970). This water is returned to the Mississippi River, except for such waters as may be evaporated in the discharge canal and cooling towers of the station. The conditions of the permit are (see Section 3.1.3 of this ER):

a) A maximum of 645 cfs may be appropriated for cooling in an "open cycle" or "once through" mode when river flows exceed 860 cfs and cooling of circulating water meets NPDES permit limits.

b) A maximum of 645 cfs may be appropriated for a "helper" cycle mode of operation that utilizes cooling towers when river flow at the site exceeds 860 cfs and river temperatures approach permit limits.

c) A "partial recirculation" mode of operation recirculates cooling tower water to the intake and the appropriated flow shall not exceed 75 percent of the river flow when the river flow is less than 860 cfs but greater than 240 cfs.

d) A "closed cycle" mode of operation with appropriated flow not to exceed 75 percent of the river flow is authorized when the river flow is less than 240 cfs.

e) At river flows less than 240 cfs, the MNGP shall comply with special operating conditions which the Commissioner of the MNDNR may prescribe.

Daily MNGP circulating water flows are illustrated in Figure 4.2-1 for the 5-year period from 1999 to 2003. A frequency distribution of the daily circulating water flows is presented in Table 4.2-1. Figure 4.2-1 indicates that circulating water flows follow a

seasonal cycle increasing to above 600 cfs during summer months. The figure also indicates that annually there is an approximately one-month maintenance outage. The 80-percentile circulating water flows in Table 4.2-1 vary between 445 and 457 cfs during December, January and February, increasing to 610-636 cfs during May to September. The Mississippi River is very seldom below the 860 cfs flow referred to in the permit. River flow below 860 cfs occurred approximately 1-percent of the time during the months of July to October (see Table 2.2-2).

During the cooler months of the year, normally October through April, MNGP typically operates in a once-through mode. During the period from 15 May to 15 September, MNGP usually operates in a helper cycle mode with approximately 90 percent of the circulating water flow passing through the cooling tower system. A partial recirculation mode is seldom used at MNGP. When operating in a once-through mode, a conservative high estimate of the consumptive use (evaporation from the discharge canal) is 1 percent of the circulating water flow. Evaporative losses when the cooling towers are in operation increase to 2.23 percent of the cooling tower flow (see NPDES Permit Flow Path Diagram in Attachment B).

Based on the above information, two worst case surface water consumptive use scenarios were constructed:

1. Once-through mode: 1 percent loss from 645 cfs circulating water flow = 6.45 cfs

2. Helper cycle mode: 2.25 percent loss from 645 cfs circulating water flow = 14.5 cfs

Under normal operating conditions with Mississippi River flows greater than 860 cfs, the consumptive use of 14.5 cfs is very small compared to natural daily and weekly flow variation at the MNGP site. A stage discharge relationship for the Mississippi River at the MNGP site was provided in Table 2.2-4. At an 860-cfs river flow, which occurs only one percent of the time (see Table 2.2-2), during summer months, a consumptive use of 14.5 cfs is equivalent to a change of water surface elevation of approximately 0.02 feet. Therefore, the consumptive use of circulating water by the MNGP has no significant effect on Mississippi River flows or water surface elevations.

In the 1971-2001 record of USGS Mississippi River flows scaled to the MNGP site, the lowest monthly average flow was 853 cfs in September 1976 (see Table 2.2-3), and the lowest daily river flow was 586 cfs, also in September (see Table 2.2-2). At a 586-cfs river flow, MNGP would be allowed to withdraw up to 439.5 cfs of water. Under these low flow conditions, MNGP would be operating in the helper cycle mode. At the higher 2.25 percent evaporative loss rate, a 439.5-cfs circulating water flow results in a 9.9-cfs consumptive use. Based on the stage discharge relationship in Table 2.2-4, a 9.9-cfs consumptive loss at a 586-cfs river flow results in a change in river surface elevation of

0.02 feet. Thus, even under worst-case low-flow conditions, the consumptive use of river water by MNGP has no significant impact on Mississippi River levels.

4.2.2 INDIRECT IMPACTS FROM SURFACE WATER USE

The alluvial aquifers in the vicinity of the MNGP site were described in Section 2.2.2 of this ER. These aquifers consist of the unconsolidated sediments of the Mississippi River Valley and the underlying sandstone. The unconsolidated sediments overlying the sandstone are attributed to the Wisconsinian glaciation. The sediments are probably less than 1,000,000 years old. Recent alluvial deposits are also contained within the unconsolidated sediments. The unconsolidated materials in the form of glacial moraines, glacial outwash plains, glacial till, and riverbed sediments are approximately 55 to 122 feet thick. In general, the sand and gravel outwash deposited by glacial melt-water streams is highly permeable. The alluvial deposits consist of silt, sand, and gravel. These deposits generally are finer-grained and are less permeable than the glacial outwash deposits. The outwash and alluvial deposits are hydrologically connected and are a highly productive source of groundwater.

In Section 4.2.1 of this ER the effects of MNGP consumptive use on Mississippi River flows and river stage were discussed. The maximum consumptive use is 14.5 cfs, present during the mid May to mid September period, when MNGP has a higher probability of operating in a helper cycle mode. A consumptive use of 14.5 cfs is small compared to natural daily and weekly flow variation at the MNGP site and corresponds to a change in river stage of no more than 0.02 feet. The consumptive use of cooling water by the MNGP has no significant effect on Mississippi River flows, river stage, or on the adjacent alluvial aquifer.

The relationship between groundwater elevations in the alluvial aquifer and river stage was examined in Section 2.2.3 of this ER based on weekly groundwater elevations at on-site Wells 1 and 2 between 1990 to 1995 (see Table 2.2-9 and Figure 2.2-3). Figure 2.2-3 contains the average monthly well elevations and Mississippi River elevations for the 1993-1995 period. Figure 2.2-3 indicates groundwater elevations were typically 2 feet higher than river elevations, particularly during the summer and fall. In March of both 1994 and 1995, during the spring freshet, river elevations were similar to well elevations. These results indicate groundwater is dominated by a regional flow towards the river, independent of local river elevation or local groundwater pumping, and suggests that the river is not a source of recharge for the alluvial aquifer.

4.2.3 CONCLUSIONS

In view of these considerations, NMC concludes that consumptive losses of water from the Mississippi River would not significantly reduce river flow or affect water surface elevation, and would have no significant impact on associated alluvial aquifers

(Issue 34) or aquatic or riparian ecological communities (Issue 13) respectively described in Sections 2.2 and 2.3 of this ER. Hence, there would be no substantial impacts to mitigate. Because the definition of "SMALL" includes impacts that are not detectable, the appropriate characterization of the impacts from consumptive water use is SMALL, and further mitigation would be unwarranted.

4.3 ENTRAINMENT OF FISH AND SHELLFISH IN EARLY LIFE STAGES

NRC

"If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(b) determinations…or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from…entrainment." 10 CFR 51.53(c)(3)(ii)(B)

"...The impacts of entrainment are small at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems. Further, ongoing efforts in the vicinity of these plants to restore fish populations may increase the numbers of fish susceptible to intake effects during the license renewal period, such that entrainment studies conducted in support of the original license may no longer be valid...."
10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 25

NRC designated impacts on fish and shellfish resources resulting from entrainment as a Category 2 issue because it could not assign a single significance level (small, moderate, or large) to the issue. The impacts of entrainment are small at many plants, but they may be moderate or large impacts at others. Also, ongoing restoration efforts may increase the number of fish susceptible to intake effects during the license renewal period (NRC 1996, Section 4.2.2.1.2). Information to be ascertained includes: (1) type of cooling system (whether once-through or cooling pond); and (2) current Clean Water Act Section 316(b) determination or equivalent state documentation.

As Section 3.1.3 of this ER indicates, MNGP uses a once-through cooling water system in combination with two mechanical draft cooling towers, enabling the plant to operate in various modes. Operating experience indicates that historically MNGP operates in open or helper cycle approximately 98 percent of the time.

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

A 316(b) Demonstration was developed and submitted to the Minnesota Pollution Control Agency (MPCA) (Amish et al. 1978). The Demonstration was ultimately accepted and approved by the MPCA in September 1979, with the conclusion that entrainment at MNGP "... offers no substantial detriment to the fisheries population." (Hoffman 1979). Documentation of State approval of the 316(b) Demonstration is provided in Attachment B. Electrofishing surveys to assess relative abundance and

seasonal distribution of fish in response to MNGP's thermal discharge have been conducted from 1976 to the present. Areas of the River sampled extended about 1.5 kilometers both up and downstream from the discharge structure, with the thermal plume generally covering less than one-half of the downstream flow of the study area. Results show similar, persistent, and stable species assemblages both up and downstream of the discharge (NSP 2004). Based on these studies, NMC concludes that impacts to fish populations as a result of entrainment (Issue 25) would be SMALL during the license renewal period and mitigation would be unwarranted.

As noted in Chapter 9 of this ER, U.S. Environmental Protection Agency (EPA) has recently issued rules implementing Section 316(b) (EPA 2004). Conformance with these new regulations will be determined within the NPDES permit renewal process as implemented by MPCA [Permit #MN0000868 expires July 31, 2007 and could only reduce the already small impacts (MPCA 2002)].

4.4 IMPINGEMENT OF FISH AND SHELLFISH

NRC

"If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(b) determinations…or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from…impingement…."10 CFR 51.53(c)(3)(ii)(B)

"...The impacts of impingement are small at many plants but may be moderate or even large at a few plants with once-through and cooling-pond cooling systems...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 26

NRC designated impacts on fish and shellfish resources resulting from impingement a Category 2 issue because it could not assign a single significance level (small, moderate, or large) to the issue. The impacts of impingement are small at many plants, but they may be moderate or large impacts at others. Also, ongoing restoration efforts may increase the number of fish susceptible to intake effects during the license renewal period (NRC 1996, Section 4.2.2.1.3). Information to be ascertained includes: (1) type of cooling system (whether once-through or cooling pond), and (2) current Clean Water Act Section 316(b) determination or equivalent state documentation.

As Section 3.1.3 of this ER indicates, MNGP uses a once-through cooling water system in combination with two mechanical draft cooling towers, enabling the plant to operate in various modes. Operating experience indicates that historically MNGP operates in open or helper cycle approximately 98 percent of the time.

Section 316(b) of the Clean Water Act requires any standard established pursuant to 301 or 306 shall require the location, design, construction, and capacity of cooling water intake structures to reflect the best technology available for minimizing adverse environmental impacts [33 USC 1326 (b)]. Impingement of fish and shellfish resources against the 3/8-inch traveling screens is one of the potential adverse environmental impacts that can be minimized by the use of the best available technology.

Upon review of the 316(b) Demonstration, the MPCA concurred that impingement at MNGP "... offer no substantial detriment to the fisheries population" (Hoffman 1979). Documentation of the State's review and approval of the 316(b) Demonstration is provided in Attachment B. Electrofishing surveys to assess relative abundance and seasonal distribution of fish in response to MNGP's thermal discharge have been conducted from 1976 to the present. Areas of the River sampled extended about 1.5 kilometers both up and downstream from the discharge structure, with the thermal plume generally covering less than one-half of the downstream portion of the study area. Results show similar, persistent, and stable species assemblages both up and downstream of the discharge (NSP 2004). Based upon these studies, NMC concludes

that impacts to fish populations as a result of impingement (Issue 26) would be SMALL during the license renewal period and mitigation would be unwarranted.

As noted in Chapter 9 of this ER, EPA has recently issued rules implementing Section 316(b) (EPA 2004). Conformance with these new regulations will be determined within the NPDES Permit renewal process as implemented by MPCA [Permit #MN000068 expires July 31, 2007 and could only reduce the already small impacts (MPCA 2002)].

4.5 HEAT SHOCK

NRC

"If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act… 316(a) variance in accordance with 40 CFR 125, or equivalent State permits and supporting documentation. If the applicant can not provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from heat shock …." 10 CFR 51.53(c)(3)(ii)(B)

"...Because of continuing concerns about heat shock and the possible need to modify thermal discharges in response to changing environmental conditions, the impacts may be of moderate or large significance at some plants...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 27

NRC made impacts on fish and shellfish resources resulting from heat shock a Category 2 issue because of continuing concerns about thermal discharge effects and the possible need to modify thermal discharges in the future in response to changing environmental conditions (NRC 1996, Section 4.2.2.1.4). Information to be ascertained includes: (1) type of cooling system (whether once-through or cooling pond), and (2) evidence of a Clean Water Act Section 316(a) variance or equivalent state documentation.

MNGP is equipped with once-through cooling system coupled with cooling towers that can operate in various modes (see Section 3.1.3 of this ER) to meet permit requirements for water appropriations and thermal discharge. The use of the system in a once-through capacity requires evaluation of the effects of the heated discharge on biological resources of the Mississippi River.

As described in Section 3.1.3 of this ER, cooling water is withdrawn from the Mississippi River using two, 140,000 gallons per minute (gpm) circulating water pumps. The water is circulated through the condenser and then routed, along with service water, to the discharge structure. During open cycle operation, i.e., when ambient river water temperature is less than 68 degrees Fahrenheit (°F) (and river flow is adequate), the condenser effluent is routed to an open canal and discharged directly to the river. Open-cycle operation is typical from about mid-September to mid-May. When river water temperatures exceed 68°F and river flow is adequate, condenser effluent from the discharge structure is pumped into two, induced-draft cooling towers, and then to the river via the discharge canal. Under high temperature and/or low flow conditions, MNGP can also be operated in a partial recycle mode or closed-cycle mode. These alternative operating modes are used to comply with MNDNR (formerly Minnesota Department of Conservation) water appropriation restrictions and MPCA thermal discharge limits established in the NPDES permit (see Section 3.1.3.3 of this ER).

In the 316(a) Demonstration for MNGP, Afzal et al. (1975, pages 2 and 3) summarized the extent and behavior of the thermal discharge plume under various conditions. The

author's observations were based on 34 plume-mapping surveys conducted between 1971 and 1973. Compliance with State water quality standards and draft NPDES permit conditions was not always achieved, and compliance was dependent primarily on plant operating mode and river flow. Particularly under extreme summer low flows, compliance was not possible with or without cooling towers. Occasional non-compliance was documented during the fall through spring period. Notwithstanding some periods of non-compliance with draft NPDES permit conditions and water quality standards, Afzal et al. (1975, page 14) concluded, based on a review of pertinent ecological studies, that there had been no "indication of prior appreciable harm to the biota of the Mississippi River within the area of influence of MNGP." This evaluation included all major biotic groups including phytoplankton, periphyton, macrophytes, zooplankton, benthic macroinvertebrates, and fish. NMC notes that when River conditions (i.e., flow and temperature) limit the ability for MNGP thermal discharge to meet the State water quality standards, plant procedures call for a reduction in power output to maintain current NPDES permit compliance.

One aspect of the thermal plume evaluation discussed in the 316(a) Demonstration was the attraction of fish to the discharge canal in winter, and their vulnerability to cold shock mortality in the event of a plant shutdown. This may occur when fish enter the warm effluent during fall/winter and become acclimated, and then are subjected to a near instantaneous drop to ambient temperature when the plant shuts down. There were eight winter shutdown events between 1975 and 1979 resulting in the cold shock death of 1,200 fish. Concerns about this phenomenon resulted in the construction of a fish barrier-weir at the mouth of the discharge canal in 1980. This weir prevents fish from entering the warmest part of the discharge, and has reduced the frequency and severity of cold shock kills. Since 1980, there were just eight events with a total loss of 969 fish. Even before installation of the fish barrier-weir, Afzal et al. (1975, page 12) concluded that cold shock mortality did not appear to adversely affect the fish community near the MNGP.

Installation of the fish barrier-weir in 1980 was assumed to have altered the configuration of the thermal plume. Consequently, from 1982 through 1987, temperature surveys were conducted over a six-kilometer reach below MNGP and at upstream control areas on a seasonal basis. During the worst-case year of 1983, the plume reached approximately six kilometers downstream. Excess temperatures (above ambient) during winter in the main body of the plume ranged from 26°F just below the discharge to 12°F six kilometers downstream at the State Highway 25 Bridge. However, the main body of the plume was confined to the right (south) bank of the river and never spanned the entire river. Depending on conditions and location, from 30 to 70 percent of the river was always unaffected by the thermal plume.

One of the most valuable tools for assessing the effects of the MNGP thermal plume on the river is the fishery monitoring database compiled by NSP since the mid-1970s. As

described in Section 2.3.1 of this ER, this database contains a nearly 30-year annual record of electrofishing and seining results both up- and downstream of the MNGP site. The fish community in recent years is essentially the same as the community found in the Mississippi River near MNGP at the onset of commercial operation (NSP 1999a,b). Electrofishing catches have been consistently dominated by common carp, shorthead redhorse, and silver redhorse, with lesser numbers of smallmouth bass, northern hogsuckers, and other species (NSP 1999b). Minnows consistently dominated the seine catches, primarily spotfin shiner, bigmouth shiner, sand shiner, and bluntnose minnow (NSP 1999a). Changes noted in the fish community have been unrelated to the MNGP thermal discharge, such as the invasion of channel catfish in the late 1980s and subsequent growth of the population. Examination of the annual fish monitoring data confirms that a "balanced, indigenous community" of fish has been maintained in the river throughout the operational period of MNGP.

Based on several years of pre-operational and post-startup ecological monitoring, the 316(a) Demonstration was developed and submitted to the MPCA (Afzal et al. 1975). The Demonstration was ultimately accepted and approved by that agency in September 1979, with the conclusion that the "thermal discharges from MNGP currently offer no substantial detrimental effects to the benthic and fisheries communities." (Hoffman 1979). That conclusion is still supportable 25 years later, based on evaluation of the annual fisheries monitoring data. Documentation of the State approval of the 316(a) Demonstration is provided in Attachment B. On the basis of these considerations, NMC concludes that heat shock impacts (Issue 27) from continued operation of MNGP during the license renewal period would continue to be SMALL, and mitigation would be unwarranted.

4.6 IMPACTS OF REFURBISHMENT ON TERRESTRIAL RESOURCES

NRC

The environmental report must contain an assessment of "…the impact of refurbishment and other license-renewal-related construction activities on important plant and animal habitats…." 10 CFR 51.53(c)(3)(ii)(E)

"…Refurbishment impacts are insignificant if no loss of important plant and animal habitat occurs. However, it cannot be known whether important plant and animal communities may be affected until the specific proposal is presented with the license renewal application…." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 40

"…If no important resources would be affected, the impacts would be considered minor and of small significance. If important resources could be affected by refurbishment activities, the impacts would be potentially significant…." (NRC 1996, Section 3.6, Page 3-6)

NRC made impacts of refurbishment on terrestrial resources a Category 2 issue because the significance of ecological impacts cannot be determined without considering site-specific and project-specific refurbishment details (NRC 1996, Section 3.6). Aspects of the site and the project to be ascertained are (1) the identification of important ecological resources, (2) the nature of refurbishment activities, and (3) the extent of impacts to plant and animal habitat.

Detailed analyses are not required for this issue because, as Section 3.2 of this ER discusses, NMC has no plans for major refurbishment or other license renewal-related construction activities at MNGP.

4.7 THREATENED AND ENDANGERED SPECIES

NRC

"All license renewal applicants shall assess the impact of refurbishment and other license-renewal-related construction activities on important plant and animal habitats. Additionally, the applicant shall assess the impact of the proposed action on threatened and endangered species in accordance with the Endangered Species Act." 10 CFR 51.53(c)(3)(ii)(E)

"Generally, plant refurbishment and continued operation are not expected to adversely affect threatened or endangered species. However, consultation with appropriate agencies would be needed at the time of license renewal to determine whether threatened or endangered species are present and whether they would be adversely affected." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 49

NRC made impacts to threatened and endangered species a Category 2 issue because the status of many species is being reviewed, and a site-specific assessment is required to determine whether any identified species could be affected by refurbishment activities or continued plant operations through the renewal period. In addition, compliance with the Endangered Species Act requires consultation with the appropriate Federal agencies (NRC 1996, Sections 3.9 and 4.1).

Sections 2.3.1 and 2.3.2 of this ER describe aquatic and terrestrial habitats on and in the vicinity of the MNGP site and along the transmission line corridors of concern. As noted in Section 3.4, the transmission corridors of concern for license renewal are those constructed for the purpose of connecting the plant to the transmission system. No critical habitats have been identified on the site or transmission corridors. Section 2.3.3 of this ER provides a discussion of those species listed as threatened or endangered at the federal level or the state level (in Minnesota) that may occur in the vicinity of MNGP and its transmission lines. This section presents an assessment of the environmental consequences to these species from future plant refurbishment activities and continued operation of the plant.

As discussed in Section 3.2 of this ER, NMC has no plans to conduct major refurbishment or construction activities for continued operations during the license renewal period at MNGP. Therefore, there would be no refurbishment-related or other license renewal construction-related impacts to protected species, and no further analysis of such impacts is required. NMC's assessment presented in this section is, therefore, limited to potential impacts from operations during the license renewal period of MNGP and those transmission line segments NMC has chosen to address in this ER. These transmission lines, the 54.3-mile long Monticello-Parkers Lake 345-kV line and the 49.2-mile long Monticello-Coon Creek 345-kV line, are more fully described in Section 3.1.4 of this ER and are depicted in Figure 3.1-2. Section 3.1.4 also describes vegetation maintenance practices for the transmission rights-of-way (ROW). Land use and terrestrial habitats that occur along the line are described in Section 2.3.2.3 of this

ER. Although NRC's license renewal regulations at 10 CFR 51.53(c)(3)(ii)(E) require only an assessment of impact on species protected under the federal Endangered Species Act, NMC also addresses in this assessment those species designated as endangered or threatened by the State of Minnesota.

Section 2.3.3 of this ER presents information summarizing the potential for occurrence of threatened or endangered species in the immediate vicinity of the site and the transmission corridors of interest to this ER. Table 2.3-3 lists the species that have been documented by MNDNR as occurring on or in the vicinity of MNGP or the transmission corridors of interest. Four of these species are protected bird species known to occur on or in the vicinity of the MNGP and the transmission corridors of interest: bald eagle, peregrine falcon, loggerhead shrike, and trumpeter swan. The remaining three protected species were identified by MNDNR as occurring along or in the vicinity of the transmission corridors of interest: Blanding's turtle, Uncas skipper, and tall nut-rush. In this section of the ER, NMC presents an analysis of potential impacts of the continued operation of MNGP and the associated transmission lines of interest on these species.

Impact initiators pertaining to the bald eagle, peregrine falcon, and loggerhead shrike include direct destruction of habitat from land disturbing activities on site and routine vegetation maintenance practices on site and along the transmission corridors. However, NMC has not identified any land disturbing activities that would be undertaken for license renewal. Further, any onsite activity potentially resulting in significant land disturbance during the license renewal term would necessitate a separate assessment of potential environmental impacts. NMC would conduct these assessments and obtain necessary permits before implementing any activities on the site that could potentially result in adverse impact to threatened or endangered species, and would continue to comply with all such applicable protective requirements in the license renewal term. Vegetation maintenance practices used for the onsite power corridor and transmission corridors are consistent with those described in Section 3.1.4 of this ER, and are designed to maintain herbaceous and lower growing trees and shrubs using selective removal of tall-growing trees and brush by manual cutting and selective application of EPA-approved herbicides. These practices would not be expected to adversely impact any of these four species and would typically result in long-term persistence on the site of areas consistent with the habitat affinities of the loggerhead shrike.

Impact initiators pertaining to the trumpeter swan include cessation of warm water discharges during the winter months and collisions with transmission lines. The cessation of warm water discharges during the winter months could result in the loss of the open water habitat downstream from MNGP that is currently being utilized by trumpeter swans. However, NMC's nuclear fuel management process typically schedules outages to coincide with periods of reduced demand for power. Coincidentally, periods of reduced power demand are usually in the fall or spring, thus

minimizing the potential impact to open water habitat. Xcel Energy Inc. (Xcel Energy) has in place a program to install flight diverters on its transmission lines in areas where incidents of bird collisions have occurred in an effort to minimize this impact. Further, in April 2002, Xcel Energy entered into a memorandum of understanding (MOU) with the USFWS and MNDNR for the purpose of establishing procedures and policies to be employed by the three parties in dealing with migratory birds that may be present, injured, or killed or Xcel Energy's property with the shared goal of the signatories of the MOU being the development and implementation of an Avion Protection Plan and elimination of the unlawful take of migratory birds (Xcel Energy et al. 2002).

Three other protected species were identified by MNDNR as occurring along or in the vicinity of the transmission corridors of interest. Impact initiators pertaining to Blanding's turtle, Uncas skipper, and tall nut-rush, include routine vegetation maintenance practices along the transmission corridors. However, NMC observes that plant communities that are maintained on the transmission corridors by these established management practices are highly consistent with the habitat affinities identified for these three species. In particular, both wetland and upland habitats are maintained in low-growing vegetation through the selective application of EPA-approved herbicides resulting in the open habitats preferred by these species.

In addition, potential for adverse impact on federal or stated-listed threatened and endangered species from continued plant operation is highly unlikely on the basis of plant operational history. Specifically, NMC and Xcel Energy are not aware of any adverse impacts on threatened or endangered species that have resulted from MNGP operation during the 30-year operating history.

NMC has initiated contacts with the U.S. Fish and Wildlife Service (FWS) and MNDNR regarding MNGP license renewal and potential impacts to threatened and endangered species. Attachment C to this ER includes copies of the contact letters and agency responses. Based on the considerations presented above and the results of correspondence with these agencies, renewal of the MNGP license is not expected to result in the taking of any threatened or endangered species, and is not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of any critical habitat. NMC concludes that impact to threatened and endangered species from continued operation of MNGP in the license renewal period (Issue 49) would be SMALL, and mitigation would be unwarranted.

4.8 AIR QUALITY DURING REFURBISHMENT (NONATTAINMENT AREAS)

NRC

"If the applicant's plant is located in or near a nonattainment or maintenance area, an assessment of vehicle exhaust emissions anticipated at the time of peak refurbishment workforce must be provided in accordance with the Clean Air Act as amended…." 10 CFR 51.53(c)(3)(ii)(F)

"Air quality impacts from plant refurbishment associated with license renewal are expected to be small. However, vehicle exhaust emissions could be cause for concern at locations in or near nonattainment or maintenance areas. The significance of the potential impact cannot be determined without considering the compliance status of each site and the numbers of workers expected to be employed during the outage." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 50

NRC made impacts to air quality during refurbishment a Category 2 issue because vehicle exhaust emissions from refurbishment-related activities could be cause for some concern, and a general conclusion about the significance of the potential impact could not be drawn without considering the compliance status of each site and the size of the estimated peak refurbishment-related workforce (NRC 1996, Section 3.3). Information needed would include (1) the attainment status of the plant-site area and (2) number of vehicles added as a result of refurbishment activities.

Detailed analysis is not required for this issue because, as Section 3.2 of this ER discusses, NMC has no plans for major refurbishment at MNGP.

4.9 IMPACT ON PUBLIC HEALTH OF MICROBIOLGICAL ORGANISMS

NRC

"If the applicant's plant uses a cooling pond, lake, or canal or discharges into a river having an annual average flow rate of less than 3.15×10^{12} ft^3/year (9×10^{10} m^3/year), an assessment of the impact of the proposed action on public health from thermophilic organisms in the affected water must be provided." 10 CFR 51.53(c)(3)(ii)(G)

"These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals that discharge to small rivers. Without site-specific data, it is not possible to predict the effects generically." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 57

NRC designated impacts to public health from thermophilic organisms a Category 2 issue, requiring plant-specific analysis, because the magnitude of the potential public health impacts associated with thermal enhancement of such organisms, particularly *Naegleria fowleri,* could not be determined generically. NRC noted in the GEIS that impacts of nuclear power plant cooling towers and thermal discharges are considered to be of small significance if they do not enhance the presence of microorganisms that are detrimental to water quality and public health (NRC 1996, Section 4.3.6). Information to be ascertained includes: (1) thermal conditions for the enhancement of *Naegleria fowleri*; (2) thermal characteristics of the Mississippi River; (3) thermal discharge temperature; and (4) impacts to public health.

NRC requires [10 CFR 51.53(c)(ii)(G)] an assessment of the potential impact of thermophilic organisms in receiving waters on public health if a nuclear power plant uses cooling ponds, cooling lakes, or cooling canals or discharges to a river with an average annual flow rate of less than 3.15×10^{12} cubic feet per year. Because the average Mississippi River discharge in the vicinity of the MNGP site is approximately 2.3×10^{11} cubic feet per year (see Section 2.2.1 of this ER), NRC considers it a small river, making this issue applicable to MNGP.

The Mississippi River in the vicinity of the plant is a broad turbulent stream with a boulder substrate. Recreational use including boating, fishing, and canoeing is common in the vicinity of the plant. NMC employees also perform sampling in the river. All of these activities create the potential for human exposure.

Thermophilic bacteria generally occur at temperatures of 77°F to 176°F, with maximum growth occurring between 122°F and 140°F. Bacteria pathogenic to humans typically have optimum temperatures of approximately 99°F (Joklik and Willett 1976). Populations of the pathogenic amoeba *Naegleria fowleri* can be enhanced in thermally altered water bodies at temperatures ranging from 95°F to 106°F or higher, but this organism is rarely found in water cooler than 95°F based on studies reviewed and coordinated by Tyndall et al. (1989).

The ambient temperatures of the Mississippi River near MNGP vary from freezing (approximately 32°F) in the winter to 83°F in the summer (AEC 1972, page V-20). Therefore, ambient river conditions are not likely to support the proliferation of pathogenic organisms of concern.

Based on MNGP discharge monitoring data collected from 1999 through 2001 for the months of June through September, the monthly average water temperature within the discharge canal ranged from 86.5°F to 90.82°F (NSP 1999-2001). As a condition of the plant's NPDES permit, the maximum daily average temperature at the end of the discharge canal may never exceed 95°F, the temperature specified for the warmer months of the year (April – October, see Section 3.1.3.3 of this ER). From a public health perspective, MNGP's temperature limit for the months of April through October when ambient river temperatures are the highest (95°F) are cooler than that required for proliferation of pathogenic organisms of concern.

Based on the average temperature of the discharge and receiving water, species such as *Naegleria fowleri* and *Legionella* sp. would not be expected to proliferate in the vicinity of MNGP. Given these poor conditions for supporting populations of thermophilic organisms, such organisms in the MNGP discharge do not constitute a significant public health issue.

NMC has initiated contacts with the Minnesota Department of Health regarding MNGP license renewal. Attachment D includes copies of the contact letters. Based on the evaluation presented above, NMC concludes that impacts on public health from thermophilic microbiological organisms are not likely to occur as a result of license renewal, and there would be no impacts to mitigate. Because the definition of "small" includes impacts that are not detectable, the appropriate characterization of the impact on public health of microbiological organisms (Issue 57) from continued operation of MNGP in the license renewal period is SMALL, and further mitigation is unwarranted.

4.10 ELECTROMAGNETIC FIELD - ACUTE EFFECTS

NRC

"If the applicant's transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the National Electrical Safety Code for preventing electric shock from induced currents, an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines must be provided." 10 CFR 51.53 (c)(3)(ii)(H)

"Electrical shock resulting from direct access to energized conductors or from induced charges in metallic structures have not been found to be a problem at most operating plants and generally are not expected to be a problem during the license renewal term. However, site-specific review is required to determine the significance of the electric shock potential at the site." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 59

NRC made impacts of electric shock from transmission lines a Category 2 issue because conformance of the plant's transmission lines with the currently applicable National Electrical Safety Code® (NESC®) standard for electric shock potential could not be determined without site-specific review (NRC 1996, Section 4.5.4.1). NRC does not define the phrase "transmission line" in its regulations at 10 CFR 51.53(c)(3)(ii)(H), but does indicate in the GEIS that transmission lines use voltages of about 115/138 kilovolts (kV) and higher (NRC 1996, Section 4.5.1). As indicated in the regulation cited above, the transmission lines of concern to license renewal are those constructed for the specific purpose of connecting the plant to the transmission system. NRC further elaborates in the GEIS and its guidance to applicants that the transmission lines to be addressed for license renewal are those that were constructed to connect the plant switchyard to the existing transmission system and reviewed as part of the construction permit for the plant (NRC 1996, Section 4.5; NRC 2000, Section 4.13).

As described in Section 3.1.4 of this ER, two 345-kV transmission lines (Monticello to Coon Creek and Monticello to Parkers Lake circuits) were originally constructed to connect MNGP to the transmission system and were evaluated in the Final Environmental Statement (FES) for initial operations. However, changes to the 345-kV transmission system and to these lines have fully integrated Xcel Energy's Monticello Substation into the 345-kV system. Based on these considerations, Xcel Energy's Monticello Substation now constitutes the transmission interconnection for MNGP.

All lines emanating from Xcel Energy's Monticello Substation were designed, constructed and are operated in compliance with the applicable sections of the NESC®, including the most recent edition. Specifically, these lines meet the requirement in effect since the 1990 edition of the Code for lines exceeding 98kV alternating current to ground, which limits "the steady state current due to electrostatic effects to 5 milliamp if the largest anticipated truck, vehicle or equipment under the line were short-circuited to ground." (Section 232.C.1.c. and 232.D.3.c.). This current is induced in vehicles by the transmission line electric field, which is proportional to the voltage of the line and

inversely proportional to the distance from the line. The Electric Power Research Institute has performed measurements on objects beneath lines to determine the level of electric field that will induce current in various objects. Results indicate that an electric field of 7.8 kV per meter at 1 meter above ground is required to induce a 5 milliamp current through a large tractor trailer (EPRI 1987, Chapter 8). The 345-kV lines associated with MNGP produce a maximum electric field at 1 meter above ground of 6.0 kV per meter. The unloaded sag at 120°F is limited by the NESC® to a minimum distance to ground of 30 feet in order to meet the minimum clearance required for operation at 212°F, which is the highest temperature that Xcel Energy operates the lines (NESC® Section 232). For a large vehicle, the electric field values indicated above could potentially generate an induced current of 3.84 milliamp, which is below the NESC® code criteria of 5 milliamp.

Transmission line compliance with the provisions of the NESC® code discussed above is verified by periodic air patrols (monthly), which monitor construction activities beneath and near the lines that could alter corridor terrain and clearances. Based on these considerations, NMC concludes that the Monticello 345-kV transmission lines meet the NESC® recommendations for preventing shock from induced currents and further assessment of the impact of the proposed action on the potential shock hazard is not required. NMC adopts, by reference, NRC's conclusion in the GEIS that the impact of electric shock (Issue 59) is of SMALL significance for such lines. Due to the small significance of the issue, mitigation measures, such as the installation of warning signs at roadway crossings or increasing wire clearance, are not warranted.

4.11 HOUSING IMPACTS

NRC

The environmental report must contain "[a]n assessment of the impact of the proposed action on housing availability…" 10 CFR 51.53(c)(3)(ii)(l)

"…Housing impacts are expected to be of small significance at plants located in a medium or high population area and not in an area where growth control measures that limit housing development are in effect. Moderate or large housing impacts of the workforce associated with refurbishment may be associated with plants located in sparsely populated areas or areas with growth control measures that limit housing development…." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 63

"…[S]mall impacts result when no discernible change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and no housing construction or conversion occurs." (NRC 1996, Section 4.7.1.1)

NRC made housing impacts a Category 2 issue because impact magnitude depends on local conditions NRC could not predict for all plants at the time of the GEIS publication (NRC 1996, Section 3.7.2). Local conditions that need to be ascertained are (1) population categorization as small, medium, or high and (2) applicability of growth control measures.

4.11.1 REFURBISHMENT

Refurbishment activities and continued operations could impact housing due to increased staffing. As described in Section 3.2 of this ER, NMC does not plan to perform major refurbishment activities during the MNGP license renewal period. NMC concludes that there would be no refurbishment-related impacts to area housing and, therefore, no analysis is required. As Section 3.4 of this ER describes, approximately 73 percent of the MNGP workforce resides in the Sherburne and Wright combined-county area. Accordingly, the following discussion focuses on impacts of continued operations on local housing availability in Sherburne and Wright counties.

4.11.2 LICENSE RENEWAL TERM

As Section 2.5 of this ER describes, the MNGP site is located in a high population area, as designated by NRC. As noted in Section 2.9 of this ER, neither Sherburne County nor Wright County is subject to growth control measures that limit housing development. In 10 CFR Part 51, Subpart A, Appendix B, Table B-1 (Issue 63), NRC concludes that housing impacts are expected to be of small significance at plants in high population areas where growth control measures are not in effect. Therefore, NMC expects housing impacts to be SMALL.

A site-specific housing analysis supports this conclusion. The maximum impact to area housing is calculated using the following assumptions: (1) all direct and indirect jobs

would be filled by immigrating residents; (2) the residential distribution of new residents would be similar to current worker distribution; and (3) each new job created (direct and indirect) represents one housing unit. As Section 3.4 of this ER describes, NMC's conservatively high estimate of 60 employees required to support license renewal related activities could generate 134 new jobs in the area (60 direct and 74 indirect). If it is assumed each of the 134 new workers would locate to the Sherburne and Wright combined county area, an additional 134 new housing units would be needed. This would not create a discernible change in housing availability, rental rates and housing values, or spur housing construction or conversion in an area with an estimated Year 2003 population of 177,196 persons, Year 2000 homeowner vacancy rates of 0.8 percent and 1.1 percent, and rental vacancy rates of 2.5 percent and 3.1 percent in Sherburne and Wright counties, respectively (Census 2001a,b; Census 2004). Given the magnitude of the impact on housing from continued operation (Issue 63) of MNGP in the license renewal period, which is SMALL, mitigative measures would not be necessary.

4.12 PUBLIC UTILITIES: PUBLIC WATER SUPPLY AVAILABILITY

NRC

The environmental report must contain "…an assessment of the impact of population increases attributable to the proposed project on the public water supply." 10 CFR 51.53(c)(3)(ii)(l)

"An increased problem with water shortages at some sites may lead to impacts of moderate significance on public water supply availability." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 65

"Impacts on public utility services are considered small if little or no change occurs in the ability to respond to the level of demand and thus there is no need to add capital facilities. Impacts are considered moderate if overtaxing of facilities during peak demand periods occurs. Impacts are considered large if existing service levels (such as quality of water and sewage treatment) are substantially degraded and additional capacity is needed to meet ongoing demands for services." (NRC 1996, Section 3.7.4.5)

NRC made public utility impacts a Category 2 issue because water shortages may occur in conjunction with plant demand and plant-related population growth (NRC 1996, Section 4.7.3.5). Local information needed would include a description of water shortages experienced in the area and an assessment of the public water supply system's available capacity.

NRC's analysis of impacts to the public water supply system considered both plant demand and plant-related population growth demands on local water resources. As stated in Section 3.2 of this ER, NMC does not plan to undertake major refurbishment activities for MNGP license renewal. NMC concludes there would be no refurbishment-related impacts on the public water supply system, and no analysis is required. Accordingly, the following discussion addressed impacts of continued MNGP operation on public water supply availability during the license renewal term.

The impact to the local water supply systems from plant-related population growth can be determined by calculating the amount of water that would be required by these individuals. As Section 3.4 of this ER describes, NMC's conservatively high estimate of 60 license renewal employees could generate a total of 134 new jobs. This could increase population in the area by 338 [134 jobs multiplied by 2.52, the average number of persons per household in the State of Minnesota (Census 2001c)]. The average American uses between 50 and 80 gallons of water per day for personal use (Fetter 1980, page 2). Assuming that this increase (16,900 to 27,040 gallons per day) is distributed across the Sherburne and Wright combined-county area, consistent with current employee trends, the increase in water demand represents a small percentage of total daily demand and would not create shortages in capacity of the water supply systems in these communities since all have either excess capacity or additional supply becoming available through planned systems increases in the next several years (see Section 2.8 of this ER). Therefore, NMC concludes that impacts resulting from plant-

related population growth on the public water supply (Issue 65) from continued operation of MNGP in the license renewal period would be SMALL, requiring no increase in capacity or additional supplies, and would not warrant mitigation.

4.13 EDUCATION IMPACTS FROM REFURBISHMENT

NRC

The environmental report must contain "An assessment of the impact of the proposed action on… public schools (impacts from refurbishment activities only) within the vicinity of the plant…." 10 CFR 51.53(c)(3)(ii)(l)

"…Most sites would experience impacts of small significance but larger impacts are possible depending on site- and project-specific factors…." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 66

"…[S]mall impacts are associated with project-related enrollment increases of 3 percent or less. Impacts are considered small if there is no change in the school systems' abilities to provide educational services and if no additional teaching staff or classroom space is needed. Moderate impacts are associated with 4 to 8 percent increases in enrollment. Impacts are considered moderate if a school system must increase its teaching staff or classroom space even slightly to preserve its pre-project level of service…. Large impacts are associated with project-related enrollment increases above 8 percent…." (NRC 1996, Section 3.7.4.1)

NRC made impacts to education from refurbishment a Category 2 issue because site-specific and project-specific factors determine the significance of impacts (NRC 1996, Section 3.7.4.1). Local factors to be ascertained include (1) project-related enrollment increases and (2) status of the student/teacher ratio.

As Section 3.2 of this ER describes, NMC does not plan to perform major refurbishment activities at MNGP. NMC concludes there would be no refurbishment-related impacts to education; therefore, no analysis is required.

4.14 OFFSITE LAND USE

4.14.1 REFURBISHMENT

NRC

The environmental report must contain "[a]n assessment of the impact of the proposed action on… land-use… within the vicinity of the plant…." 10 CFR 51.53(c)(3)(ii)(l)

"…Impacts may be of moderate significance at plants in low population areas…." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 68

"…[I]f plant-related population growth is less than 5 percent of the study area's total population, off-site land-use changes would be small, especially if the study area has established patterns of residential and commercial development, a population density of at least 60 persons per square mile, and at least one urban area with a population of 100,000 or more within 50 miles…." (NRC 1996, Section 3.7.5)

NRC made impacts to offsite land use as a result of refurbishment activities a Category 2 issue because land-use changes could be considered beneficial by some community members and adverse by others. Local conditions to be ascertained include: (1) plant-related population growth, (2) patterns of residential and commercial development, and (3) proximity to an urban area of at least 100,000 residents.

As Section 3.2 of this ER describes, NMC does not plan to perform major refurbishment activities at MNGP. NMC concludes there would be no refurbishment-related impacts to offsite land use; therefore, no analysis is required.

4.14.2 LICENSE RENEWAL TERM

NRC

The environmental report must contain "…[a]n assessment of the impact of the proposed action on …land-use…within the vicinity of the plant…" 10 CFR 51.53(c)(3)(ii)(l)

"Significant changes in land use may be associated with population and tax revenue changes resulting from license renewal." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 69

"…[I]f plant-related population growth is less than five percent of the study area's total population, off-site land-use changes would be small…" (NRC 1996, Section 3.7.5)

"If the plant's tax payments are projected to be small relative to the community's total revenue, new tax-driven land-use changes during the plant's license renewal term would be small, especially where the community has pre-established patterns of development and has provided adequate public services to support and guide development." (NRC 1996, Section 4.7.4.1)

NRC designated impacts to offsite land use during the license renewal term a Category 2 issue because land-use changes may be perceived to be beneficial by some community members and adverse by others. Therefore, NRC could not assess the

potential significance of site-specific offsite land-use impacts (NRC 1996, Section 4.7.4.2). Site-specific factors to consider in an assessment of new tax-driven land-use impacts include: (1) the size of plant-related population growth compared to the area's total population, (2) the size of the plant's tax payments relative to the community's total revenue, (3) the nature of the community's existing land-use pattern, and (4) the extent to which the community already has public services in place to support and guide development.

The GEIS presents an analysis of population-driven and tax-driven impacts on offsite land use for the renewal term (NRC 1996, Section 4.7.4.1). Based on the GEIS case study analysis, NRC concludes that all new population-driven land-use changes during the license renewal term at all nuclear power plants would be small. This is based on the fact that population growth caused by license renewal would represent a much smaller percentage of the local area's total population than has resulted from plant operation (NRC 1996, Section 4.7.4.2).

Section 4.7.4.1 of the GEIS states the assessment of tax-driven land-use impacts during the license renewal term should consider (1) the size of the plant's payments relative to the community's total revenues, (2) the nature of the community's existing land-use pattern, and (3) the extent to which the community already has public services in place to support and guide development (NRC 1996). If the plant's tax payments are projected to be small (less than 10 percent) relative to the community's total revenue, new tax-driven land-use changes by the plant during the plant's license renewal term would be SMALL. This is the case particularly where the community has pre-established patterns of development and has provided adequate public services to support and guide development. If the plant's tax payments are projected to be 10 to 20 percent of the community's total revenue, new tax-driven land-use changes would be MODERATE. This is most likely to be true where the community has no pre-established patterns of development (i.e., land-use plans or controls) or has not provided adequate public services to support and guide development in the past, especially infrastructure that would allow industrial development. If the plant's tax payments are projected to be a dominant source (greater than 20 percent) of the community's total revenue, new tax-driven land-use changes would be LARGE. This would be especially true where the community has no pre-established pattern of development or has not provided adequate public services to support and guide development in the past.

Wright County has not experienced any significant changes in land-use patterns due to the operation of MNGP. Current land-use characteristics within Wright County are described in Section 2.9 of this ER. Wright County is one of the fastest growing counties in Minnesota because of its close proximity to the Twin Cities Metropolitan Area. Additionally, Wright County ranked third and fourth in the state by percent change in population and total number change between 2000 and 2003, respectively (Census

2004). Continuation of tax receipts from MNGP keeps tax rates below what they otherwise would have to be to fund the local governments and also provide for a higher level of public infrastructure and services than otherwise would be possible. This enhances the county's attractiveness as a place to live and may tend to accelerate the conversion of open space to residential and commercial uses.

Because there are no major refurbishment activities as a result of license renewal at MNGP, no new sources of plant-related tax payments are expected that could significantly influence land use in Wright County or the City of Monticello. During the license renewal term, however, new land-use impacts could result from the use by local governments of the tax revenue paid by NMC for MNGP. As described in Section 2.7 of this ER, NMC has historically contributed a significant portion of total revenues in the City of Monticello and School District 882. These payments have represented a steadily decreasing percentage of total revenues for both entities, though the actual payments to the City have increased since 1998. NMC expects that any future property taxes assessed through the license renewal term should be similar or slightly more than current payments. Using NRC's criteria, NMC's payments to the county and hospital district are of small significance, the payments to the school district are of medium significance, and the payments to the city are of large significance.

As described in Section 2.9 of this ER, Wright County, including the City of Monticello, has an established pattern of development and guides growth with regulatory measures such as zoning and comprehensive planning. Population growth in Wright County has been significant during the period of MNGP operation and is projected to continue during the period of license renewal. Increased population growth within the vicinity of MNGP is attributed to the area's close proximity to the Minneapolis-St. Paul area, as well as improved highway conditions between the two locations. Operation of MNGP over the license renewal term would continue to be an important source of tax revenue for the City of Monticello, the local school district, Wright County, and the hospital district. This will continue to help to maintain current levels of development and public services. NMC's tax contributions during this period should not induce changes to local land-use and development patterns. NMC has no plans to conduct any major refurbishment activities for MNGP; therefore, no additional tax impact would result from an increase in the plant's assessed value due to refurbishment-related improvements. Therefore, there are no land-use changes expected during the license renewal period due to new tax-driven impacts. NMC concludes that the land-use impact (Issue 69) will be SMALL and mitigation is not warranted.

4.15 TRANSPORTATION

NRC

The environmental report must contain an assessment of "…the impact of highway traffic generated by the proposed project on the level of service of local highways during periods of license renewal refurbishment activities and during the term of the renewed license." 10 CFR 51.53(c)(3)(ii)(J)

"Transportation impacts ... are generally expected to be of small significance. However, the increase in traffic associated with the additional workers and local road and traffic control conditions may lead to impacts of moderate or large significance at some sites." 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Issue 70

Level of Service (LOS) "A and B are associated with small impacts because the operation of individual users is not substantially affected by the presence of other users." LOS A is characterized by "free flow of the traffic stream; users are unaffected by the presence of others." LOS B is characterized by "stable flow in which the freedom to select speed is unaffected but the freedom to maneuver is slightly diminished." (NRC 1996, Section 3.7.4.2)

NRC made impacts to transportation a Category 2 issue because impact significance is determined primarily by road conditions existing at the time of the project, which NRC could not forecast for all plants, primarily determine impact significance (NRC 1996, Section 3.7.4.2). Local road conditions to be ascertained are (1) level of service (LOS) conditions and (2) incremental increase in traffic associated with refurbishment activities and license renewal staff.

As Section 3.2 of this ER describes, NMC does not plan to perform major refurbishment activities at MNGP. NMC concludes there would be no refurbishment-related impacts to local transportation; therefore, no analysis is required.

As described in Section 3.4 of this ER, approximately 519 workers are currently employed at MNGP for normal plant operations (414 permanent employees and 105 long-term contractors). Approximately 73 percent of the permanent workforce resides in Wright and Sherburne Counties. During refueling outages, which occur at approximately 22- to 24-month intervals, site employment increases by as many as 600 temporary workers for a period of 30 to 40 days.

As described in Section 2.8.2 of this ER, road access to MNGP is via County Road 75. Major commuting routes used by employees are detailed on Table 2.8-2 with Average Annual Daily Traffic Counts. For the most heavily used roadways, State Highways 24 and 25 and Interstate 94, LOS data was also available and revealed that the addition of 60 vehicles would have no appreciable effect on the level of service. In Section 4.7.3 of the GEIS, NRC concludes that impacts are SMALL if existing infrastructure can accommodate any plant related demand without a noticeable effect on level of service. NMC's conservative estimate of 60 additional employees associated with license

renewal for MNGP would represent a 14.5 percent increase in the current number of permanent employees and an even smaller percentage of employees present on site during a typical refueling outage.

Given these employment projections and the roadway volume characterizations, NMC concludes the impacts of potential additional staff due to continued operation of MNGP during the license renewal period on traffic conditions (Issue 70) would be SMALL and additional mitigative measures would be unwarranted.

4.16 HISTORIC AND ARCHAEOLOGICAL RESOURCES

NRC

The environmental report must contain an assessment of "…whether any historic or archaeological properties will be affected by the proposed project." 10 CFR 51.53(c)(3)(ii)(K)

"Generally, plant refurbishment and continued operation are expected to have no more than small adverse impacts on historic and archaeological resources. However, the National Historic Preservation Act requires the Federal agency to consult with the State Historic Preservation Officer to determine whether there are properties present that require protection." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 71

"Sites are considered to have small impacts to historic and archaeological resources if: (1) the State Historic Preservation Office (SHPO) identifies no significant resources on or near the site; or (2) the SHPO identifies (or has previously identified) significant historic resources but determines they would not be affected by plant refurbishment, transmission lines, and license-renewal-term operations and there are no complaints from the affected public about the altered historic character; and (3) if the conditions associated with moderate impacts do not occur." (NRC 1996, Section 3.7.7)

NRC made impacts to historic and archaeological resources a Category 2 issue because determinations of impacts to historic and archaeological resources are site-specific in nature, and the National Historic Preservation Act mandates that determination of impacts must be made through consultation with the State Historic Preservation Officer (SHPO) (NRC 1996, Section 4.7.7.3).

As Section 3.2 of this ER describes, NMC does not plan to perform land-disturbing refurbishment activities at MNGP. NMC concludes that there would be no refurbishment-related impacts to historic and archaeological resources.

As described in Section 2.10 of this ER, no known archaeological or historic sites have been identified on site grounds. No known archaeological or historic sites have been identified along the transmission line rights-of-way. Moreover, because there are no land-disturbing modifications of those lines associated with license renewal, the rights-of-way are not considered part of the area of potential effects.

NMC has initiated correspondence regarding potential impact of MNGP license renewal on historical and archaeological resources with the SHPO. Attachment E includes copies of the correspondence with the SHPO. Based on the considerations above, NMC concludes that continued operation of MNGP would have no adverse impacts to historic or archaeological resources; hence, there would be no impacts to mitigate. The impact on historic and archaeological resources (Issue 71) from continued operation of MNGP in the license renewal period is therefore SMALL and mitigative measures would be unwarranted.

4.17 SEVERE ACCIDENT MITIGATION ALTERNATIVES

NRC

The environmental report must contain a consideration of alternatives to mitigate severe accidents "…if the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environment assessment..." 10 CFR 51.53(c)(3)(ii)(L)

"…The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to ground water, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives…." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 76

The term "accident" refers to any unintentional event (i.e., outside the normal or expected plant operation envelope) that results in the release or a potential for release of radioactive material to the environment. NRC categorizes accidents as "design basis" or "severe." Design basis accidents are those for which the risk is great enough that NRC requires plant design and construction to prevent unacceptable accident consequences. Severe accidents are those that NRC considers too unlikely to warrant design controls.

Historically, NRC has not included in its environmental impact statements or environmental assessments any analysis of alternative ways to mitigate the environmental impacts of severe accidents. A 1989 court decision ruled that, in the absence of an NRC finding that severe accidents are remote and speculative, severe accident mitigation alternatives (SAMAs) should be considered in the NEPA analysis [Limerick Ecology Action v. NRC, 869 F.d 719 (3rd Cir. 1989)]. For most plants, including MNGP, license renewal is the first licensing action that would necessitate consideration of SAMAs.

NRC concluded in its license renewal rulemaking that the unmitigated environmental impacts from severe accidents met its Category 1 criteria. However, NRC made consideration of mitigation alternatives a Category 2 issue because not all plants had completed ongoing regulatory programs related to mitigation (e.g., individual plant examinations and severe accident management). Site-specific information to be presented in the license renewal environmental report includes: (1) potential SAMA candidates; (2) benefits, costs, and net value of implementing potential SAMA candidates; and (3) sensitivity of analysis to changes in key underlying assumptions.

Section 4.17 provides a brief synopsis of the methodology and results for the NMC SAMA analysis, and Attachment F provides additional detail on the characterization of plant risk, process used to identify potential modifications, the cost-benefit methodology, and results.

NMC maintains a probabilistic safety assessment (PSA) model to use in evaluating the most significant risks of radiological release. The MNGP PSA model has two aspects. Level 1 determines core damage frequencies based on system analysis and human-factor evaluations, and Level 2 determines the physical and chemical phenomena that affect the performance of the containment and other radiological release mitigation features to quantify accident behavior and release of fission products to the environment. To support the SAMA analysis, NMC developed a Level 3 PSA model to characterize the hypothetical impacts from severe accidents on the surrounding environment and members of the public. The results of these models provide the primary input to the cost-benefit analysis.

4.17.1 METHODOLOGY OVERVIEW

The methodology used to perform the MNGP SAMA cost-benefit analysis was based on the handbook used by NRC to analyze benefits and costs of its regulatory activities (NUREG/BR-0184), subject to MNGP-specific considerations. The metrics used to represent plant risk include core damage frequency (CDF), dose risk, and economic cost risk. The following summarizes the approach NMC used in the SAMA analysis in Attachment F.

MNGP PSA Model – Use the MNGP Internal and External Events PSA models to characterize plant risk (Section F.2).

Level 3 PSA Analysis – Use MNGP Level 1 and 2 Internal Events PSA output and site-specific meteorology, demographic, land use, and emergency response data as input in performing a Level 3 PSA using the MELCOR Accident Consequences Code System Version 2 (MACCS2) (Section F.3).

Baseline Risk Monetization – Use NRC regulatory analysis techniques to calculate the monetary value of the unmitigated MNGP severe accident risk. Assuming that all plant risk is eliminated, this value represents the maximum averted cost-risk (MACR) (Section F.4).

Phase I SAMA Analysis – Identify potential SAMA candidates based on the MNGP PSA, coupled with documentation from the industry and NRC. Screen SAMA candidates that are not applicable to the MNGP design or are of low benefit in boiling water reactors such as MNGP; have already been implemented at MNGP or whose benefits have been achieved using other means; or have estimated implementation costs that exceed the maximum averted cost-risk (Section F.5).

Phase II SAMA Analysis – Screen Phase II SAMA candidates using PSA insights. Calculate the risk reduction attributable to each remaining SAMA candidate, and perform a detailed cost-benefit analysis to identify the potential net benefit (Section F.6).

Uncertainty Analysis – Evaluate how changes in certain assumptions used in the SAMA analysis might affect the results (Section F.7).

4.17.2 BASELINE RISK MONETIZATION

The purpose of establishing baseline cost risk is to provide a basis for determining the cost-risk reductions (benefits) that would be attributable to the implementation of potential SAMA(s). In accordance with NUREG/BR-0184, the present dollar value for severe accident risk is characterized as the sum of the offsite exposure costs, offsite economic costs, onsite exposure costs, onsite economic costs including replacement power costs. The total baseline cost risk for MNGP is approximately $4,321,000 (based on on-line internal events contributions). The methodology for calculating each of the 5 factors is presented in Attachment F, Section F.4. As described in Section F.5.1.7, NMC modified this value by applying a factor of two to account for external events contributions. Assuming all risk is eliminated, this modified value ($8,642,000) represents the maximum averted cost-risk, and is used as in the Phase I screening process.

4.17.3 SAMA IDENTIFICATION AND SCREENING

NMC utilized industry, NRC, and MNGP-specific information to create a list of 40 SAMA candidates for consideration. NMC analyzed this list and screened out those SAMAs already implemented at MNGP, those not applicable to MNGP design, or those achieving results already attained at MNGP by other means. NMC prepared preliminary cost estimates for the remaining SAMAs and used the baseline risk value to screen out SAMAs that would clearly not be cost-beneficial. Sixteen candidate SAMAs remained for further consideration.

For each SAMA candidate, NMC calculated the risk reduction that would be attributable to implementing the modification and re-quantified the risk value. The difference between the baseline risk value (MACR) and the SAMA-reduced risk value is the averted risk or the benefit of implementing the SAMA. NMC prepared more detailed cost estimates for implementing each SAMA and repeated the cost-benefit comparison.

4.17.4 COST-BENEFIT RESULTS

The benefits of revising the operational strategies in place at MNGP and/or implementing hardware modifications can be evaluated without the insight from a risk-

based analysis. Use of the PSA in conjunction with cost-benefit analysis methodologies has, however, provided an enhanced understanding of the effects of the proposed changes relative to the cost of implementation and projected dose and economic impact. The results of this study indicate several potential improvements are cost beneficial based on the methodology applied in this analysis and warrant further review for potential implementation.

NMC conducted the analysis initially on an individual candidate basis. However, NMC notes the most effective means of reducing risk at MNGP appears to be through implementation of a combination of SAMAs that allow for a synergistic effect maximizing the total benefit. For instance, while improving low pressure injection reliability can reduce plant risk, such an improvement in conjunction with the ability to maintain the RPV at low pressure for long-term cases greatly improves the effectiveness of the SAMA. The selected combination of SAMAs includes:

SAMA 2:	Enhanced DC Power Availability (provide cables from Diesel Generator-13, the security diesel, or another source to directly power division II 250 Volt battery chargers or other required loads)
SAMA 11:	Enhance Alternate Injection Reliability (include the Residual Heat Removal Service Water and Fire Service Water valves in the maintenance testing program)
SAMA 12:	Additional Diesel Fire Pump for Fire Service Water System (proceduralize the use of a fire truck to pressurize and provide flow to the fire main)
SAMA 28:	Refill Condensate Storage Tank (develop emergency procedures and ensure viability of refilling the Condensate Storage Tank with Fire Service Water)
SAMA 36:	Divert Water from Turbine Building 931-foot elevation East
SAMA 37:	Manual Reactor Core Isolation Cooling Operation

Sensitivity cases were conducted to assess the impact on the results if a 3 percent discount rate were used and if the 95th percentile results were used for CDF. The base case calculation used a 7 percent discount rate and the mean CDF value. While the magnitude of the benefit changed for each remaining SAMA, the net value for each SAMA was negative.

Based on the results presented in Attachment F, Section F.7.3, which are considered to best represent the current plant configuration, implementation of this group of SAMAs reduces the cost-risk of operating the plant by about 82 percent for a relatively low Implementation cost. The analysis was performed again using the assumption that this combination of SAMAs was implemented. Results of this assessment indicate that one additional modification, SAMA 16 (Passive Overpressure Relief), had a positive net value.

NMC notes that this analysis should not necessarily be considered dispositive because other engineering reviews are necessary to determine ultimate implementation. NMC

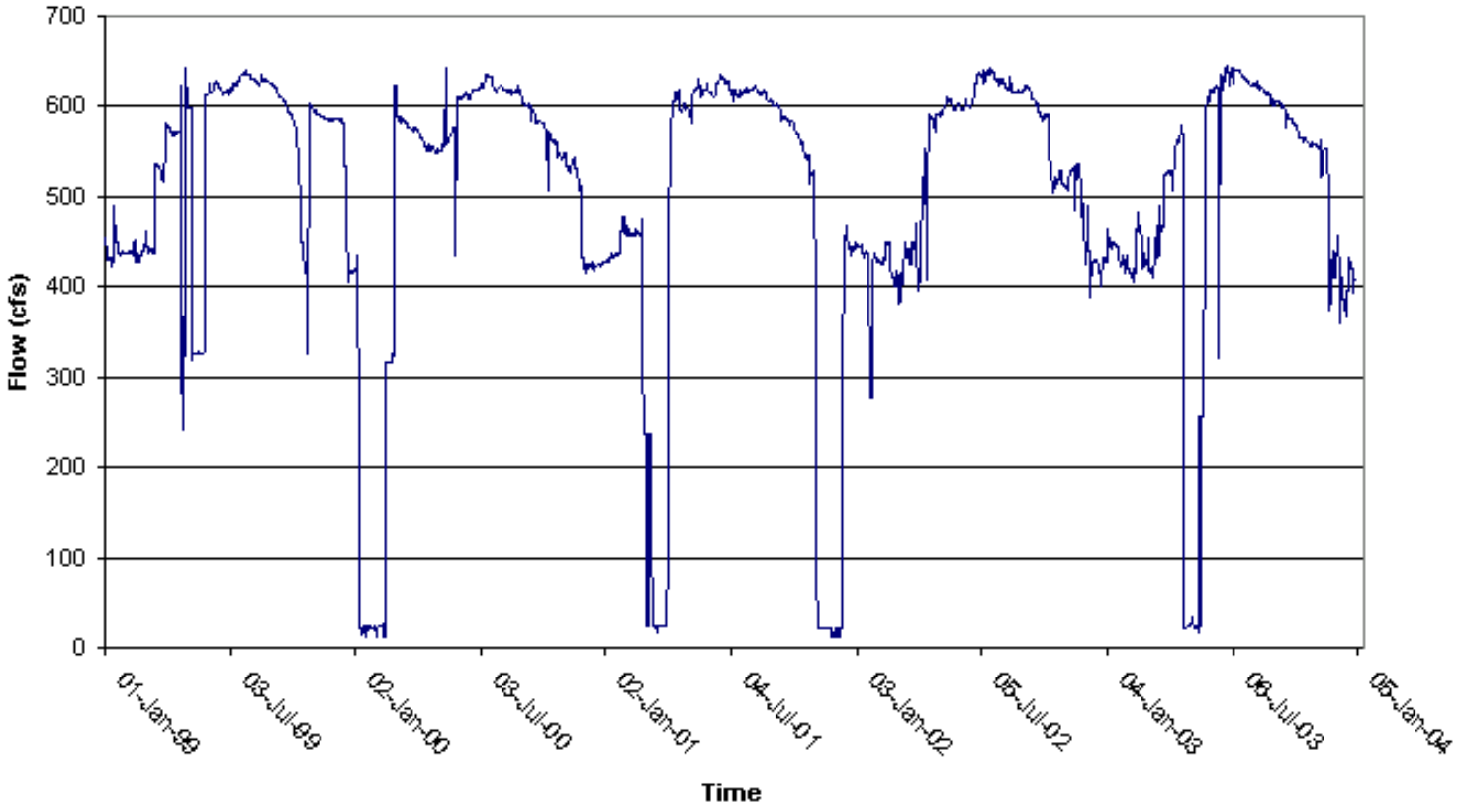
continues consideration and implementation of 7 SAMAs (2, 11, 12, 16, 28, 36, and 37) identified in this analysis through MNGP's corrective action program.

TABLE 4.2-1
FREQUENCY DISTRIBUTION OF DAILY CIRCULATING WATER FLOW AT MNGP, 1999-2003

Percentile (%)	Circulating Water Flow (cfs)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0	13	13	17	21	18	321	607	603	576	327	13	13	13
1	16	13	17	21	21	406	611	606	580	405	13	13	16
5	21	21	24	242	21	596	613	609	582	438	21	21	24
10	24	26	24	405	25	601	616	613	583	512	21	368	327
15	24	316	24	442	255	606	617	615	586	519	21	395	417
20	337	324	237	512	327	609	619	615	588	524	394	405	428
25	426	409	408	527	327	611	619	615	590	531	444	411	436
30	428	415	416	547	528	613	620	616	593	542	504	416	446
35	429	421	426	552	556	615	622	616	596	547	510	418	467
40	430	426	433	553	560	615	624	617	598	556	520	421	528
45	432	428	439	559	575	616	625	618	600	559	528	423	550
50	434	429	442	564	592	617	628	618	601	561	530	424	565
55	434	435	448	568	595	617	629	620	602	562	533	425	580
60	436	437	455	571	598	618	632	620	603	565	536	427	588
65	437	439	466	573	599	619	633	621	605	567	541	428	597
70	438	446	525	575	603	620	634	622	606	571	552	432	605
75	443	450	533	580	607	624	635	624	608	577	556	443	613
80	445	457	573	590	610	626	636	625	611	579	584	452	616
85	446	458	577	595	614	628	638	627	615	582	586	469	619
90	449	460	581	602	618	631	639	628	619	587	590	563	623
95	459	465	587	609	619	636	640	630	622	592	592	586	630
99	479	622	622	622	629	643	642	634	624	603	597	587	640
Mean	367	383	402	521	477	614	627	619	600	549	446	410	502
Max	491	622	622	643	643	644	642	635	624	603	597	587	644
Obs	155	141	155	150	155	150	155	155	150	155	150	155	1826

FIGURE 4.2-1

MNGP CIRCULATING WATER FLOW, 1999-2003



4.18 REFERENCES

Note to reader: This list of references identifies web pages and associated URLs where reference data was obtained. Some of these web pages may likely no longer be available or their URL addresses may have changed. NMC has maintained hard copies of the information and data obtained from the referenced web pages.

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5.0 ASSESSMENT OF NEW AND SIGNIFICANT INFORMATION

NRC

"The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware." 10 CFR 51.53(c)(3)(iv)

When applying to the U.S. Nuclear Regulatory Commission (NRC) for license renewal, licensees of domestic nuclear power plants must provide an application that includes an Environmental Report (ER) (10 CFR 54.23). NRC regulations at 10 CFR 51 prescribe the ER content and identify the specific analyses the applicant must perform. In an effort to perform the environmental review efficiently and effectively, NRC has resolved most of the environmental issues generically (Category 1) but requires an applicant's analysis of all remaining applicable issues (Category 2).

While NRC regulations do not require an applicant's ER to contain analyses of the generically resolved issues [10 CFR 51.53(c)(3)(i)], the regulations do require that an applicant identify any new and significant information of which the applicant is aware [10 CFR 51.53(c)(3)(iv)]. These requirements serve to alert NRC staff to such pertinent information, so that the staff can determine whether to seek NRC's approval to waive or suspend application of the License Renewal Rule with respect to the affected generic analysis. NRC has explicitly indicated, however, that an applicant is not required to perform a site-specific validation of its GEIS conclusions (NRC 1996b, pages C9-13 and C9-14, Concern Number NEP.015).

Nuclear Management Company, LLC (NMC) assumes new and significant information to include the following:

- Information that identifies a significant environmental issue the GEIS does not cover and is not codified in the regulation, or
- Information that was not covered in the GEIS analyses and that leads to an impact finding different from that codified in the regulation.

NRC does not define the term "significant." For the purpose of its review, NMC used guidance available in Council on Environmental Quality (CEQ) regulations. The National Environmental Policy Act (NEPA) authorizes the CEQ to establish implementing regulations for federal agency use. NRC requires license renewal applicants to provide NRC with input, in the form of an ER (10 CFR 51.10) that NRC will use to meet NEPA requirements as they apply to license renewal. CEQ guidance provides that federal agencies should prepare environmental impact statements for actions that would significantly affect the environment (40 CFR 1502.3), focus on significant environmental issues (40 CFR 1502.1), and eliminate from detailed study

issues that are not significant [40 CFR 1501.7(a)(3)]. The CEQ guidance includes a lengthy definition of "significantly," which requires consideration of the context of the action and the intensity or severity of the impact(s) (40 CFR 1508.27). NMC assumes that moderate or large impacts, as NRC defines, would be "significant." Section 4.1.2 of this ER presents NRC definitions of "moderate" and "large" impacts.

NMC implemented a process for identifying new and significant information as part of its preparation of the ER for the license renewal of Monticello Nuclear Generating Plant (MNGP). The process included the following actions:

(1) Assembly of an investigative team of individuals from NMC, Xcel Energy Inc., and representatives of Constellation Nuclear Services, Inc., a subsidiary of Constellation Energy, to support preparation of the ER. (These individuals provided knowledge pertinent to plant systems, the site environment, and plant environmental issues.);

(2) Interviews with subject matter experts from NMC and Xcel Energy Inc. on information related to the conclusions in the GEIS as they relate to MNGP;

(3) Review of NMC's internal and external environmental documents including permits, procedures, and practices to understand how the programs and activities manage potential impacts and/or provide mechanisms for staff to become aware of new and significant information;

(4) Review of documents related to environmental issues of MNGP and associated environs;

(5) Correspondence with state and federal regulatory agencies to determine if the agencies had concerns not addressed in the GEIS;

(6) Review of interfaces maintained with the nuclear power industry to ensure current knowledge of events at other plants with potential to affect environmental issues;

(7) Review of other operating plant license renewal application submittals for pertinent issues; and

(8) Review of the oversight provided by inspections of plant facilities by state and federal regulatory agencies.

The combination of NMC and non-NMC, on-site and off-site, and multidisciplinary personnel resulted in a team that was well qualified to implement the new and significant information process. As a result of this process, NMC is aware of no new

and significant information regarding the environmental impacts of MNGP license renewal and continued operation.

5.1 REFERENCES

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6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

6.1 LICENSE RENEWAL IMPACTS

Nuclear Management Company, LLC (NMC), has reviewed the environmental impacts associated with renewing the Monticello Nuclear Generating Plant (MNGP) operating license and has concluded that all of the impacts would be small and would not require mitigation. This Environmental Report (ER) documents the basis for the conclusion. In Section 4.1 of this ER, NMC incorporates by reference the U.S. Nuclear Regulatory Commission's (NRC's) findings for the 56 Category 1 issues that apply to MNGP, all of which have impacts that are SMALL (see Attachment A). Sections 4.2 through 4.17 of this ER, present NMC's analysis of the 18 Category 2 issues that apply to the MNGP site. Results of these analyses indicate that impacts would be SMALL for all applicable Category 2 issues. NMC studies indicate that no major refurbishment would be required for MNGP license renewal; therefore, no impacts would be associated with the Category 2 refurbishment issues included in Sections 4.6, 4.8, 4.11.1, 4.13, and 4.14.1 of this ER. The impacts MNGP would have on resources associated with Category 2 issues are summarized in Table 6.1-1.

6.2 MITIGATION

NRC
"The report must contain a consideration of alternatives for reducing adverse impacts...for all Category 2 license renewal issues..." 10 CFR 51.53(c)(3)(iii)
"The environmental report shall include an analysis that considers and balances...alternatives available for reducing or avoiding adverse environmental effects...." 10 CFR 51.45(c) as incorporated by 10 CFR 51.53(c)(2) and 10 CFR 51.53(c)(3)(iii)

All impacts of license renewal at MNGP are small and would not require additional mitigation. Mitigative measures were implemented during original construction to minimize potential operational impacts. The Circulating Water System was designed to operate in several modes minimizing impacts to aquatic life. The System has the capability to operate using once-through circulation of river water, recirculation in closed cycle with cooling towers, and several variations of these two basic modes so as to comply with State water-use permits and the National Pollutant Discharge Elimination System Permit (NPDES) discharge limits.

In 1980 the Discharge Canal was modified by the addition of an overflow weir at the end of the canal where it abuts the River. The weir inhibits fish from entering the canal and has reduced the occurrence of cold shock incidents during the winter months.

All impacts of license renewal at MNGP are either beneficial or small and, in either case, would not require additional mitigation. Ecological studies assessing impacts of plant operations on aquatic ecology in the Mississippi, as summarized in Sections 4.2, 4.3, and 4.4 of this ER, concluded that impacts from operations were small. There are environmental monitoring activities associated with current operations including the Radiological Environmental Monitoring Program (REMP) and National Pollutant Discharge Elimination System (NPDES) monitoring as required by the existing permit and as amended by any subsequent NPDES permits.

6.3 UNAVOIDABLE ADVERSE IMPACTS

NRC

The environmental report shall discuss any "...adverse environmental effects which cannot be avoided should the proposal be implemented…." 10 CFR 51.45(b)(2) as adopted by 10 CFR 51.53(c)(2)

The report "...should not be confined to information supporting the proposed action but should also include adverse information." 10 CFR 51.45(e)

NMC adopts by reference for this ER NRC findings stated in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) for applicable Category 1 issues (see Attachment A), including discussions of any unavoidable adverse impacts. In Chapter 4 of this ER, NMC examined the 21 Category 2 issues NRC identified in the GEIS. Eighteen of the 21 Category 2 issues were applicable to MNGP. NMC's review of these issues identified the following unavoidable adverse impacts of renewing the operating licenses for MNGP:

- The once-through cooling water system employed at MNGP would cause some early life stages of fish, largely suckers and perch, to be lost by entrainment during plant operation. Operational monitoring conducted at MNGP estimates that entrainment of eggs and larvae results in negligible losses to the population (see Sections 2.3.1.1 and 4.3 of this ER).

- Some fish would be lost due to impingement on the intake screens at MNGP. Impingement monitoring at MNGP was conducted from 1972 through 1976. The results showed that impinged fish consisted predominantly of black bullhead. Impingement monitoring conducted from April 1976 to April 1977 found two sucker (Catostomidae) species dominating the impinged fish. Results of these studies indicated that the overall effects of impingement on Mississippi River fish populations in the vicinity of MNGP were minimal (see Sections 2.3.1.1 and 4.4 of this ER).

- NMC expects that existing "surge" capabilities would enable MNGP to perform the increased SMITTR workload without additional staff. However, for purpose of analysis, NMC is adopting NRC's GEIS approach and has assumed that license renewal could necessitate adding as many as 60 staff. The assumed addition of 60 direct workers to Wright and Sherburne Counties, where approximately 73 percent of the MNGP workforce resides, could result in small impacts to housing availability, public water supplies, offsite land use, and transportation infrastructure (see Sections 4.11, 4.12, 4.14, and 4.15 of this ER).

6.4 IRREVERSIBLE OR IRRETRIEVABLE RESOURCE COMMITMENTS

NRC

The environmental report shall discuss any "...irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented…." 10 CFR 51.45(b)(5) as adopted by 10 CFR 51.53(c)(2)

The continued operation of MNGP for the license renewal term will result in irreversible and irretrievable resource commitments including:

- Nuclear fuel, which is utilized in the reactor and converted to radioactive waste,
- Land required to permanently store or dispose of this spent nuclear fuel and low-level radioactive wastes generated as a result of plant operations,
- Elemental materials that will become radioactive, and
- Materials used for the normal industrial operations of the plant that cannot be recovered or recycled or that are consumed or reduced to unrecoverable forms.

6.5 SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

NRC

The environmental report shall discuss the "...relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity…." 10 CFR 51.45(b)(4) as adopted by 51.53(c)(2)

The current balance between short-term use and long-term productivity of the environment at the MNGP site has remained relatively constant since operations began in 1970. This balance is described in the *Final Environmental Statement* (FES) for MNGP, which noted the conversion of approximately 60 acres of land to facilities for electrical power generation (AEC 1972, Section V.A). Much of the land in the vicinity of MNGP is utilized for agricultural purposes. Prior to construction of the plant, Northern States Power Company leased most of the property that now makes up the site for farming. NRC noted that these lands were essentially irreversibly committed because the land is not likely to be returned to agricultural use at the end of the project (AEC 1972, Section VIII.B).

NMC notes that the current balance between short-term use and long-term productivity of the environment at the MNGP site is now well established and can be expected to remain essentially unchanged by renewal of the operating license and extended operation of the MNGP site. Extended operation of MNGP would postpone restoration of the site and its potential availability for uses other than electric power generation. It would also result in other short-term impacts on the environment, all of which have been determined to be small on the basis of NRC's evaluation in the GEIS and NMC's evaluation in this ER.

TABLE 6.1-1
ENVIRONMENTAL IMPACTS RELATED TO LICENSE RENEWAL OF MNGP[a]

No.	Issue	Environmental Impact
	Surface Water Quality, Hydrology, and Use (for all plants)	
13	Water-use conflicts (plants using cooling ponds or cooling towers using makeup water from a small river with low flow)	SMALL. No significant impacts observed from current operations. Under low flow conditions, MNGP consumptive use of Mississippi River is 1.7 percent of flow that equates to a negligible change in river surface water elevation (0.25 inches).
	Aquatic Ecology (for plants with once-through and cooling pond heat dissipation systems)	
25	Entrainment of fish and shellfish in early life stages	SMALL. NMC has a current NPDES permit that constitutes compliance with CWA Section 316(b) requirements to provide best available technology to minimize entrainment.
26	Impingement of fish and shellfish	SMALL. NMC has a current NPDES permit that constitutes compliance with CWA Section 316(b) requirements to provide best available technology to minimize impingement.
27	Heat shock	SMALL. Thermal discharge from MNGP complies with Minnesota Water Quality Standards without recourse to a CWA Section 316(a) variance.
	Groundwater Use and Quality	
33	Groundwater use conflicts (potable and service water, and dewatering; plants that use more than 100 gpm)	NONE. The issue is not applicable because MNGP does not use more than 100 gpm.
34	Groundwater use conflicts (plants using cooling towers withdrawing makeup water from a small river)	SMALL. No significant impacts observed from current operations. Under low flow conditions, MNGP consumptive use of Mississippi River is 1.7 percent of flow that equates to a negligible change in river surface water elevation (0.25 inches).
35	Groundwater use conflicts (Ranney wells)	NONE. The issue is not applicable because the MNGP site does not use Ranney wells.
39	Groundwater quality degradation (cooling ponds at inland sites)	NONE. The issue is not applicable because the MNGP site does not use cooling ponds.
	Terrestrial Resources	
40	Refurbishment impacts to terrestrial resources	NONE. NMC has no plans for major refurbishment at MNGP related to license renewal.

TABLE 6.1-1 (CONTINUED)
ENVIRONMENTAL IMPACTS RELATED TO
LICENSE RENEWAL OF MNGP[a]

No.	Issue	Environmental Impact
	Threatened or Endangered Species	
49	Threatened or endangered species	SMALL. Species of concern have a low potential for occurrence in habitats affected by the plant and transmission line operation and associated maintenance; no impacts have been observed during operational monitoring.
	Air Quality	
50	Air quality during refurbishment (nonattainment and maintenance areas)	NONE. NMC does not have plans for major refurbishment at MNGP related to license renewal.
	Human Health	
57	Microbiological organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river)	SMALL. MNGP site operations have had no known impact on public health due to thermophilic microbial pathogens. Risk to human health is low due to poor conditions for supporting populations of such organisms in the Mississippi River, including areas affected by the thermal discharge, and low potential for exposure of the public in the thermally affected areas.
59	Electromagnetic fields, acute effects (electric shock)	SMALL. All circuits meet National Electric Safety Code® requirements for limiting induced shock.
	Socioeconomics	
63	Housing impacts	SMALL. NMC does not plan any refurbishment activities related to license renewal, so there would be no housing impacts as a result of refurbishment activities. A bounding analysis, which assumes 60 additional employees may be required during the license renewal term, indicates the need for an additional 134 housing units in an area with a population greater than 169,554 persons and demonstrates impacts would be small.
65	Public services: public utilities	SMALL. NMC does not plan any refurbishment activities related to license renewal, so there would be no impacts to public utilities as a result of refurbishment activities. A bounding analysis, which assumes 60 additional employees may be required during the license renewal term, indicates increased demand of approximately 27,040 gallons of water per day on water systems in the Sherburne and Wright combined-County area. Given the available capacity of these systems, bounding analysis demonstrates impacts would be small.

TABLE 6.1-1 (CONTINUED)
ENVIRONMENTAL IMPACTS RELATED TO
LICENSE RENEWAL OF MNGP[a]

No.	Issue	Environmental Impact
	Socioeconomics (continued)	
66	Public services: education (refurbishment)	NONE. NMC has no plans for major refurbishment at MNGP as part of license renewal.
68	Offsite land use (refurbishment)	NONE. NMC has no plans for major refurbishment at MNGP as part of license renewal.
69	Offsite land use (license renewal term)	SMALL. Wright County has not experienced any significant changes in land-use patterns from current operations. Given the established patterns of development and the growth management measures enacted in the County and the City of MNGP, license renewal tax-driven land-use changes are not likely to generate significant changes in the area's land-use patterns.
70	Public services: transportation	SMALL. The addition of up to 60 employees would be less than a typical refueling outage workforce (600). Access and commuting routes are adequate to handle outage traffic. Therefore, impacts on local transportation systems would be small
71	Historic and archaeological resources	SMALL. No impacts to historic or archaeological resources were identified.
76	Severe accidents	NMC identified 7 potentially cost-beneficial SAMAs; however, none were related to aging. NMC plans to implement these as voluntary enhancements or NMC will continue to pursue these as potential voluntary enhancements.

a. Exclusive of Issue 60, "Electromagnetic Field - Chronic Effects," which is categorized "NA" by NRC and for which the applicant is not required to provide an analysis [10 CFR 51.53(c)(3); 10 CFR 51, Subpart A, Appendix B, Table B-1] and Issue 92, "Environmental Justice," which will be addressed by NRC in plant-specific reviews [10 CFR 51, Subpart A, Appendix B, Table B-1].

CWA = Clean Water Act

gpm = gallons per minute

No. = issue number

6.6 REFERENCES

Note to reader: This list of references identifies web pages and associated URLs where reference data was obtained. Some of these web pages may likely no longer be available or their URL addresses may have changed. NMC has maintained hard copies of the information and data obtained from the referenced web pages.

AEC (U.S. Atomic Energy Commission). 1972. *Final Environmental Statement Related to the Operation of Monticello Nuclear Generating Plant*. Docket No. 50-263. Directorate of Licensing. Washington, D.C. November.

7.0 ALTERNATIVES TO THE PROPOSED ACTION

NRC

The environmental report shall discuss "Alternatives to the proposed action.…"
10 CFR 51.45(b)(3), as adopted by reference at 10 CFR 51.53(c)(2).

"...The report is not required to include discussion of need for power or economic costs and benefits of ... alternatives to the proposed action except insofar as such costs and benefits are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation...." 10 CFR 51.53(c)(2).

"While many methods are available for generating electricity, and a huge number of combinations or mixes can be assimilated to meet a defined generating requirement, such expansive consideration would be too unwieldy to perform given the purposes of this analysis. Therefore, NRC has determined that a reasonable set of alternatives should be limited to analysis of single, discrete electric generation sources and only electric generation sources that are technically feasible and commercially viable…." (NRC 1996a, Section 8.1).

"…The consideration of alternative energy sources in individual license renewal reviews will consider those alternatives that are reasonable for the region, including power purchases from outside the applicant's service area…." (NRC 1996b, Section II.H, Page 66541).

The U.S. Nuclear Regulatory Commission (NRC) considers the environmental impacts of the proposed action (i.e., license renewal) and alternatives to the proposed action in accordance with its National Environmental Policy Act (NEPA) implementing regulations when deciding whether to approve renewal of an applicant's operating license [10 CFR 51.95(c)]. In this chapter, Nuclear Management Company, LLC (NMC) identifies reasonable alternatives to renewal of the Monticello Nuclear Generating Plant (MNGP) operating license and presents its evaluation of associated environmental impacts. This chapter also includes descriptions of alternatives NMC considered but determined to be unreasonable to consider in detail, and associated supporting rationale.

NMC divided its alternatives discussion into two categories, "no action" and "alternatives that meet system generating needs." In Section 7.1, NMC addresses the "no-action alternative" in terms of the potential environmental impacts of not renewing the MNGP operating license, independent of any actions taken to replace or compensate for the loss of generating capacity. In Section 7.2, NMC describes feasible alternative actions that could be taken, which NMC also considers to be elements of the no-action alternative, and presents other alternatives that NMC does not consider to be reasonable. Section 7.3 presents environmental impacts for the reasonable alternatives.

The environmental impact evaluations of alternatives presented in this chapter are not intended to be exhaustive. Rather, the level of detail and analysis rely on NRC's decision-making standard for license renewal, as follows:

> "…the NRC staff, adjudicatory officers, and Commission shall determine whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decision makers would be unreasonable" [10 CFR 51.95(c)(4)].

Therefore, NMC generally structured the analyses to provide enough information to support NRC decision-making by demonstrating whether an alternative would have a smaller, comparable, or greater environmental impact than the proposed action. Additional detail or analysis was not considered useful or necessary if it would identify only additional adverse impacts of license renewal alternatives. This approach is consistent with the Council on Environmental Quality regulations, which provide that the consideration of alternatives (including the proposed action) be adequately addressed so reviewers may evaluate their comparative merits [40 CFR 1502.14(b)].

NMC characterizes environmental impacts in this chapter using the same definitions of SMALL, MODERATE, and LARGE used in Chapter 4 of this Environmental Report (ER) and by NRC in its *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996a, page 1-4). In Chapter 8, NMC presents a summary comparison of environmental impacts of the proposed action and alternatives.

7.1 NO-ACTION ALTERNATIVE

NMC considers the no-action alternative addressed in this ER to be a scenario in which NRC does not renew the current MNGP operating license, MNGP ceases operation and is decommissioned, and Northern States Power (NSP)[1] or others take appropriate action to replace or compensate for the loss of generating capacity. Section 7.1.1 addresses potential environmental impacts of terminating operations and decommissioning exclusive of actions to replace power from MNGP. NMC discusses alternatives for replacing or compensating for the loss of generating capacity in Section 7.2 of this ER.

7.1.1 TERMINATING OPERATIONS AND DECOMMISSIONING

In the event NRC does not renew the MNGP operating license, NMC assumes the unit would be operated until its current license expires in 2010, then decommissioned in accordance with NRC requirements. Decommissioning, defined by NRC at 10 CFR 50.2, denotes the safe removal from service of a nuclear generating facility and the reduction of residual radioactivity to a level that permits release of the property for unrestricted or restricted use, and termination of the license. The two decommissioning options typically selected for U.S. reactors are (NRC 2002, Section 3.2):

- immediate decontamination and dismantlement (DECON), and
- safe storage of the stabilized and defueled facility for a period of time followed by decontamination and dismantlement (SAFSTOR).

Regardless of the option chosen, decommissioning methods would be described in the post-shutdown decommissioning activities report, which must be submitted to NRC within two years following cessation of operations [10 CFR 50.82(a)(4)]. Decommissioning activities must be completed within 60 years after operations cease in accordance with 10 CFR 50.82(a)(3) [NRC 1996a, Section 7.2.2]. Related NRC

requirements ensure that the decommissioning activities, when defined, would be subject to required environmental reviews in accordance with NEPA [10 CFR 50.82, 10 CFR 51.53(d)].

In the GEIS, NRC provides a summary of decommissioning activities, generic environmental impacts of the decommissioning process, and an evaluation of potential changes in impact that could result from deferring decommissioning for up to 20 years (NRC 1996a, Chapter 7). The GEIS analysis is based on a 1988 generic environmental impact evaluation of decommissioning [i.e., NUREG-0586 (NRC 1988)], which uses the

[1] Northern States Power is a wholly owned utility operating subsidiary of Xcel Energy Inc.

1,155-megawatt (MW) Washington Public Power Supply System Nuclear Project 2 reactor as representative of decommissioning activities for a boiling water reactor, the reactor type used at MNGP (Section 3.1.1 of this ER). NRC concluded from the GEIS generic evaluation that decommissioning would have SMALL impacts with respect to radiation dose, waste management, air quality, water quality, socioeconomic impacts and ecological resources, and that impacts would not be significantly greater as a result of the proposed action (NRC 1996a, Section 7.4; 10 CFR 51, Subpart A, Appendix B, Table B-1).

Considering the information presented in the GEIS Chapter 7 and the fact that the MNGP has a smaller reactor than the GEIS reference plant, NMC considers NRC's generic evaluation and associated conclusions in the GEIS to bound MNGP for purposes of this ER. NRC has updated the 1988 generic environmental impact evaluation of decommissioning on which the GEIS is based. This update, Supplement 1 to NUREG-0586, expanded the original analysis by addressing impacts of dismantling structures, systems, and components required to operate the reactor and also considered characteristics of plants currently operating in the U.S. (NRC 2002, Sections 1.1, 1.3, 3.1). Of the 23 environmental issues evaluated in this updated analysis, NRC concluded that the following were site-specific: impacts on land use from offsite activities; impacts on aquatic and terrestrial ecology and cultural and historic resources from activities beyond operational areas; impacts on threatened and endangered species; and environmental justice impacts. NRC concluded that all of the remaining issues were generic with SMALL impacts (NRC 2002, Table ES-1).

Based on its review of Supplement 1 to NUREG-0586, NMC considers these generic conclusions to be appropriate for MNGP for purposes of this ER. With respect to those environmental issues identified as site-specific:

- NMC has no reason at this time to believe that MNGP decommissioning would involve land use disturbance off-site or beyond current operational areas.

- Decommissioning activities would be subject to substantial environmental reviews as noted above.

- No significant historic or archaeological resources are known to exist on the site (Section 2.10 of this ER).

- The census block group closest to MNGP that qualifies as minority or low income by NRC criteria is located in St. Cloud, approximately 20 miles from MNGP, and is the only such block group in the Sherburne and Wright County area (Table 2.5-2 and Figure 2.5-8 of this ER).

- Only four threatened, endangered, or candidate species are known to occur on or in the vicinity of the MNGP site (Section 2.3.3 of this ER), for which the following are decommissioning impact considerations:

  – Bald eagles (federal-threatened) have been observed to nest on Cedar Island, portions of which are as close as 600 feet from the power block (Figure 2.1-3 of this ER). Discouragement or disruption of nesting in this area could result from decommissioning activities. However, NMC expects this impact would be of SMALL significance considering its temporary nature, factors contributing to recovery of this species, and recent confirmation that 681 active nests exist in the state.

  – Peregrine falcons (state-threatened) successfully nest on the MNGP Off-Gas Stack. Removal of the stack would eliminate one of only 25 successful nesting sites that currently exist in the State. NMC assumes that adverse impact would be noticeable, but not destabilizing (i.e., MODERATE) in the absence of mitigation and SMALL if efforts to provide successful alternative nesting habitat were successful.

  – The loggerhead shrike (state-threatened) reportedly occurs on or in the vicinity of the MNGP site. However, NMC expects that decommissioning would not involve activities beyond current operational areas, and so assumes that adverse impact on this species, if any, would be of SMALL significance.

  – Trumpeter swans (state-threatened) congregate on the Mississippi River downstream from the site in winter, apparently enabled by the ice-free areas resulting from the MNGP cooling water discharge and efforts by a local resident to feed them. NMC expects that termination of MNGP operations and associated reduction of cooling water discharges would reduce or eliminate suitable wintering habitat and therefore congregation of individuals in this affected river segment; therefore, NMC assumes there would be little or no opportunity for significant adverse impacts on this species from decommissioning.

NMC notes that decommissioning activities and their impacts, discussed above, are not discriminators between the proposed action and the no-action alternative. License renewal would only postpone decommissioning for 20 years, and NRC has established in the GEIS that the timing of decommissioning operations does not substantially influence the environmental impacts of decommissioning. NMC adopts by reference NRC findings that the impacts of delaying decommissioning until after the renewal terms would be SMALL (10 CFR 51, Appendix B, Table B-1).

Environmental impacts that could result more directly from terminating plant operations (e.g., from cessation of thermal effluents, reduced property tax payments, workforce

reductions) are not in the scope of the analyses presented in Chapter 7 of the GEIS or in Supplement 1 to NUREG-0586, but are discussed in Section 8.4 of the GEIS and to a limited extent in Sections 1.3 and 4.3.12 of the latter document (NRC 2002). With the potential exception of ecological resources and socioeconomics, NRC's generic evaluation of these issues indicates that environmental impacts of terminating operations would be SMALL (NRC 1996a, Section 8.4). Based on its review of the discussion in these documents and information presented in this ER, NMC considers NRC's generic evaluation and conclusions in Section 8.4 of the GEIS to be appropriate for MNGP. With particular respect to ecological resources and socioeconomics impacts:

- With exception of the state-threatened trumpeter swan, NMC expects that termination of MNGP operations would have little, if any, adverse effect on ecological resources, considering occurrence and habitat affinities of threatened or endangered species (Section 2.3 of this ER), possible impact initiators (e.g., cessation of thermal discharge), the small significance of current operational impacts (Chapter 4 of this ER), and the expectation that transmission lines from MNGP addressed in this ER would continue to be used (Section 3.1.4 of this ER).

- As noted above, trumpeter swans (state-threatened) congregate on the Mississippi River downstream from the site in winter. NMC expects that termination of MNGP operations and associated reduction of cooling water discharges would require them to find other suitable wintering habitat within or outside of Minnesota. NMC concludes that impact would be SMALL if the effect of plant shutdown were limited to the displacement of wintering individuals without significant losses and potentially MODERATE otherwise.

- NMC notes that terminating MNGP operations would result in a decrease in tax revenues to local jurisdictions 20 years sooner than if the MNGP operating license is renewed. Property tax payments attributable to MNGP represent 12-13 percent of the operating budget for the City of Monticello (Section 2.7 and Table 2.7-1 of this ER) and, by NRC criteria, a loss of 10-20 percent is considered detectable but not destabilizing (NRC 2002, Section 4.3.12.3).

In consideration of the above, NMC concludes that terminating operations and decommissioning MNGP could result in SMALL to MODERATE impact on ecological resources (i.e., state-threatened peregrine falcon and trumpeter swan) and MODERATE socioeconomic impact from loss of tax revenues by the City of Monticello 20 years earlier than would occur if the MNGP operating license is renewed. NMC further concludes that terminating operations and decommissioning MNGP would result in SMALL impacts with respect to the remaining resource areas evaluated, providing little or no basis for discriminating between the proposed action and the no-action alternative. The environmental impacts of replacement options considered in

Section 7.3 of this ER provide substantial additional information useful for evaluating the relative environmental merits of the proposed action versus the no-action alternative.

7.1.2 REPLACEMENT CAPACITY

MNGP has a net generating capability of approximately 597 megawatts electrical (MWe) (EIA 2004a,b). In 2002-2003, MNGP generated an annual average of approximately 4,800,000 megawatt-hours (MWh) of electricity, approximately 13 percent of NSP's total annual electricity generation in that 2-year period (EIA 2004a). This power, equivalent to the annual electric power usage of approximately 585,000 of NSP's Minnesota residential customers, would be unavailable in the event the MNGP operating license is not renewed. Replacement options discussed in Section 7.2 include purchasing power, building new generating facilities, delaying retirement of non-nuclear assets, and reducing power requirements through demand reduction.

7.2 ALTERNATIVES THAT MEET SYSTEM GENERATING NEEDS

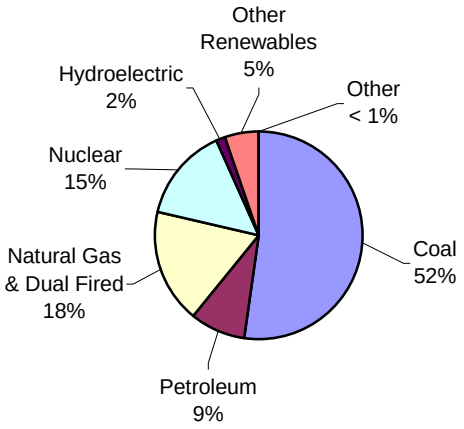
In Section 7.2.1, NMC provides background information pertinent to the identification and selection of alternatives available to replace MNGP generating capability. Alternatives NMC considers to be reasonable are described in Section 7.2.2. Section 7.2.3 describes other alternatives NMC evaluated and rationale for not considering them further in this ER.

7.2.1 GENERAL CONSIDERATIONS

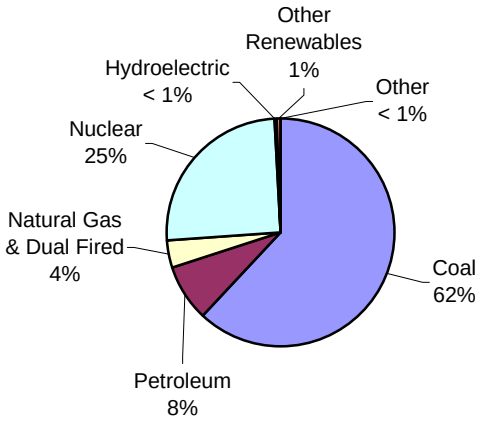
7.2.1.1 Current and Projected Generating Capability and Utilization

Current and anticipated future electric power generating capability and utilization are indicative of the technical and economic viability of technologies for generating electricity, and therefore of potentially reasonable alternatives to replace power produced by MNGP. Based on the following graphs, the generating capacity of Minnesota's electric utility industry as a whole consists mostly of coal, natural gas and dual-fired, and nuclear units. Petroleum-fueled and renewable sources (i.e., conventional hydroelectric, wind, solar, biomass, other) comprise approximately nine percent and eight percent, respectively, of generating capacity in the state.

NSP's generating capability in Minnesota also consists primarily of coal-fired and nuclear units. Facilities firing primarily natural gas and petroleum represent smaller



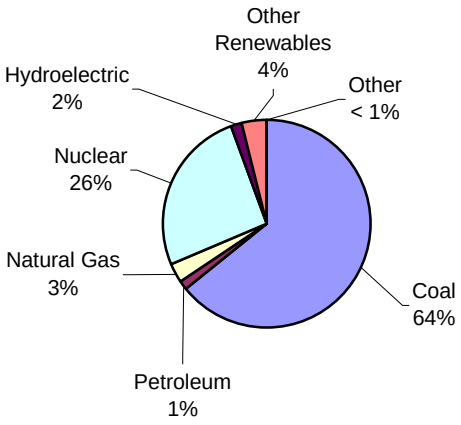
2002 Minnesota Electric Industry Capacity (EIA 2004b)



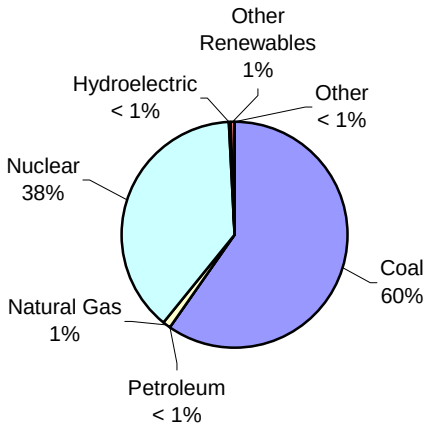
2002 NSP Minnesota Capacity (EIA 2004c)

capacity shares of NSP's generating portfolio, while renewables account for less than 3 percent of capacity.

Comparison of generating capacity by type with actual utilization of this capacity as illustrated below indicates preferential use of coal-fired and nuclear plants to generate electricity in Minnesota, and is reflective of relatively low operating cost and suitability of these technologies for continuous (base-loaded) operation. In contrast, use of fossil-fueled generating capability other than coal (i.e., gas and oil) is relatively low, reflecting relatively high fuel costs for oil and natural gas and use of these fuels primarily as needed to meet intermediate or peak loads.



2002 Minnesota Electric Industry Utilization (EIA 2004b)



2002 NSP's Minnesota Utilization

Insight regarding Minnesota's future generation portfolio can be gained from U.S. Department of Energy (DOE) Energy Information Agency (EIA) projections for the nation and the Mid-Continent Area Power Pool (MAPP) region, which includes Minnesota and all or part of surrounding states and two Canadian provinces (Manitoba and Saskatchewan) (MAPP 2004). Nationally, coal-fired generation is expected to remain the predominant source of electricity through 2025 and the relative amount of generation from natural gas and coal is expected to increase. Aggregate generation from nuclear plants is expected to remain near present levels with no new facilities expected as a result of the relatively favorable economics of competing technologies. Generation from renewable sources is expected to exhibit relatively slow growth because of the relatively low costs of fossil-fired generation and because competitive electricity markets favor less capital-intensive technologies (EIA 2004d, page 6; EIA 2004e, Table 64).

Projected increases in capacity and generation in the MAPP region for the 2004-2010 and 2004-2025 periods (EIA 2004e, Table 64) are illustrated by the following selective summary tabulation:

MAPP Projected Capacity Increase					MAPP Projected Generation Increase				
	2004-2010		2004-2025			2004-2010		2004-2025	
Source	MW	%	MW	%	Source	GWh	%	GWh	%
Coal Steam	- 40	- 1	5,240	45	Coal	14,380	78	53,300	85
Nuclear	0	0	0	0	Nuclear	110	1	110	< 1
Combined Cycle	210	7	620	5	Natural Gas	890	5	5,140	8
Combustion Turbine/Diesel	1,750	62	4,730	41	Petroleum	- 30	< 1	860	1
Renewables	810	29	950	8	Renewables	2,970	16	3,530	5
All Sources	2,810		11,610		All Sources	18,320		62,940	

As indicated by this data summary, EIA projects there will be no appreciable change in nuclear capacity or generation the MAPP region. No coal-fired steam capacity additions are projected in the MAPP region in the 2004-2010 period, but in 2004-2025 most capacity addition is from coal-fired steam; by far the greatest increase in generation during both periods is expected to be from coal. Combustion turbine/diesel and combined cycle together represent significant projected capacity additions in both periods, but the increase is predominantly peaking capacity because most is from combustion turbine/diesel units (likely to be nearly all combustion turbines), and the contribution to projected generation from natural gas and petroleum, typical combustion turbine fuels, is low.

EIA projects a greater relative increase in capacity and generation from renewables in MAPP than is projected nationally through 2025. This is particularly true in the 2004-2010 period, when its contribution to generation increases is expected to exceed that of natural gas. This phenomenon is mostly the result of ongoing and projected development of regional wind-conversion facilities, which is projected to account for approximately 90 percent or more of renewable capacity and generation in the 2004-2010 and 2004-2025 periods (EIA 2004e, Table 80). Minnesota has the potential to develop wind energy resources, particularly in the Buffalo Ridge area in the southwestern part of the state (MDC 2004a, pages 16, 30-32). NSP is in the process of developing a high voltage transmission line to deliver power from the Buffalo Ridge area to the Minneapolis-St. Paul (Twin Cities) area as part of its plans to fulfill a portion of substantial renewable energy obligations imposed by Minnesota statute (Minn. Stat. 216B.1691, 2423, 2424). While this line will help mitigate the transmission constraints in the area, additional transmission would be necessary to continue development of this resource (MDC 2004a, pages 16, 30-32, Appendix 3).

7.2.1.2 Electric Power Industry Regulation

The U.S. electric power industry began its transition from a regulated monopoly structure to a competitive retail market with the passage of the federal Energy Policy Act of 1992 and associated state initiatives. As summarized by the EIA, the Federal Energy Regulatory Commission (FERC) Order 888 requires that all public utilities provide open access to their transmission lines and functionally separate their wholesale power services and transmission services, and encouraged the creation of independent system operators (ISOs) to ensure independence in transmission operations (EIA 2004f). Order 889 prevents public utility power marketing organizations from having preferential access to transmission information, and requires that such information be equally shared with transmission customers. FERC Order 2000 encouraged all transmission owners to voluntarily allow operation of their transmission assets by independent Regional Transmission Operators (RTOs) to improve market performance and equal access (FERC 2002).

In the wake of these federal initiatives and upon approval of the Minnesota Public Utilities Commission (MPUC), Minnesota's investor-owned utilities, including NSP, have joined the Midwest Independent System Operator (MISO), and have transferred functional control (but not ownership) of their transmission facilities to MISO, the operations of which are subject to FERC approval (MDC 2004a, page 18; MISO 2004).

Almost half the states across the country have passed major legislation and/or regulations to restructure their electric power industry, including provisions to promote retail competition (EIA 2000, pages ix-xi; EIA 2004f). Minnesota has not enacted major restructuring initiatives such as these. Rather, Minnesota and most states in North American Electric Reliability Council's (NERC's) MAPP region have retained the traditional regulatory model in which electric utilities are comprehensively regulated to ensure reliable electric service within pre-determined utility service territories (MDC 2004a, page 23). In this context, NSP, through a regulated operating subsidiary (Northern States Power-Minnesota), provides a comprehensive portfolio of energy-related products and services in Minnesota, including generation, purchase, transmission, distribution, and sale of electricity; purchase, distribution and sale of natural gas to retail customers; and transport of customer-owned natural gas (Xcel Energy 2004a, page 3). NSP's service area in Minnesota is located predominantly in the southern part of the state from St. Cloud southward, including the Twin Cities Metropolitan area (Xcel Energy 2004b). Its Minnesota power generating facilities are also located in the southern part of the state (Xcel Energy 2004c).

Results of the utility restructuring initiatives discussed above are reflected in increases in the non-utility share of new electric generating capacity and generation. These increases are lower than national averages in Minnesota, which retains a traditional regulatory structure. Nonetheless, non-utility share of capacity in the state increased at

an average annual rate of 5.4 percent during 1993-2002 and the non-utility share of generation increased from 6.3 percent to 8.0 percent in this same period (EIA 2000, page xi; EIA 2004b, Tables 4 and 5).

In the regulatory environment described above, and as specifically provided by Minnesota statute (Minn. Stat. 216B.37, 216B.04), NSP is obligated to ensure the electric power needs of customers in its service area are met and to take appropriate action (e.g., power purchase, development of new generation capacity) to accommodate any shortfall in available power resulting from a decision by NRC to not renew the MNGP operating license. These actions would be undertaken in the context of planning and permitting requirements and activities of the MPUC, Minnesota Environmental Quality Board (MEQB), MISO, and various other state agencies, including the following:

- Integrated Resource Plan - Regulated utilities submit to the MPUC for approval biennial integrated resource plans projecting future resource needs and providing analysis and proposals to reduce and manage energy demand and develop new generating facilities (Minnesota Rules 7843.0400; MDC 2004a, page 24).

- Transmission Plan - Transmission-owning utilities in the state collaboratively identify inadequacies in the state's transmission system and propose solutions biennially (MDC 2004a, page 24; Dairyland Power Cooperative, et al 2003). MISO also conducts regional transmission planning consistent with requirements set forth in FERC Order (MISO 2003, Sections 1.1, 1.2).

- Certificate of Need (CON) - Development in Minnesota of electric power generating plants having a capacity of 50 MW or more, high voltage transmission lines with a capacity of 200 kilovolts (kV) or more, and major natural gas pipelines (i.e., those having an operating pressure over 200 pounds per square inch (psi) and instate length of more than 50 miles) requires MPUC approval either by issuance of a CON or other means (e.g., integrated resource plan approval). The CON process includes an initial review of the project with respect to environmental impacts and alternatives, including conservation and renewable alternatives (MDC 2004a, page 24 and Appendix 6).

- Site/Route Permit - Development in Minnesota of electric power generating equipment with a capacity of 50 MW or more, large wind energy conversion systems (combination of wind turbines with a capacity of 5 MW or more) and, regardless of length, transmission lines operating at 100 kV or more and natural gas pipelines more than 6 inches in diameter operating at pressures more than 275 psi are required to obtain a site or route permit from MEQB. This process entails detailed environmental review, analysis of alternatives, and opportunity for public input (MDC 2004a, pages 24-35 and Appendix 6).

- Other Environmental Approvals - A variety of additional permits and approvals from other federal, state, and local entities also may be required to develop electrical energy facilities in Minnesota.

7.2.1.3 Mixtures

NRC indicated in the GEIS that, while many methods are available for generating electricity and a huge number of combinations or mixes can be assimilated to meet system needs, such expansive consideration would be too unwieldy given the purposes of the alternatives analysis. Therefore, NRC determined that a reasonable set of alternatives should be limited to analysis of single discrete electrical generation sources and only those electric generation technologies that are technically reasonable and commercially viable (NRC 1996a, page 8-1). Consistent with NRC's determination, NMC has not evaluated mixes of generating sources in this ER. However, the impacts from coal- or gas-fired generation presented in this chapter are expected to bound impacts from any generation mixture of technologies.

7.2.2 FEASIBLE ALTERNATIVES

In view of the background information presented in Section 7.2.1 and additional information presented in this section, NMC considers that purchased power and development of new generating capacity represented by modern natural gas combined-cycle and pulverized coal-fired steam power generation technologies are reasonable alternatives to replace MNGP generating capacity in the event its operating license is not renewed. NMC describes these alternatives in the following subsections as reasonable hypothetical scenarios for analysis without regard to whether they would be developed by NSP or others.

7.2.2.1 Purchased Power

Most Minnesota utilities rely on electricity generated outside of Minnesota to meet their customer's needs, and in some manner all of them, including NSP, use the regional grid to import power at various times (MDC 2004a, page 22). However, many major transmission lines into and out of Minnesota are nearing operational limits, which could affect reliability in the future and impede the ability to import power if additional transmission infrastructure is not developed (MDC 2004a, pages 15-16). These problems are recognized by state and regional transmission planning organizations and mechanisms are in place to identify and address transmission constraints affecting system reliability (MDC 2004a, pages 15-24; MISO 2003, Sections 1.1, 1.2). Therefore, NMC assumes purchased power would be a reasonable alternative to replace power lost in the event the MNGP operating license is not renewed.

Technologies that would be used to generate the purchased power are a matter of conjecture but, based on the discussion of Minnesota capacity and utilization data and national and MAPP region projections, NMC considers that the most likely candidates would be coal-fired and nuclear sources during off-peak periods and gas-fired sources during on-peak periods, probably supplemented by power from renewable sources, particularly wind-conversion facilities. Because of the size of the block of baseload capacity supplied by MNGP, construction of additional generating capacity using one or more of these technologies would likely be required even under the power purchase scenario. Such construction could occur within or outside of the MAPP region. NMC assumes the GEIS description of these technologies to be appropriately representative.

In view of constraints in the existing transmission infrastructure, NSP expects that substantial additions to either the 500-kV or 345-kV transmission systems in the Upper Midwest would be required to import power into Minnesota in amounts that would replace generation from MNGP. Specific plans for such additional transmission would entail detailed studies beyond the scope or purpose of this ER. However, for purposes of analysis, NMC assumes that 100 miles of new 345-kV transmission line(s) using a 150-foot wide right-of-way (ROW) would be needed in the Upper Midwest, assumed for analysis to be located in southern Minnesota south of the Twin Cities metropolitan area, the state's main load center, in an area roughly bounded by existing 345-kV lines entering the state from the south.

As indicated in Section 7.2.1.2 of this ER, the location and design of the transmission line would be subject to substantial environmental restrictions and review, including MEQB site permit review and opportunity for public participation. Therefore, NMC assumes it would be sited, developed, and operated in accordance with all applicable environmental requirements and in a manner that ensures adverse environmental impacts would not be destabilizing with respect to resources of concern.

7.2.2.2 Representative Natural Gas-Fired Generation

For purposes of this analysis, NMC assumes development of a modern natural gas-fired combined-cycle plant similar to others being planned or developed in Minnesota could be configured to replace power currently generated by MNGP. The Mankato Energy Center, planned for development by Calpine Corporation to generate baseload power for NSP near the City of Mankato, approximately 50 miles southwest of the Twin Cities in Blue Earth County, Minnesota, meets these general criteria. Therefore, NMC used selected plant characteristics as described in the environmental assessment for that facility (MEQB 2004) as a main source of information for the representative plant characteristics. NMC also drew upon other relevant sources, including the GEIS (NRC 1996a) and utility industry information. Basic design and operating assumptions for the representative plant are listed in Table 7.2-1.

The assumed representative plant consists of two steam combustion turbines (CTs), each with an associated heat recovery steam generator (HRSG) that together supply steam to a single steam turbine generator. Net generating capacity of the representative plant with this "two-on-one" configuration is approximately 550 MW. Although capacity of the representative plant is somewhat less than that of MNGP (597 MW), it is nonetheless reasonably comparable for purposes of this ER.

NMC assumes for conservatism that the representative plant would use natural gas as its only fuel. However, the facility reasonably could be constructed with capability to fire oil as a backup fuel for use during high demand periods for natural gas, thus improving fuel supply capabilities and operating cost. Based on the information presented in Table 7.2-1, total annual heat input from natural gas would be approximately 27,150,000 million British thermal units (MMBtu), corresponding to an annual natural gas consumption of approximately 26.9 billion cubic feet.[2] Availability of sufficient capacity from existing natural gas transmission infrastructure in Minnesota to supply the plant in 2010 is conjectural. NMC notes that only a limited number of natural gas generation facilities can be added to the existing system without significant upgrades (MDC 2004a, page 15). However, the Minnesota Department of Commerce (MDC) indicates that while existing infrastructure is near capacity, there is a potential for more natural gas supplies becoming available within the state as long as liquefied natural gas displaces natural gas supplies consumed in other parts of the country, and there appears to be adequate supplies available to meet projected demand for some time beyond 2025 (MDC 2004a, pages 47-50). In view of these considerations, NMC acknowledges that the representative plant would likely contribute to the need for major gas supply infrastructure in the state, but conservatively assumes that no such major improvements would be needed.

The representative plant would be designed to meet applicable standards with respect to control of air and wastewater emissions (MPCA 2003). Exhaust from the two HRSGs would be dispersed through individual 200-foot high stacks (MEQB 2004, Section 4.4). NMC assumes that the representative plant would feature closed-cycle cooling that utilizes a single 45-foot high mechanical-draft cooling tower (MEQB 2004, Sections 2.2.7, 4.4). Consumptive losses of water from the cooling tower (from evaporation) and discharge of cooling water (as cooling tower blowdown) for the Mankato Energy Center are expected to amount to approximately 3 cubic feet per second (cfs) and 1 cfs, respectively, as an annual average when the plant operates without supplemental firing, which NMC considers to be reasonable approximations for the representative plant (MEQB 2004, Section 2.2.7 and Figure 6).

2 Annual Natural Gas Requirement (Btu) = [Natural Gas Heat Input] x [Heating Value of Fuel] = [Total Gross Capability (561 MW) x Heat Rate (6,500 Btu/kW-hour) x 1,000 kW/MW x Capacity Factor (0.85) x 8,760 hr/yr] Therefore: Natural Gas Heat Input = 2.715×10^{13} Btu/yr, or 2.715×10^{7} MMBtu/yr. Volume of gas required per year = Annual Natural Gas Requirement (Btu/yr) x [Heating Value of Fuel (1 scf/1,008 Btu)] = 2.693×10^{10} scf/yr, or 26.9 billion scf^3/yr. Table 7.2-1 lists all necessary parameters and values.

NMC estimates that the representative plant with associated support facilities would occupy approximately 25 acres at a greenfield site (MEQB 2004, Section 2.1.2, Figures 4 and 5). Additional land could be needed as buffer from adjacent land uses. For example, NRC estimates that 110 acres would be required for a 1,000 MW plant (NRC 1996a, Table 8.1). Assuming use of an existing power plant site (e.g., MNGP site) as a replacement unit and use of the existing switchyard and perhaps other support facilities and no need for additional land as buffer, NMC estimates that new facilities would occupy approximately 15 acres (MEQB 2004, Section 2.1.2, Figures 4 and 5). Offsite infrastructure needed for the representative plant could reasonably include a natural gas supply pipeline and new transmission facilities to connect the plant to the grid.

NMC assumes for this assessment that construction of the gas-fired plant would be timed to enable its operation in 2010 when the MNGP operating license expires. NMC estimates that the plant would be constructed in approximately two years with a peak onsite workforce of approximately 450 workers, and that a permanent full-time workforce of approximately 24 persons would operate the plant (MEQB 2004, Section 4.6).

7.2.2.3 Representative Coal-Fired Generation

Specific coal generating technologies that would represent viable alternatives in 2010 when the MNGP operating license expires are less certain than for a natural gas-fired plant, particularly in view of potentially higher air emissions compared to natural gas firing. NMC notes that integrated gasification combined-cycle (IGCC) technology could be viable based on potential development of the Mesaba Energy Project. The Mesaba Energy Project is a IGCC facility with a capacity of approximately 750 MW proposed for development in northern Minnesota (MDC 2004a, page 11). However, the Mesaba facility would be the largest capacity IGCC facility constructed to date in the U.S and represents technology that is not yet fully demonstrated commercially at the size proposed. IGCC demonstration plants to date have been much smaller (MDC 2004a, page 40). Given these circumstances, the long-term reliability of IGCC may not be known at the point when a decision would need to be made regarding replacement of MNGP capacity. NSP recognizes modern pulverized coal-fired steam units with advanced, clean-coal technology air emission controls as currently proven technology that is economically competitive and commercially available in large-capacity unit sizes that could effectively replace MNGP. Therefore, NMC uses a representative plant of this type for purposes of impact evaluation, noting that air emissions impacts of IGCC may be lower than modern pulverized coal, but likely would be comparable to or higher than the gas-fired combined-cycle alternative (DOE 1999, page 7).

The representative plant consists of a commercially available standard-sized unit having a nominal net output of approximately 600 MW, comparable to MNGP's net capacity.

Consistent with the representative gas-fired plant alternative, NMC assumes that the representative coal-fired plant would use closed-cycle cooling with a mechanical draft cooling tower. Based on a simple ratio of steam cycle gross power (660 MW versus 196 MW; Tables 7.2-1 and 7.2-2), average consumptive loss and blowdown from the cooling system for the representative coal-fired plant would be 3.4 times that of the representative gas-fired plant, or approximately 10 cfs and 3 cfs, respectively.

Table 7.2-1 lists basic specifications for the plant. Based on this information, annual coal consumption for the facility would be approximately 2.7 million tons.[3] The representative plant would be designed to meet applicable standards with respect to control of air and wastewater emissions (MPCA 2003). Exhaust would be dispersed through a stack approximately 500 feet high, assuming a boiler building height of approximately 200 feet and application of EPA's standard for good engineering practice [40 CFR 51.100(ii)]. NMC estimates that approximately 31,000 tons of limestone could be needed annually to operate the scrubber assumed for control of sulfur oxides (SOx) emissions.

NMC estimates that approximately 260 acres would be required to accommodate the generating plant and related onsite ancillary and support facilities and infrastructure (e.g., coal and limestone transport, storage, and handling facilities; switchyard and onsite transmission lines; storage tanks; cooling towers; technical and administration buildings; access roads; parking). Additional land would be required to dispose of solid waste from the plant's air emissions control systems (i.e., ash and flue gas desulfurization waste). The extent to which these solid wastes could be used beneficially is dependent on such factors as air emission control design specifics and future demand. However, approximately 30 percent of the ash from NSP's coal-fired generating plants goes to such beneficial uses as concrete products and roadbed material (Xcel Energy 2004d). Therefore, NMC assumes for purposes of this ER that 30 percent of the ash from the representative coal-fired plant would be beneficially used, and that the remainder of this air emission control waste would be landfilled onsite. Assuming an average fill depth of 30 feet, approximately 120 acres would be required over an assumed 40-year plant life. Therefore, the minimum total land requirement for the plant is assumed to be approximately 380 acres. Additional land likely would be necessary to allow for a peripheral buffer. For example, NRC estimates that a total of 1,700 acres could be required for a larger (1,000 MW) plant (NRC 1996a, Table 8.1). Offsite infrastructure needed for the representative plant could reasonably include a new rail spur for delivery of coal and limestone and new transmission facilities to connect the plant to the grid, which NMC assumes would occupy ROWs 50-feet wide and 150-feet wide, respectively. Assuming delivery of coal and limestone by unit trains

3 Coal Combusted (tons/year) = Gross Capability (660 MW) x Heat Rate (9,800 Btu/kilowatt-hour) x 1,000 kilowatt/MW x 1/Fuel Heat Value (8,903 Btu/lb) x 0.0005 (ton/lb) x Capacity Factor (0.85) x 8,760 hr/year = 2.7 million tons/yr. All necessary parameters and values are provided in Table 7.2-2.

composed of 100 cars, each having a capacity of 100 tons, an average of 5-6 trains per week would be required to supply the representative plant.

NMC assumes that construction of the coal-fired unit would be timed to enable its operation when the MNGP operating license expires in 2010, and estimates that the plant could be constructed in approximately 5 years with average and peak onsite workforces of approximately 400 and 1,000 workers, respectively. Depending on the level of automation, a permanent work force of 50-80 full-time employees would likely be required to operate the plant.

7.2.2.4 Siting Considerations

NSP considers it unlikely that either of the representative plants would be developed at the MNGP site. There are approximately 245 acres of undeveloped land on the site that could accommodate either the representative gas- or coal-fired plant. This acreage is largely unforested and is east and south of the MNGP power block between the River and the Burlington Northern–Santa Fe (BNSF) branch rail and consists mostly of former agricultural land and areas occupied by the former MNGP Ecological Research Station (see Figure 2.1-3 of this ER). However, several constraints offset the potential advantages offered by use of land already designated for industrial use and use of existing infrastucture (e.g., substation, transmission lines, cooling water system and support facilities).

Optimal arrangement of the gas-fired plant would likely require locating it within 0.5 miles of MNGP spent fuel storage, which would require specific NRC approval. Assuming this constraint were overcome, NMC assumes that approximately 35 miles of 16-inch natural gas pipeline occupying a 30-foot wide ROW would be required supply the plant (MEQB 2004, Section 2.3). NSP considers that the Viking Gas Transmission interstate pipeline, which traverses Benton and Mille Lacs Counties north of MNGP (Figure 2.1-1 of this ER) to be the closest pipeline with the potential for sufficient capacity (Northern Border Partners 2000). This additional infrastructure represents a potential economic and environmental constraint.

Theoretically, the noted on-site area could support the representative coal-fired plant facilities. However, the configuration of this otherwise potentially suitable area, proximity to County Road 75 and Interstate 94, and the fact that the River bisects the site all present significant constraints to an optimal layout of plant facilities (Figure 2.1-3). Potentially significant issues include the possible need to realign County Road 75 and insufficient suitable area for onsite disposal of air emission control waste south of the River. The latter constraint would necessitate transport of this waste to an existing disposal facility at NSP's Sherburne County Generating Plant site or a new facility developed offsite or on suitable land (e.g., agricultural land) on the MNGP site north of the River (Figure 2.1-2 of this ER).

In view of these considerations, NMC assumes for purposes of this ER that the hypothetical alternative would be located at a greenfield site in southern Minnesota generally south of the Twin Cities, and NMC addresses the MNGP site only as a secondary siting option. The choice of a specific location for the plant would require detailed studies and analysis beyond the scope or necessity for this ER. However, NMC notes that NSP has recently considered areas generally south of the Twin Cities (e.g., at Mankato and in the Rosemount area, near the Mississippi River immediately southeast of the Twin Cities metropolitan area), as potentially favorable for siting natural gas-fired or coal-fired power plants for new generation.

Offsite infrastructure needed to locate either plant at a greenfield site is conjectural. NMC assumes that 5 miles of new natural gas supply pipeline would be needed to supply the gas-fired plant and 10 miles of new rail would be required for delivery of coal and limestone to the coal-fired plant. In addition, NMC assumes 5 miles of new 345-kV transmission line would be needed to connect to the grid. NMC assumes that the supply pipeline would require a 30-foot wide ROW, a rail spur would require a 50-foot wide ROW, and the transmission line would occupy a 150-foot wide ROW.

As indicated by discussion elsewhere in this ER, the location and design of either alternative plant and associated offsite infrastructure would be subject to substantial environmental restrictions and review, including MEQB site permit review and opportunity for public participation. Therefore, NMC assumes the representative plant and associated offsite infrastructure would be sited, developed, and operated in accordance with all applicable environmental requirements and in a manner that ensures adverse environmental impacts would not be destabilizing with respect to resources of concern.

7.2.3 OTHER ALTERNATIVES CONSIDERED

In this section, NMC describes alternatives other than purchasing power and developing new coal- or natural gas-fired generation that were considered. The discussion includes the reasons why NMC does not consider these alternatives to be reasonable or feasible for purposes of this evaluation.

7.2.3.1 Other Generation Alternatives

In addition to coal-fired and natural gas-fired generation, NRC evaluated several other generation technologies in the GEIS (NRC 1996a, Chapter 8). NMC has considered these options as potential alternatives to continued operation of MNGP and determined them to be unreasonable on the basis of economics, high land-use impacts, low capacity factors, geographic limitations, insufficiently developed technology, or other reasons. Table 7.2-3 summarizes the results of the review.

7.2.3.2 Delayed Retirement of Existing Non-nuclear Units

Extending the lives of existing non-nuclear generating plants beyond the time they were originally scheduled for retirement represents another potential alternative to license renewal (NRC 1996a, Section 8.3.13). However, delaying retirement in order to compensate for MNGP generally would be unreasonable without major construction to upgrade or replace plant components. NSP undertakes upgrades of its older baseload plants in cases where it is reasonable to do so. Such actions are currently accounted for in NSP's plans to meet anticipated demands irrespective of the loss of generating capacity if the MNGP operating license is not renewed and, therefore, do not represent a realistic option. In any event, NMC expects that the environmental impacts of implementing such upgrades and operating the upgraded plants are reasonably bounded by assessments presented in this chapter for the gas-fired and coal-fired alternatives.

7.2.3.3 Demand-Side Management

Under provisions of Minn. Stat. 216B.241, Minnesota public utilities, rural electric cooperatives, and municipal utilities are required to invest 1.5 percent of in-state revenues in projects designed to reduce their customers' consumption of electricity and improve efficient use of energy resources. Utilities that operate nuclear generating facilities like MNGP are required to invest 2.0 percent of revenues in this manner. Cost of this program, which is administered by the MDC, is recovered from utility customers (MDC 2004b). Each utility is required to submit to the MDC for approval an annual conservation improvement plan (CIP) which details its energy-saving programs (MDC 2004b; Minn. Stat. 216B.241). Within certain limits as specified under Minn. Stat. 216B.241, the MDC may specifically direct utilities like NSP in regards to investments and expenditures to be made for energy conservation.

In this context, NSP has in place a wide variety of electrical energy conservation (i.e., demand-side management, or DSM) programs and activities, including:

- Conservation Programs – programs like NSP's Energy Solutions newsletter and internet-based information resources designed to educate and inform customers about energy efficiency and NSP offerings.

- Energy Efficiency Programs – programs like ConservationWise from Xcel Energy^{SM} that help customers increase energy efficiency by providing rebates, pricing, or other incentives to purchase energy efficient systems or components (e.g., boilers, air conditioning systems, lighting, motors); renovate facilities that meet specific energy efficiency standards (e.g., roofing); undertake energy conservations assessments; and obtain expert energy conservation design assistance.

- Load Management Programs – programs such as OperationWise from Xcel Energy^{SM} that encourage customers to switch load to customer-owned standby generators during periods of peak demand, and include features like Saver's Switch® that encourage customers to allow a portion of their load to be interrupted during periods of peak demand.

Details of NSP's DSM programs are provided in its most recent CIP.

In its order approving Xcel Energy's 2000 Integrated Resource Plan, the MPUC adopted the DSM goal referred to as the 175 percent incentive scenario for the 2000-2014 planning period. This scenario established aggressive targets of 3,253 gigawatt-hours (GWh) of cumulative energy savings and 1,174 MW of cumulative peak demand savings in NSP's service area over this period. NSP surpassed its annual goals in the early years of the program, but anticipates that it will become increasingly difficult to cost-effectively maintain annual targets (50-80 MW) in the future.

NMC notes that even if these aggressive annual DSM savings targets were achieved, the cumulative savings through 2010 would be insufficient to replace generation lost as a result of MNGP operations termination at the end of its current operating license. Moreover, NSP credits these DSM goals in its demand forecasts, which indicate the need for substantial amounts of energy to meet obligations in its service area even assuming the MNGP operating license is renewed. Therefore, NMC concludes that DSM does not represent a meaningful alternative to renewal of the MNGP operating license.

7.3 ENVIRONMENTAL IMPACTS OF ALTERNATIVES

NMC evaluations of environmental impacts for the feasible replacement power alternatives are presented in the following sections. Section 7.3.1 provides NMC's impact assessment of the purchased power alternative. Sections 7.3.2 and 7.3.3 address impacts associated with the natural gas-fired and coal-fired plant alternative, respectively. Chapter 8 presents a summary comparison of the environmental impacts of license renewal and the alternatives discussed in this section.

The evaluations presented below focus on the impacts specific to these alternatives. Impacts associated with terminating operations and decommissioning MNGP (i.e., base case, Section 7.1.1 of this ER) are expected to be of SMALL significance for all resource areas addressed except socioeconomics and ecological resources; therefore, these generally are not further discussed. However, conclusions expressed below regarding the significance of impact for each alternative denote the total expected impact for each resource area, inclusive of the base case. The influence of the base case on these conclusions is noted where appropriate.

The new generating plants addressed in Sections 7.3.2 and 7.3.3 would not be constructed only to operate for the period of extended operation of MNGP. Therefore, NMC assumes for this analysis a typical design life of 30 years for the combined-cycle natural gas-fired plant and 40 years for the coal-fired plant, and considers impacts associated with operation for the entire design life of the units in this analysis. As discussed in Section 7.2, NMC assumes that construction of these plants would be phased to provide replacement capacity in 2010 when the MNGP operating license expires.

7.3.1 PURCHASED POWER

NMC assumes that the generating technology employed under the purchased power alternative would be one of those that NRC analyzed in the GEIS (Section 7.2.2.1 of this ER). NMC is adopting by reference NRC analysis of the environmental impacts from those technologies. Therefore, under the purchased power alternative, environmental impacts associated with developing any new generation required would still occur, but would be located elsewhere in the region, the U.S., or Canada. However, for purposes of comparative analysis, NMC assumes that overall generation-associated adverse impacts would be no greater than are identified in this ER for the representative gas-fired and coal-fired plant alternatives.

Environmental impacts associated with terminating operations and decommissioning MNGP nonetheless could result in MODERATE adverse socioeconomic impacts to the City of Monticello from loss of tax revenues 20 years earlier than would occur if the

MNGP operating license is renewed, and SMALL to possibly MODERATE impact on the peregrine falcon and trumpeter swan, both state-listed threatened species (Section 7.1.1 of this ER).

NMC assumes that 100 miles of new 345-kV transmission on a 150-foot wide right-of-way in southern Minnesota, potentially affecting approximately 1,800 acres, would be required to import purchased power. Considering the nature of transmission line development and mitigation available, impacts of greatest concern are those related to changes in land use, terrestrial ecological communities, and aesthetics.

Land use and terrestrial ecological habitats in the region where it is assumed the line would be built consists predominantly of rural agricultural land interspersed in some areas with natural vegetation (e.g., forested tracts, wetlands). Therefore, NMC expects these land uses and ecological habitats, which are abundant in the region, would be most affected by transmission line development. Development of the transmission line would limit changes in future land uses on the ROW to those that are compatible with the line, but most agricultural practices and other currently compatible uses could continue.

Establishment of ROW for the transmission line(s) would have little effect on either the amount or value of habitat represented by agricultural land, the predominant habitat expected on lands traversed by these facilities, because compatible agricultural practices could continue. Similarly, open wetlands would be spanned and therefore little affected. Depending on route specifics, clearing of forest and shrubland, some of which may qualify as wetland, would also likely be required. However, hydrologic regimes of wetlands would not be appreciably affected and the conversion of ROW areas currently in forest to open (herbaceous and shrub) habitats can be advantageous to species with affinities for remnant prairie habitats, now rare in the area of interest.

Some visual impairment of the rural landscape would result from development of the transmission line. However, the topography throughout most of southern Minnesota is rolling, and forested tracts occur in some parts of the area. Both of these attributes would act to reduce the viewshed and limit potential for impairment of visual aesthetics. In addition, the presence of transmission lines is not out of character for the existing rural southern Minnesota landscape.

Finally, NMC expects that routing of the line could be accomplished such that highly incompatible land uses, important habitats and associated important species, and areas of potentially high impact on visual aesthetics would be recognized and avoided or appropriately mitigated such that important attributes of these resources would not be destabilized.

On the basis of these considerations, NMC concludes that the associated impacts of the transmission line development and operation would be SMALL to MODERATE with respect to land use, ecological resources, and aesthetics, and that impacts to remaining resources would be of SMALL significance.

7.3.2 GAS-FIRED GENERATION

Potential moderate and large impacts associated with the natural gas-fired representative alternative are addressed in the following subsections by resource category, followed by a discussion of the remaining resource categories.

Land Use

Although potential impacts on land use would be location specific and therefore conjectural for a greenfield site, potentially affected areas are predominantly rural agricultural land interspersed in some areas with natural vegetation (e.g., forested tracts and wetlands). Based on information presented in Section 7.2.2.2 of this ER, NMC expects plant development would involve conversion of approximately 110 acres of rural agricultural land and/or natural plant communities abundant in the region to industrial use, of which 25 acres would be occupied by plant facilities. NMC assumes current non-conflicting land uses on the balance of the plant site (e.g., agriculture) would remain unaffected and provide appropriate buffer with respect to any highly incompatible land uses (e.g., residential development). Development of offsite infrastructure (i.e., transmission line, gas pipeline), involving approximately 110 acres of ROW, would similarly limit development of future incompatible land uses but compatible land uses, including most agricultural practices, could continue. Considering also that land use impacts would be addressed in siting and designing these facilities, NMC concludes that land use impacts could range from SMALL to MODERATE, depending on site-specific factors.

Development of the representative plant at the MNGP site would represent the expansion of existing land use; therefore, associated land use impact would be of SMALL significance. Development of 35 miles of new gas supply pipeline could alter land use on approximately 130 acres of ROW. Considering that agriculture is the predominant land use in the region (Sections 2.3.2.1, 2.3.2.3, and 2.6 of this ER), NMC expects that land use impacts would be similar to those discussed above for the greenfield site (i.e., SMALL to MODERATE).

Air Quality

Potential for adverse impacts to air quality from a fossil-fueled power plant are substantially different from those of a nuclear power plant. The combustion process results in emissions of criteria pollutants including nitrogen oxides (NOx), sulfur dioxide

(SO_2), carbon monoxide (CO), and particulates, as well as carbon dioxide (CO_2), an unregulated "greenhouse gas" implicated as a potential contributor to climate change. Natural gas contains very little sulfur and other contaminants that are present in coal, and is inherently a relatively clean-burning fossil fuel (EPA 2000a, Sections 1.1 and 1.4.3).

Based on emission factors and estimated efficiencies for emission controls cited by the EPA and assumed design parameters listed in Table 7.2-1, operation of the plant would result in the following annual air emissions for criteria pollutants: 134 tons of NOx, 9 tons of SO_2, 26 tons of particulates having a diameter of less than 10 microns (PM_{10}), and 203 tons of CO (EPA 2000a).[4] These emission rates are relatively low. Nonetheless, emissions from the plant would result in some increase in regional concentrations of these criteria pollutants. Considering that the plant would be subject to regulatory controls, NMC concludes that the overall impact on air quality from this alternative would be noticeable but not destabilizing, a characteristic of MODERATE impact, regardless of locations considered in this ER.

Ecological Resources

Development of the representative plant at a greenfield site in southern Minnesota would likely result in the loss of approximately 25 acres of terrestrial habitat for onsite plant facilities, and modification of approximately 110 acres of existing offsite terrestrial habitat for a new natural gas supply pipeline and transmission line ROW. Habitat most likely to be affected consists of rural agricultural land interspersed in some areas with natural vegetation communities abundant in the region (e.g., forested tracts and wetlands).

Impacts associated with transmission line and pipeline development would be similar to those described in Section 7.3.1 for the transmission line(s) assumed to be needed for the purchase power alternative.

The most significant potential impacts to aquatic communities relate to operation of the cooling water system. However, the cooling system for the plant would be designed and operated in compliance with the Clean Water Act (CWA), including National Pollutant Discharge Elimination System (NPDES) limitations for physical and chemical parameters of potential concern and provisions of CWA Sections 316(a) and 316(b), which are respectively established to ensure appropriate protection of aquatic communities from thermal discharges and the location and operation of cooling water

4 Annual emissions of regulated air pollutants calculated as follows from natural gas heat input and EPA estimates of uncontrolled air emissions and removal efficiencies (Table 7.2-1 and Section 7.2.2.2 list all necessary parameters and values): Annual Emissions (tons/yr) = Natural Gas Heat Input (2.715×10^7 MMBtu/yr) x Uncontrolled Emissions (lb/MMBtu) x 0.0005 (ton/lb) x [100 – removal efficiency (%)]. Removal efficiencies for SOx, CO, and PM_{10} are assumed to be zero.

intakes. Moreover, the cooling water intake and discharge flows of the representative gas-fired plant would be about one-third that of MNGP, the impact from which is considered to be SMALL (Sections 4.1.1 and 4.3 of this ER).

In view of these considerations and assumptions of this assessment, NMC expects that impacts on ecological resources would not noticeably alter any important attribute of the resource, particularly if located on agricultural lands, consistent with NRC's definition of SMALL impact significance. However, considering the uncertainties associated with greenfield development, NMC concludes that impacts on ecological resources could be of SMALL to MODERATE significance

Impacts on ecological resources from development of the representative plant at the MNGP site would be similar in nature to that described for the greenfield option, except that terrestrial habitats affected would be limited to active and former agricultural land and other disturbed lands. Little, if any, loss or disturbance of natural plant communities or wetlands would occur as a result of onsite facilities development. The ROW for the natural gas supply pipeline to the site is assumed to traverse the Anoka Sand Plain Subsection of the Southeastern Minnesota and the West-Central Wisconsin Savanna, inclusive of Sherburne County, which consists of farmland interspersed with natural vegetation, including forest, wetland, and prairie habitat (Albert 1995, Section III; Section 2.3.2.1 of this ER). NMC expects that ecological resource impacts would be similar to those discussed above for the greenfield site pipeline. Considering routing uncertainties, NMC concludes that ecological resource impacts for the MNGP site option could range from SMALL to MODERATE under the assumptions of this analysis.

Socioeconomics

Major sources of potential socioeconomic impacts from the representative gas-fired generation alternative include:

- temporary increases in jobs, economic activity, and demand for housing and public services in communities surrounding the site during the construction period, and

- net change in permanent jobs, tax revenues, and economic activity attributable to gas-fired plant operation and termination of MNGP operations.

Although the area south of Minneapolis is predominantly rural, it is within commuting distance of relatively large population centers, including Minneapolis-St. Paul, Mankato, and Rochester. Considering the proximity of these sources of labor and services, NMC expects that most of the construction workforce would commute and relatively few would relocate to small communities near the plant such that significant demand for housing or public services would result. A similar conclusion is appropriate for the MNGP site option, considering the proximity of Minneapolis-St. Paul and St. Cloud

(Sections 2.5.1 and 2.6; Figure 2.1-1 of this ER). Associated socioeconomic impacts during construction are therefore expected to be SMALL, regardless of plant location.

Considered together with impacts of the no action "base case" (terminating operations and decommissioning MNGP), the greenfield siting alternative could result in MODERATE adverse socioeconomic impacts to the City of Monticello from loss of tax revenues 20 years earlier than would occur if the MNGP operating license is not renewed. NMC concludes that overall socioeconomic impact of the representative plant at the assumed greenfield site would be of MODERATE significance.

Location of the representative plant at the MNGP site would provide property tax payments that would significantly reduce the potential losses to local jurisdictions that would otherwise occur. From data presented in Table 2.7-1, NMC expects that the net reduction in tax payments for this case would amount to less than 10 percent for all taxing jurisdictions and so would result in only SMALL impact as a result.

Aesthetics

Potential aesthetic impacts of construction and operation of a gas-fired plant include visual impairment resulting from the presence of a industrial facility and associated ROWs, particularly 200-foot high exhaust stacks and condensate plume from the cooling tower. However, the topography throughout most of southern Minnesota is rolling and forested tracts are common in some areas. Both of these factors act to reduce the viewshed and limit potential for impairment of visual aesthetics. NMC assumes that adequate buffer and vegetation screens would be provided at the plant site as needed to moderate visual and noise impacts. Considering also that the location and design of the plant and associated offsite infrastructure would be decided with consideration of potential adverse aesthetic effects, NMC concludes that aesthetic impact could range from SMALL to MODERATE, depending on location.

Location of the representative gas-fired plant on the MNGP plant site would represent the incremental addition, and ultimate replacement, of an existing industrial facility having similar characteristics, and no additional transmission lines would be required. The natural gas pipeline would be buried and NMC expects it would be largely unnoticed once installed. NMC concludes that aesthetic impact of this site option would be of SMALL significance.

Other Impacts

Cooling water intake and discharge flows, potable and service water use, and wastewater discharges for the representative gas-fired plant would be substantially lower than currently result from MNGP operation, due to less power derived from a steam cycle, use of a closed-cycle cooling system, and smaller operating workforce.

Cooling water, wastewater, and stormwater discharges would be regulated under the CWA and corresponding state programs by NPDES permit. Potential impacts on water quality during construction would also be subject to regulatory controls. Average consumptive water use from cooling system operation would amount to approximately 3 cfs.

Operation of the gas-fired alternative would generate only small quantities of municipal and industrial waste, including spent catalyst used for NOx control, which would be disposed of in accordance with applicable regulations at a permitted offsite disposal facility.

NRC cites risk of accidents to workers and public risks (e.g., cancer, emphysema) from the inhalation of toxics and particulates associated with air emissions as potential risks to human health associated with the gas-fired generation alternative (NRC 1996a). NMC assumes that regulatory requirements imposed on facility design and operations under the authority of the Occupational Safety and Health Act, Clean Air Act, and related statutes are designed to provide an appropriate level of protection to workers and the public with respect to these risks.

The representative gas-fired plant and associated gas supply pipeline and transmission line would be located with consideration of cultural resources, and NMC expects that appropriate measures would be taken to avoid, recover or provide other mitigation for loss of any resources discovered during onsite or offsite construction.

NMC concludes that the potential adverse impacts of this alternative on water quality and use, waste management, human health, and cultural resources would like by SMALL.

7.3.3 COAL-FIRED GENERATION

In the following subsections, NMC presents its impact evaluation for the representative coal-fired alternative for resource categories potentially subject to moderate to large impacts, followed by a discussion impacts for the remaining resource categories.

Land Use

Although potential impacts on land use would be location specific and therefore conjectural for a greenfield site, potentially affected areas are predominantly rural agricultural land interspersed in some areas with natural vegetation (e.g., forested tracts and wetlands) all of which are abundant in the region. NMC expects the total site could consist of approximately 1,700 acres to provide flexibility in facility arrangement and appropriate buffer from adjacent land uses. Land uses would be entirely precluded on 380 acres onsite (for plant facilities and waste disposal). NMC assumes current non-

conflicting land uses on the balance of the plant site (e.g., agriculture) would remain unaffected. Offsite, an estimated 60 acres of land would be converted to transportation use (rail spur) and 90 acres would be converted to utility use (transmission line). Similarly, development of future incompatible land uses would be precluded on the transmission ROW, but compatible land uses, including most agricultural practices, could continue. Land occupied by the 120-acre landfill would be permanently restricted to noninvasive uses (e.g., recreation) for the long term. In view of the large amount of land affected and the permanent land use change from the landfill, NMC concludes that land use impacts would be clearly noticeable. Considering also the assumption that environmental review, siting and design of these facilities would ensure that land uses in affected areas would not be destabilized, NMC concludes that land use impacts would be MODERATE.

Development of the coal-fired alternative plant at the MNGP site would represent the expansion of existing land use on an industrial site. However, land occupied by the 120-acre landfill would be permanently restricted to noninvasive uses (e.g., recreation) for the long term. In addition, delivery of coal and limestone to the site, assumed to require reactivation of the currently unused BNSF branch line and involving 5-6 unit train round trips per week, given that residential development exists adjacent to the line between the plant and downtown Monticello (BNSF 2003; Wright County 2003, USGS 1991a, 1991b). In addition, transport of waste to the landfill could adversely affect local land use development. Under the assumptions of this analysis, NMC concludes that associated land use impacts would also be MODERATE for this site option.

Air Quality

The principal air emissions from a coal-fired power plant are the same as those noted for the natural gas alternative. However, coal contains much higher concentrations of sulfur, and combustion is less efficient than for natural gas. As a result, even with application of appropriate control technologies, emission of these pollutants from a coal-fired facility are typically higher than for a natural gas-fired facility of comparable size (EPA 2000a, Sections 1.1 and 1.4). In addition, coal contains other constituents (e.g., mercury, beryllium) that are potentially emitted as hazardous air pollutants (EPA 2000b).

NMC has assumed a plant design that effectively minimizes emissions of criteria pollutants. Based on emission factors and estimated efficiencies for emission controls cited by the EPA and assumed design parameters listed in Table 7.2-2 of this ER, operation of the plant would result in the following annual air emissions for criteria

pollutants: 486 tons of NOx, 1,755 tons of SO_2, 77 tons of total particulates (filterable), 18 tons of PM_{10}, and 675 tons of CO (EPA 2000a). [5]

Aggregate regional emissions of SO_2 are subject to budget caps. Nonetheless, emissions from the plant would result in some impairment of local air quality and would contribute to increased regional concentrations of SO_2 and other criteria pollutants listed above, and some hazardous air pollutants (e.g., mercury). Considering that the plant would be subject to regulatory controls, NMC concludes that the overall impact on air quality from this alternative would be noticeable but not destabilizing, a characteristic of MODERATE impact, regardless of locations considered in this ER.

Waste Management

Based on estimated annual coal consumption, coal ash and sulfur content, and assumed air emission controls, the representative coal-fired plant would produce approximately 107,000 tons of ash and 51,000 tons of flue gas desulfurization waste (dry basis). NMC assumes 30 percent of the ash would be beneficially used, and the remainder disposed of in an landfill occupying approximately 120 acres over an assumed plant operating life of 40 years. The coal-fired alternative plant could also generate relatively small quantities of the spent catalyst used for NOx control at the plant. NMC assumes this waste would be disposed of in accordance with applicable regulations at a permitted offsite disposal facility.

NMC assumes that the ash and flue gas desulfurization waste landfill would be designed and operated to maintain landfill integrity and minimize the potential for escape of leachate, which could result in some local degradation of groundwater quality. NMC further assumes that groundwater quality degradation, in the event it did occur, would be appropriately managed to ensure potential uses remain protected. After closure and revegetation of the disposal facility, the land could be made available for other noninvasive uses (e.g., recreation).

Considering the large volumes of waste that would be generated and potential for noticeable localized impacts on land use and groundwater quality resulting from its disposal, NMC concludes that waste management impacts for the coal-fired generation alternative would be MODERATE, regardless of plant location.

Ecological Resources

Development of the representative coal-fired plant at a greenfield site in southern Minnesota would likely result in the loss of 380 acres of terrestrial habitat for onsite plant

5 Annual emissions of regulated air pollutants calculated as follows from amount of coal combusted and EPA estimates of uncontrolled air emissions and removal efficiencies (all necessary parameters are listed in Table 7.2-1): Pollutant Emissions (tons/yr) = Coal Combusted (tons/yr) x Uncontrolled Emissions (lb/ton) x 0.0005 (ton/lb) x [100 – removal efficiency (%)]. Removal efficiency for carbon monoxide is assumed to be zero.

facilities and air emission control waste landfill, loss of approximately 60 acres of offsite habitat for the rail line, and modification of 90 acres of offsite terrestrial habitat for a new transmission line to serve the plant. While the amount of habitat affected would be larger, the nature of impacts would be the same as described for the gas-fired alternative (Section 7.3.2).

The most significant potential impacts to aquatic communities relate to operation of the cooling water system, but regulatory controls would be expected to ensure appropriate protection of aquatic communities from thermal discharges and the location and operation of cooling water intakes. In addition, because the plant is assumed to use closed-cycle cooling, the cooling water intake and discharge flows would be much lower than that of MNGP, the impact from which is considered to be SMALL (Sections 4.1.1 and 4.3 of this ER).

For the same reasons provided with respect to the gas-fired alternative, NMC concludes that impacts on ecological resources from the representative coal-fired plant could be of SMALL to MODERATE significance for the greenfield site option.

Impacts on ecological resources from development of the representative plant at the MNGP site would be similar in nature to that described for the greenfield option, except that terrestrial habitats affected would be limited to active and former agricultural land and other disturbed lands. Little, if any, loss or disturbance of natural plant communities or wetlands would occur. However, considering base case impacts (i.e., displacement of state-threatened nesting peregrine falcons and wintering trumpeter swans), NMC concludes that impacts on ecological resources would be SMALL to MODERATE for this site option.

Socioeconomics

Major sources of potential socioeconomic impacts from the representative coal-fired generation alternative include:

- temporary increases in jobs, economic activity, and demand for housing and public services in communities surrounding the site during the construction period, and
- net change in permanent jobs, tax revenues, and economic activity attributable to gas-fired plant operation and termination of MNGP operations.

As indicated for the gas-fired alternative, NMC expects that socioeconomic impacts from construction to be SMALL regardless of location. Considered together with impacts of the no action “base case” (terminating operations and decommissioning MNGP), the greenfield siting alternative could result in MODERATE adverse socioeconomic impacts to the City of Monticello from loss of tax revenues 20 years earlier than would occur if the MNGP operating license is not renewed.

As for the gas-fired alternative, NMC expects that location of the representative plant at the MNGP site would provide property tax payments that would reduce the potential losses to local jurisdictions such that related impacts would be SMALL. However, the BNSF rail line assumed to be used to deliver coal and limestone to the site (5-6 unit train round trips per week) is routed through the City of Monticello, which has many at-grade road crossings (USGS 1991a, 1991b). In addition, transport of waste to the landfill would also impact local transportation flows. Both of these offer potential for traffic congestion and impaired safety. Under the assumptions of this analysis, NMC concludes that overall socioeconomic impact associated with the MNGP site option would be SMALL to MODERATE, depending on the feasibility and effectiveness of mitigating potential impacts of rail deliveries and waste transport.

Aesthetics

Potential aesthetic impacts of construction and operation of a coal-fired plant include visual impairment resulting from the presence of a industrial facility, particularly a 500-foot high exhaust stack and condensate plume from the cooling tower. However, the topography throughout most of southern Minnesota is rolling and forested tracts are common in some areas. Both of these factors act to reduce the viewshed and limit potential for impairment of visual aesthetics from onsite and offsite infrastucture. NMC assumes that adequate buffer and vegetation screens would be provided at the plant site as needed to reduce visual and noise impacts. Considering also that the location and design of the plant and associated offsite infrastructure would be decided with consideration of potential adverse aesthetic effects, NMC concludes that aesthetic impact could range from SMALL to MODERATE, depending on location.

Location of the representative coal-fired plant on the MNGP plant site would represent the incremental addition, and ultimate replacement, of an existing industrial facility having similar characteristics, and no additional transmission lines would be required. However, delivery of coal and limestone by BNSF rail through the City of Monticello as previously described could adversely affect aesthetics, including visual and noise impacts with respect to nearby residences and businesses. NMC concludes that aesthetic impacts associated with this option would be SMALL to MODERATE, depending on the feasibility and effectiveness of mitigating potential adverse impacts of rail deliveries.

Other Impacts

NMC expects that cooling water intake and discharge flows, potable and service water use, and wastewater discharges for the representative coal-fired plant, which has a closed-cycle cooling system would be lower than current MNGP operations, the impact from which is considered to be small. Cooling water, wastewater, and stormwater discharges would be regulated under the CWA and corresponding state programs by

NPDES permit. Potential impacts on water quality during construction would also be subject to regulatory controls. Average consumptive loss from the cooling system for the representative coal-fired plant would be approximately 10 cfs, or within the range of the two worst-case surface water consumption scenarios evaluated for MNGP operation in Section 4.2 of this ER, the impact of which is SMALL.

In the GEIS, NRC cites risk of accidents to workers and public risks (e.g., cancer, emphysema) from the inhalation of toxics and particulates associated with air emissions as potential risks to human health associated with the coal-fired generation alternative (NRC 1996a). NMC assumes that regulatory requirements imposed on facility design and operations under the authority of the Occupational Safety and Health Act, Clean Air Act, and related statutes are designed to provide an appropriate level of protection to workers and the public with respect to these risks.

The representative coal-fired plant and associated gas supply pipeline and transmission line would be located with consideration of cultural resources, and NMC expects that appropriate measures would be taken to avoid, recover or provide other mitigation for loss of any resources discovered during onsite or offsite construction.

NMC concludes that the potential adverse impacts of this alternative on water quality and use, waste management, human health, and cultural resources would likely be SMALL.

TABLE 7.2-1
REPRESENTATIVE NATURAL GAS-FIRED GENERATION ALTERNATIVE

Characteristic	Basis/Detail
No. of units, type and capability (net): 1 combined cycle unit, 550 MW	Standard size approximately equivalent to MNGP total net capacity (Industry data).
No. of units, type and capability (gross): 2 CTs (365 MW) + 1 ST (196 MW) = 561 MW	Industry data. Gross capability less net capability = energy consumed onsite.
Capacity factor: 85%	Within range for base-load plants; results in annual generation reasonably comparable to MNGP
Fuel type = natural gas	Assumed.
Heat rate = 6,500 Btu/kWh	Estimate from industry data.
Fuel heating value = 1,008 Btu/scf	Value for Minnesota natural gas (EIA 2004g, Table 14).
Fuel S content: 0.2 grains/100 scf (0.00068 wt%)	Typical for pipeline quality natural gas (EPA 2000a, page 1.4-2).
SO_2 emissions: 0.00064 lb/MMBtu [= 0.94 x wt% S in fuel]	EPA estimate for natural gas-fired turbines (EPA 2000a, Table 3.1-2a).
NOx emissions (assuming dry-low-NOx combustors): 0.099 lb/MMBtu	EPA estimate for best available NOx combustion control (EPA 2000a, Table 3.1-1).
NOx post-combustion control: selective catalytic reduction (90 % reduction)	EPA estimate for best available NOx post-combustion control (EPA 2000a, Section 3.1.4.3).
CO emissions (assuming dry low-NO_x combustors): 0.015 lb/MMBtu	EPA estimate (EPA 2000a, Table 3.1-1).
PM emissions (all PM_{10}): 0.0019 lb/MMBtu	EPA estimate (EPA 2000a, Table 3.1-2a).
CO_2 emissions: 110 lb/MMBtu	EPA estimate (EPA 2000a, Table 3.1-2a).

% = percent
Btu = British thermal unit
CO = carbon monoxide
CO_2 = carbon dioxide
CT = combustion turbine
EPA = U.S. Environmental Protection Agency
kWh = kilowatt-hour
lb = pound
MMBtu = million Btu
MNGP = Monticello Nuclear Generating Plant
MW = megawatts
NMC = Nuclear Management Company, LLC
NOx = nitrogen oxides
PM = filterable particulate matter
PM_{10} = filterable particulates with diameter < 10 microns
scf = standard cubic feet
SOx = sulfur oxides
ST = steam turbine
wt% = percent by weight

TABLE 7.2-2
REPRESENTATIVE COAL-FIRED GENERATION ALTERNATIVE

Characteristic	Basis/Detail
Number and type of units: 1 pulverized coal Unit size: 660 MW (gross); 600 MW (net)	Standard size approximately equivalent to MNGP total net capacity (Industry Data).
Capacity factor: 85%	Within range for base-load plants; results in annual generation comparable to MNGP.
Firing mode: subcritical, tangential, dry-bottom pulverized coal	Widely demonstrated, reliable, economical; tangential firing minimizes NOx emissions (EPA 2000a, Table 1.1-3).
Fuel type: sub-bituminous coal	Type used at NSP King Plant (EIA 2004g, Table 24).
Fuel heating value: 8,903 Btu/lb	Average for coal used at NSP King Plant (EIA 2004g, Table 24).
Heat rate: 9,800 Btu/kWh	NSP estimate.
Fuel ash content by weight: 5.68%	Average for coal used at NSP King Plant (EIA 2004g, Table 24).
Fuel sulfur content: 0.37 wt%; 0.41 lb/MMBtu	Average for coal used at NSP King Plant (EIA 2004g, Table 24).
Uncontrolled SOx emissions: 13.0 lb/ton coal	EPA estimate for sub-bituminous coal calculated as 35 x wt% sulfur in coal (EPA 2000a, Table 1.1-3).
Uncontrolled NOx emissions: 7.2 lb/ton coal	EPA estimate (EPA 2000a, Table 1.1-3).
Uncontrolled CO emissions: 0.5 lb/ton coal	EPA estimate (EPA 2000a, Table 1.1-3).
Uncontrolled PM emissions: 56.8 lb/ton coal	EPA estimate calculated as 10 x percent of ash in coal (EPA 2000a, Table 1.1-4).
Uncontrolled PM_{10} emissions: 13.1 lb/ton coal	EPA estimate calculated as 2.3 x percent of ash in coal (EPA 2000a, Table 1.1-4).
NOx control: low NOx burners, overfire air, selective catalytic reduction (95% reduction)	Best available for minimizing NOx emissions (EPA 2000a, Table 1.1-2).
Particulate control: fabric filter (99.9% removal)	Best available for minimizing particulate emissions (EPA 2000a, Section 1.1.4.1).
SOx control: Limestone flue gas desulfurization (90% removal)	Among best available for minimizing SOx emissions (EPA 2000a, Table 1.1-1). (Can be used on low sulfur coal with demonstrated 90% removal).

% = percent
Btu = British thermal unit
CO = carbon monoxide
EPA = U.S. Environmental Protection Agency
kWh = kilowatt-hour
lb = pound
MMBtu = million Btu
MNGP = Monticello Nuclear Generating Plant
MW = megawatts
NOx = nitrogen oxides
PM = filterable particulate matter
PM_{10} = filterable particulates with diameter < 10 microns
SOx = sulfur oxides
wt% = percent by weight

TABLE 7.2-3
OTHER GENERATION TECHNOLOGY OPTIONS CONSIDERED

Alternative	Considerations/Reasons for Not Evaluating Further[a]
Wind	Intermittency of adequate wind speed and expense of energy storage results in capacity factors too low for baseload generation, and land requirements are very large for 597 MW required to replace MNGP (NRC 1996a, Section 8.3.1; MDC 2004a, page 30). According to the *Wind Energy Resource Atlas of the United States* (NREL 1986) areas suitable for wind energy applications must be wind power Class 3 or higher. Class 3 and higher wind energy potential exists at exposed areas in the North Central Region, which consists of Minnesota, Nebraska, North Dakota, and South Dakota, except for portions of eastern Minnesota, southeastern Iowa and the Missouri River lowlands along the Nebraska-Iowa border. In Minnesota, Class 4 wind potential exists in exposed uplands in the southern part of the state and in the Red River Valley between North Dakota and northern Minnesota. These resources, particularly in the Buffalo Ridge area in the southwestern part of the state, could support development approaching 3,000 MW by 2010, but significant transmission constraints exist (MDC 2004a, page 16, 30-33) EIA projects that wind-power generating capacity in MAPP will total 1,190 MW in 2004 and will increase by 760 MW in the period 2004-2010 (EIA 2004e, Table 80). From a practical perspective, the scale of this technology is too small to directly replace a power generating plant the size of MNGP, and the functionality is not equivalent.
Solar Photovoltaic and Solar Central Receiver	EIA indicates there was no commercial solar thermal or solar photovoltaic generating capability in MAPP in 2001, and projects no additional capacity will be developed in the region by 2010 (EIA 2004e, Table 80). Although there is some potential for development in the region (e.g., between than 4.4 and 3.3 kWh/m^2 per day in Minnesota), the intermittency of this resource, and expense of energy storage results in capacity factors are too low for practical baseline generation. Land requirements are very large. Based on estimates presented in the GEIS, approximately 8,000 and 21,000 acres, respectively, would be required for 597 MW of solar thermal or solar photovoltaic generating capability to replace MNGP, even in areas of high solar availability (NRC 1996a, Figure 8.2, Sections 8.3.2, 8.3.3). Because of the intermittency of the available solar radiation, as well as the high technology costs and land requirements, solar power in the region is limited to niche applications and is not a feasible base-load alternative to MNGP license renewal.
Hydroelectric	Undeveloped hydropower potential estimated to exist in Minnesota amounts to only 137 MW, an aggregated total for 40 sites (DOE 1996). As noted in the GEIS, hydroelectric power's percentage of the country's generating capacity is expected to decline because of siting difficulties as a result of public concern over flooding, destruction of natural habitat, and destruction of natural river courses. This option has a large land-use requirement (e.g., inundation of approximately 597,000 acres for a hydroelectric plant large enough to replace MNGP) (NRC 1996a, Section 8.3.4), and ecological impacts during operation (e.g., fish impingement) are also a potential concern. In 2001, EIA indicates that 3,180 MW of conventional hydroelectric generating capacity had been developed in MAPP, but does not project that any additional capacity will be developed in MAPP through 2025 (EIA 2004e, Table 80).

TABLE 7.2-3 (CONTINUED)
OTHER GENERATION TECHNOLOGY OPTIONS CONSIDERED

Alternative	Considerations/Reasons for Not Evaluating Further[a]
Geothermal	As noted in the GEIS, hydrothermal reservoirs in the U.S. are most prevalent in contiguous U.S. western states, Alaska, and Hawaii, and are limited in the northeastern United States (NRC 1996a, Section 8.3.5). Currently, there is no geothermal generating capability in MAPP, nor does the DOE-EIA anticipate that any additional generating capability will be developed in the region in the foreseeable future. (EIA 2004e, Table 80).
Biomass	Biomass alternatives, including wood and crop-fired plants, have construction-related environmental impacts similar to a coal-fired plants, requiring large areas for fuel storage, processing, and waste disposal. As noted in the GEIS, a significant barrier to the use of wood waste to generate electricity is the high delivered-fuel cost and high construction cost per MW of generating capacity. The maximum practical capacity of biomass-fueled power plants is approximately 50 MW, and economic feasibility depends on a reliable supply of low-cost wood wastes and residues nearby. Additionally, large-scale timber cutting can result in significant ecological impacts (e.g., soil erosion and loss of wildlife habitat) (NRC 1996a, Sections 8.3.6 and 8.3.8). Other biomass alternatives, including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops, have not progressed to the point of being competitive on a large scale or of being reliable enough to replace a baseload plant such as MNGP. The DOE estimates that potentially 30.9 billion kWh of electricity could be generated annually from biomass fuels in Minnesota (DOE 2004). However, as pointed out above, the economic and achievable potential is almost certain to be substantially less than the technical potential. EIA projects that biomass power generating capacity in MAPP will total 160 MW in 2004 and will increase by only 50 MW in the period 2004-2010 (EIA 2004e, Table 80).
Municipal Solid Waste	Installed capital cost of a municipal solid-waste-fueled plant is higher than that of a wood-waste-fueled plant, and such plants are required to operate with much stricter controls, which can result in higher operating costs. Use of this option is primarily a waste management decision. Tipping fees, availability of landfill space, and reduced heat content of the waste stream due to segregation and recycling of high-heat-content components (e.g., wood, paper, plastics) affect economic viability (NRC 1996a, Section 8.3.7). In 2001, only 120 MW of municipal solid waste generating capacity was available in MAPP, and only 10 MW of additional capacity is anticipated to be developed in the region through 2010 (EIA 2004e, Table 80).
Oil	Fuel costs comprise most of the operating costs for fossil-fired generating plants, and oil is a much more expensive fuel than either coal or nuclear fuel on a cost per Btu basis. In addition, increases in oil prices are expected to result in a decrease in oil-fired generation in the future (EIA 2004d, page 83). In 2001, only 0.82 billion kWh of electricity was generated from petroleum in MAPP, 0.5 percent of the total generation in the region; the percentage of total generation from oil in MAPP is projected to decrease to 0.1 percent by 2010 (EIA 2004e, Table 64).

TABLE 7.2-3 (CONTINUED)
OTHER GENERATION TECHNOLOGY OPTIONS CONSIDERED

Alternative	Considerations/Reasons for Not Evaluating Further[a]
Advanced Nuclear Reactor	Increased interest in the development of advanced reactor technology has been expressed recently by members of both industry and government. However, the economics of new plants remain highly uncertain and, primarily because of the relatively favorable economics of competing technologies, no new nuclear facilities are expected to be built in the U.S. through 2025 (EIA 2004d, page 6). Moreover, NSP does not consider it reasonable to expect that a new nuclear facility could be licensed and constructed to replace MNGP by 2010, when its operating license expires. Operation of an advanced reactor would have environmental impacts similar to those of the continued operation of MNGP, and construction of a new nuclear power plant would entail further environmental impacts and incur capital costs not associated with license renewal of MNGP. For these reasons, NSP does not consider development of a new nuclear plant to be economically reasonable or environmentally preferable alternative to MNGP license renewal.
Fuel Cells	Cost is the primary hurdle to fuel cell development as a major generating source. As of 2003, the most widely marketed fuel cells were commercially available at a cost of approximately $4,500 per kW of installed capacity; state-of-the-art fuel cells in testing at that time were projected to cost approximately $1,200 per kW (DOE 2003). NSP believes fuel cells are not currently economically or technologically competitive with other alternatives for baseload electricity generation.

a. Capacity data for MAPP cited in this table does not include small onsite sources of power, some of which may supply excess capacity to the grid (EIA 2004e, Table 80, Footnote 7). However, the amount of such capacity is very small for the entire period examined, and does not affect the rationale presented.

DOE = U.S. Department of Energy
MAPP = Mid-Continent Area Power Pool
EIA = U.S. Department of Energy, Energy Information Agency
GEIS = *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*
GWh = gigawatt hour(s)
kWh = kilowatt hour(s)
m^2 = square meter(s)
MW = megawatt(s)
MNGP = Monticello Nuclear Generating Plant
NRC = U.S. Nuclear Regulatory Commission
NSP = Northern States Power

7.4 REFERENCES

Note to reader: This list of references identifies web pages and associated URLs where reference data was obtained. Some of these web pages may likely no longer be available or their URL addresses may have changed. NMC has maintained hard copies of the information and data obtained from the referenced web pages.

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8.0 COMPARISON OF ENVIRONMENTAL IMPACTS OF LICENSE RENEWAL WITH THE ALTERNATIVES

NRC
"To the extent practicable, the environmental impacts of the proposal and the alternatives should view headerbe presented in comparative form…." [10 CFR 51.45(b)(3) as adopted by 51.53(c)(2)]

Nuclear Management Company, LLC (NMC) presents its evaluations of the environmental impacts associated with Monticello Nuclear Generating Plant (MNGP) operating license renewal (the proposed action) and those associated with selected alternatives in Chapter 4 and Chapter 7 of this ER, respectively. In this chapter, NMC provides a comparative summary of these impacts. The environmental impacts comparison addresses Category 2 issues associated with the proposed action and additional issues the U.S. Nuclear Regulatory Commission (NRC) identifies in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996, Section 8.1) as major considerations in an alternatives analysis. For example, NRC concluded in the GEIS that air impacts from the proposed action would be SMALL (Category 1), but indicated a potential for major human health concerns associated with air emissions from fossil-fuel generation alternatives (Section 7.3.2 of this ER). Inclusion of these additional issues therefore establishes a basis for comparison of relevant impacts among alternatives. NMC provides a comparative summary of its conclusions regarding these issues in Table 8.0-1, and a more detailed comparison in Table 8.0-2.

As indicated in Tables 8.0-1 and 8.0-2, environmental impacts of the proposed action (MNGP license renewal) are expected to be SMALL for all impact categories evaluated. In contrast, NMC expects that environmental impacts in some impact categories would be MODERATE for the no-action alternative (NRC decision not to renew the MNGP operating license), considered with or without development of replacement generation facilities. Expected adverse environmental impacts include the potential loss of substantial tax revenues by the City of Monticello from termination of MNGP operations 20 years sooner than if its operating license is renewed. Notable adverse impacts in the areas of land use, air quality, ecological resources, waste management, socioeconomics, and aesthetics may result from replacement of MNGP generating capacity with an alternative generating source, depending on the alternative selected.

In summary, NMC's analysis indicates that renewal of the MNGP operating license is preferred from an environmental standpoint. With respect to NRC's decision-making standard at 10 CFR 51.95(c)(4), the analysis supports a conclusion that the option of renewing the MNGP operating license should be preserved.

TABLE 8.0-1
IMPACTS COMPARISON SUMMARY

Impact	Proposed Action (License Renewal)	No-Action Alternative[a, b]			
		Base (Terminate Operations & Decommission)	With Purchased Power[b]	With Gas-Fired Generation	With Coal-Fired Generation
Land Use	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	MODERATE
Water Use and Quality	SMALL	SMALL	SMALL	SMALL	SMALL
Air Quality	SMALL	SMALL	SMALL to MODERATE	MODERATE	MODERATE
Waste Management	SMALL	SMALL	SMALL to MODERATE	SMALL	MODERATE
Ecological Resources	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Socioeconomics	SMALL	MODERATE	MODERATE	MODERATE	MODERATE
Human Health	SMALL	SMALL	SMALL	SMALL	SMALL
Aesthetics	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Cultural Resources	SMALL	SMALL	SMALL	SMALL	SMALL

a. Impact significance definitions (from 10 CFR 51, Subpart A, Appendix B, Table B-1, footnote 3):
SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
MODERATE - Environmental effects are sufficient to alter noticeably but not to destabilize any important attribute of the resource.
LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

b. Impacts include those from base case, generation, and development of new transmission. Impact from generation would depend on generation technologies used and location. NMC considers the technologies and associated impacts presented in Section 8.3 of the GEIS are representative but assumes for purposes of comparison that adverse impacts would not be of greater significance than those from coal-fired and gas-fired alternatives considered in this Environmental Report.

c. Location and design of transmission line(s) for purchased power and for plant and offsite infrastructure (e.g., pipeline, transmission lines) for gas-fired and coal fired alternatives assumed to be established on the basis of environmental reviews and regulatory controls such that impacts would not be destabilizing with respect to affected resources (Section 7.3).

TABLE 8.0-2
IMPACTS COMPARISON DETAIL

	No-Action Alternative			
Proposed Action (License Renewal)[a]	**Base (Terminate Operations & Decommission)[a]**	**With Purchased Power[b]**	**With Gas-Fired Generation[b]**	**With Coal-Fired Generation[b]**
		Description		
Renew operating license for MNGP, extending operation of the unit 20 years beyond the expiration of its current operating license in 2010 (Chapter 3).	Terminate operations and decommission MNGP following expiration of its current operating license in 2010. Adopting by reference NRC description of associated activities provided in the GEIS Chapter 7 and Section 8.4, and in Supplement 1 to NUREG-0586 as representative of corresponding MNGP activities. (Section 7.1.1).	Adopting by reference NRC description in the GEIS of alternate technologies. In addition, 100 miles of new 345-kV transmission line(s) assumed to be required to import power. (Section 7.2.2.1).	New 550 MWe (net) combined-cycle plant at greenfield site in Minnesota, generally south of the Twin Cities, with (Section 7.2.2.2): • Closed-cycle cooling (mechanical-draft). • Offsite infrastructure: 5-mile gas pipeline; 5-mile transmission line. • Air emission controls: NOx: water/steam injection; selective catalytic reduction (90% removal). PM and CO emissions limited through proper combustion controls. • 200-foot-tall stacks • Estimated workforce: Construction: 450 peak Operation: 24	New 600 MWe (net) pulverized coal plant at greenfield site in Minnesota, generally south of the Twin Cities, with (Section 7.2.2.3): • Closed-cycle cooling (mechanical draft). • Offsite infrastructure: 10-mile rail spur; 5-mile transmission line. • Air emission controls: Particulates (fabric filter, 99.9% removal); SO_x (limestone scrubber, (90% removal); NO_x (low NO_x burners, overfire air, SCR; 95% removal). • 500-foot-tall stack. Estimated workforce: Construction: 400 average, 1,000 peak Operation: 50-80

TABLE 8.0-2 (CONTINUED)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)[a]	No-Action Alternative			
	Base (Terminate Operations & Decommission) [a]	With Purchased Power[b]	With Gas-Fired Generation[b]	With Coal-Fired Generation[b]
Land Use Impacts				
SMALL – Adopting by reference applicable NRC findings for GEIS Category 1 issues (Section 4.1.1 and Attachment A, Issues 52, 53). Tax-driven and population-driven impacts on offsite land use are addressed below under Socioeconomic Impacts. No Category 2 issues.	SMALL – Adopting by reference applicable NRC impact conclusions in the GEIS Section 8.4 and Supplement 1 to NUREG-0586. MNGP decommissioning activities not expected to involve significant land-use disturbance offsite. (Section 7.1.1).	SMALL to MODERATE - Impact dependent on generation technology and location. Adopting by reference NRC description in the GEIS of land use impacts from alternate technologies (NRC 1996, Section 8.3) but assumed for comparison to be no more significant than that of gas-fired and coal-fired alternatives. Assumed 1,800 acres of land converted to transmission line ROW, likely to consist mostly of rural agricultural land with some areas of natural vegetation (e.g., forested tracts, wetlands) abundant in the region. Incompatible land uses would be restricted, but compatible land uses (e.g. farming) on transmission ROW could continue. (Section 7.3.1).	SMALL to MODERATE– Assumed 110 acres of land on plant site (including development of 25 acres for plant facilities) converted to industrial use. Also, 20 acres and 90 acres, respectively, converted to gas line and transmission line ROW. Land uses most likely affected consist mostly of rural agricultural land with some areas of natural vegetation (e.g., forested tracts, wetlands) abundant in the region. Incompatible land uses would be restricted but compatible land uses (e.g. farming) could continue on balance of plant site and transmission and gas ROWs. (Section 7.3.2).	MODERATE– Assumed 1,700 acres on plant site (including 260 acres for plant facilities and 120 acres for air emission waste landfill) converted to industrial use. Also, 60 acres of land converted to railway and 90-acres converted to transmission ROW. Land uses most likely affected consist mostly of rural agricultural land with some areas of natural vegetation (e.g., forested tracts, wetlands) abundant in the region. Incompatible land uses and restricted but compatible land uses (e.g. farming) could continue on balance of plant site and transmission ROW. Incompatible land uses on landfill restricted long-term. (Section 7.3.3).

TABLE 8.0-2 (CONTINUED)
IMPACTS COMPARISON DETAIL

	No-Action Alternative			
Proposed Action (License Renewal)[a]	**Base (Terminate Operations & Decommission)[a]**	**With Purchased Power[b]**	**With Gas-Fired Generation[b]**	**With Coal-Fired Generation[b]**
Water Use and Quality Impacts				
SMALL – Adopting by reference applicable NRC findings for GEIS Category 1 issues (Section 4.1.1 and Attachment A, Issues 3, 6-12, 32, 89). Category 2 Issues 13 and 34: Under worst-case river low-flow scenario (586 cfs), consumptive use and lowering of Mississippi River is only 9.9 cfs and 0.02 feet, respectively (Section 4.2).	SMALL – Adopting by reference applicable NRC impact conclusions in the GEIS Chapter 7 (as codified in 10 CFR 51, Subpart A, Appendix B, Table B-1) and Section 8.4, and in Supplement 1 to NUREG-0586 (Section 7.1.1).	SMALL – Impact dependent on generation technology and location. Adopting by reference NRC description in the GEIS of water quality impacts from alternate technologies (NRC 1996, Section 8.3) but assumed for comparison to be no more significant than that of gas-fired and coal-fired alternatives. (Section 7.3.1).	SMALL – Construction impacts minimized by regulatory controls. Cooling water and wastewater discharges lower than for MNGP and subject to regulatory controls. Consumptive use relatively low (3 cfs). (Section 7.3.2).	SMALL – Construction impacts minimized by regulatory controls. Cooling water and wastewater discharges lower than for MNGP and subject to regulatory controls. Consumptive use relatively low (10 cfs). (Section 7.3.3).
Air Quality Impacts				
SMALL – Adopting by reference applicable NRC findings for GEIS Category 1 issue (Section 4.1.1 and Attachment A, Issues 51, 88). No Category 2 issues.	SMALL – Adopting by reference applicable NRC impact conclusions in the GEIS Chapter 7 (as codified in 10 CFR 51, Subpart A, Appendix B, Table B-1) and Section 8.4, and in Supplement 1 to NUREG-0586 (Section 7.1.1).	SMALL to MODERATE - Impact dependent on generation technology and location. Adopting by reference NRC description in the GEIS of air quality impacts from alternate technologies (NRC 1996, Section 8.3) but assumed for comparison to be no more significant than that of gas-fired and coal-fired alternatives (Section 7.3.1).	MODERATE – Emissions: • 9 tons SO_2/yr • 134 tons NO_x/yr • 203 tons CO/yr • 26 tons PM_{10}/yr (Section 7.3.2).	MODERATE – Emissions: • 1,755 tons SO_2/yr • 486 tons NO_x/yr • 675 tons CO/yr • 77 tons PM/yr • 18 tons PM_{10}/yr (Section 7.3.3).

TABLE 8.0-2 (CONTINUED)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal) [a]	No-Action Alternative			
	Base (Terminate Operations & Decommission) [a]	With Purchased Power [b]	With Gas-Fired Generation [b]	With Coal-Fired Generation [b]
Waste Management Impacts				
SMALL – Adopting by reference applicable NRC findings for GEIS Category 1 issues (Section 4.1.1 and Attachment A, Issues 77-85, 87). No Category 2 issues.	SMALL – Adopting by reference applicable NRC impact conclusions in the GEIS Chapter 7 (as codified in 10 CFR 51, Subpart A, Appendix B, Table B-1) and Section 8.4, and in Supplement 1 to NUREG-0586 (Section 7.1.1).	SMALL to MODERATE – Impact dependent on generation technology and location. Adopting by reference NRC description in the GEIS of waste management impacts from alternate technologies (NRC 1996, Section 8.3) but assumed for comparison to be no more significant than that of gas-fired and coal-fired alternatives. (Section 7.3.1).	SMALL –Relatively low waste generation (Section 7.3.2).	MODERATE – Approximately 107,000 tons of ash and 51,000 tons of flue gas desulfurization waste generated over 40-year plant life assumed to be disposed of in a 120-acre landfill except 30 % of ash beneficially used. Potential for localized impact to groundwater from escape of leachate. (Section 7.3.3).
Ecological Resource Impacts				
SMALL – Adopting by reference applicable NRC findings for GEIS Category 1 issues (Section 4.1.1 and Attachment A, Issues 15-24, 28-30, 41-43, 45-48, and 90). Category 2 Issues 25-27: Determined from CWA Section 316(a) and 316(b)	SMALL to MODERATE – Adopting by reference applicable impact conclusions in the GEIS Chapter 7 (as codified in 10 CFR 51, Subpart A, Appendix B, Table B-1) and Section 8.4, and in Supplement 1 to NUREG-0586.	SMALL to MODERATE – Impact dependant on generation technology, location. Adopting by reference NRC's GEIS description of ecological impacts from alternate technologies (NRC 1996, Section 8.3), but assumed for comparison to be no more significant than that of gas-fired and coal-fired alternatives.	SMALL to MODERATE – Potential loss of 25 acres of habitat for plant facilities and modification of 110 acres of habitat for transmission line and pipeline, likely to consist mostly of rural agricultural	SMALL to MODERATE- Potential loss of 440 acres of habitat for onsite facilities and rail spur and modification of 90 acres of habitat offsite for transmission line, likely to consist mostly of rural agricultural land with some areas of natural vegetation (e.g., forested tracts, wetlands) abundant in the region.

TABLE 8.0-2 (CONTINUED)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)[a]	No-Action Alternative			
	Base (Terminate Operations & Decommission)[a]	With Purchased Power[b]	With Gas-Fired Generation[b]	With Coal-Fired Generation[b]
Ecological Resource Impacts (continued)				
Demonstrations to offer no substantial detriment to the Mississippi River fisheries population from impingement, entrainment, and thermal discharges. Annual surveys have shown similar, persistent, and stable fish species assemblages in the River. (Sections 4.3-4.5). Category 2 Issue 49: Impacts to threatened and endangered species expected to be small due to one or more of the following: • low potential for occurrence in habitats affected by plant and transmission line operation and maintenance, • protective operation and maintenance practices; and • lack of observed impacts as documented by operational monitoring (Section 4.7).	MNGP decommissioning activities not expected to involve activities beyond operational areas that would result in significant impacts; however, wintering trumpeter swans and nesting peregrine falcons (state threatened) dependent on MNGP would be forced to relocate with SMALL to potentially MODERATE impact. (Section 7.1.1).	Habitat traversed by the transmission line(s) likely to consist mostly of rural agricultural land with some areas of natural vegetation (e.g., forested tracts, wetlands) abundant in the region. ROW areas currently forested would be converted to shrub and herbaceous habitat; open wetland and crop/pastureland habitat would remain largely intact. (Section 7.3.1). Wintering trumpeter swans and nesting peregrine falcons (state threatened) dependent on MNGP would be forced to relocate (Section 7.1.1).	land with some areas of natural vegetation (e.g., forested tracts, wetlands) abundant in the region. ROW areas currently forested would be converted to shrub and herbaceous habitat; open wetland and crop/pastureland habitat would remain largely intact or be restored. Potential impact to aquatic resources from construction and operation (e.g., cooling water withdrawal and discharge) reduced by best management practices and regulatory controls. (Section 7.3.2). Wintering trumpeter swans and nesting peregrine falcons (state threatened) dependent on MNGP would be forced to relocate (Section 7.1.1).	Transmission ROW areas currently forested would be converted to shrub and herbaceous habitat; open wetland and crop/pastureland habitat would remain largely intact. Potential for impacts to aquatic resources from construction and operation (e.g., cooling water withdrawal and discharge) reduced by best management practices and regulatory controls. (Section 7.3.3). Wintering trumpeter swans and nesting peregrine falcons (state threatened) dependent on MNGP would be forced to relocate (Section 7.1.1).

TABLE 8.0-2 (CONTINUED)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)[a]	No-Action Alternative			
	Base (Terminate Operations & Decommission)[a]	With Purchased Power[b]	With Gas-Fired Generation[b]	With Coal-Fired Generation[b]
Socioeconomic Impacts				
SMALL – Adopting by reference applicable NRC findings for GEIS Category 1 issues (Section 4.1.1 and Attachment A, Issues 64, 67, and 91). Category 2 Issue 63: Location in area of high population with no growth control measures in effect minimizes potential for housing impacts (Section 4.11). Category 2 Issue 69: Tax-driven land-use changes would be SMALL considering that the relative contribution of property tax payments for MNGP is expected to remain similar to current levels, and Wright County and municipalities in the site vicinity (e.g., City of Monticello) have established development patterns and guide growth with regulatory measures such as zoning and comprehensive planning (Section 4.14.2). Category 2 Issue 65: Major potable water suppliers in the Sherburne and Wright County have excess capacity or have plans for additional capacity (Section 4.12). Category 2 Issue 70: Traffic volumes and capacities of major commuting routes minimize potential for transportation impacts (Section 4.15).	MODERATE – Adopting by reference applicable NRC impact conclusions in the GEIS Chapter 7 (as codified in 10 CFR 51, Subpart A, Appendix B, Table B-1) and Section 8.4, and in Supplement 1 to NUREG-0586; however, impact from loss of MNGP tax revenue comprising 12-13 % of City of Monticello total budget would be MODERATE (Section 7.1.1).	MODERATE – Impact dependent on generation technology and location. Adopting by reference NRC description in the GEIS of socioeconomic impacts from alternate technologies (NRC 1996, Section 8.3) but assumed to be no more significant than those associated with gas-fired and coal-fired alternatives evaluated in this analysis. (Section 7.3.1). MODERATE impact to the City of Monticello from loss of MNGP tax revenue comprising 12-13 % of its total budget (Section 7.1.1).	MODERATE - Impacts from construction considered SMALL because site would be within commuting distance of relatively large population centers (Section 7.3.2). MODERATE impact to the City of Monticello from loss of MNGP tax revenue comprising 12-13 % of its total budget (Section 7.1.1).	MODERATE - Impacts from construction considered SMALL because site would be within commuting distance of relatively large population centers (Section 7.3.3). MODERATE impact to the City of Monticello from loss of MNGP tax revenue comprising 12-13 % of its total budget (Section 7.1.1).

TABLE 8.0-2 (CONTINUED)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)[a]	No-Action Alternative			
	Base (Terminate Operations & Decommission)[a]	With Purchased Power[b]	With Gas-Fired Generation[b]	With Coal-Fired Generation[b]
Human Health Impacts				
SMALL - Adopting by reference applicable NRC findings for GEIS Category 1 issues (Section 4.1.1 and Attachment A, Issues 56, 58, 61-62, 86). Category 2 Issue 57: Water temperatures in the Mississippi River and MNGP discharge canal are too low for proliferation of thermophilic microbial pathogens, minimizing potential for public health impacts (Section 4.9). Category 2 Issue 59: Transmission line-induced currents conform to National Electric Safety Code® criteria (Section 4.10).	SMALL – Adopting by reference applicable NRC impact conclusions in the GEIS Chapter 7 (as codified in 10 CFR 51, Subpart A, Appendix B, Table B-1) and Section 8.4, and in Supplement 1 to NUREG-0586 (Section 7.1.1).	SMALL – Impact dependent on generation technology and location. Adopting by reference NRC description in the GEIS of human health impacts from alternate technologies (NRC 1996, Section 8.3) but assumed for comparison to be no more significant than that of gas-fired and coal-fired alternatives. (Section 7.3.1).	SMALL– Some risk of cancer and emphysema from air emissions and risk of accidents to workers, as NRC notes in the GEIS. Regulatory controls assumed to reduce risks to acceptable levels. (Section 7.3.2).	SMALL– Some risk of cancer and emphysema from air emissions and risk of accidents to workers, as NRC notes in the GEIS. Regulatory controls assumed to reduce risks to acceptable levels. (Section 7.3.3).

TABLE 8.0-2 (CONTINUED)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)[a]	No-Action Alternative			
	Base (Terminate Operations & Decommission)[a]	With Purchased Power[b]	With Gas-Fired Generation[b]	With Coal-Fired Generation[b]
Aesthetic Impacts				
SMALL – Adopting by reference applicable NRC findings for GEIS Category 1 issues (Section 4.1.1 and Attachment A, Issues 73, 74). No Category 2 issues.	SMALL – Adopting by reference applicable NRC impact conclusions in the GEIS Section 8.4 and Supplement 1 to NUREG-0586 (Section 7.1.1).	SMALL to MODERATE – Impact dependent on generation technology and location. Adopting by reference NRC description in the GEIS of aesthetic impacts from alternate technologies (NRC 1996, Section 8.3) but assumed for comparison to be no more significant than that of gas-fired and coal-fired alternatives. Transmission line(s) visible in rural landscape, though visibility could be limited by vegetation and topography depending on location. (Section 7.3.1).	SMALL to MODERATE – Stacks (200-ft. high) and cooling tower condensate plume would be apparent offsite and transmission lines would be visible in rural landscape, though visibility could be limited by vegetation and topography depending on location (Section 7.3.2).	SMALL to MODERATE – Stack (500-ft. high) and cooling tower condensate plume would be apparent offsite and transmission lines would be visible in rural landscape, though visibility could be limited by vegetation and topography depending on location (Section 7.3.3).

TABLE 8.0-2 (CONTINUED)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)[a]	No-Action Alternative			
	Base (Terminate Operations & Decommission)[a]	With Purchased Power[b]	With Gas-Fired Generation[b]	With Coal-Fired Generation[b]
Cultural Resource Impacts				
SMALL – No Category 1 issues. Category 2 Issue 71: No known archaeological or historic resources on MNGP site or transmission line corridors; no plans for land-disturbing activities (Section 4.16).	SMALL – Adopting by reference applicable NRC impact conclusions in the GEIS Section 8.4 and Supplement 1 to NUREG-0586. No known archaeological or historic resources on MNGP site; decommissioning activities are not likely to involve significant activities beyond operational areas (Sections 4.16 and 7.1.1).	SMALL – Impact dependent on generation technology and location. Adopting by reference NRC description in the GEIS of cultural resource impacts from alternate technologies (NRC 1996, Section 8.3), but assumed for comparison to be no more significant than that of gas-fired and coal-fired alternatives. Routing and construction of transmission line would be subject to regulatory review and mitigation measures could be implemented. (Section 7.3.1).	SMALL – Siting of plant and offsite infrastructure (transmission line, natural gas pipeline) would be subject to regulatory review, and mitigation measures could be implemented (Section 7.3.2).	SMALL – Siting of plant and offsite infrastructure (transmission line, rail line) would be subject to regulatory review, and mitigation measures could be implemented (Section 7.3.3).

TABLE 8.0-2 (CONTINUED)
IMPACTS COMPARISON DETAIL

	No-Action Alternative			
Proposed Action (License Renewal)[a]	**Base (Terminate Operations & Decommission)[a]**	**With Purchased Power[b]**	**With Gas-Fired Generation[b]**	**With Coal-Fired Generation[b]**

a. See Attachment A, Table A-1, for a list of issues and applicability.

b. Location and design of transmission line(s) for purchased power and for plant and offsite infrastructure (e.g., pipeline, transmission lines) for gas-fired and coal fired alternatives assumed to be established on the basis of environmental reviews and regulatory controls such that impacts would not be destabilizing with respect to affected resources (Section 7.3).

Impact significance definitions (from 10 CFR 51, Subpart A, Appendix B, Table B-1, footnote 3):
SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
MODERATE – Environmental effects are sufficient to alter noticeably but not to destabilize any important attribute of the resource.
LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

% = percent
CO = carbon monoxide
cfs = cubic feet per second
GEIS = *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (NRC 1996)
ft = foot (feet)
NO_X = nitrogen oxides
NRC = U.S. Nuclear Regulatory Commission
MNGP = Monticello Nuclear Generating Plant
MWe = megawatt(s) - electric
PM = particulate matter
PM_{10} = filterable particulates having diameter less than 10 microns
ROW = right-of-way
SCR = selective catalytic reduction
SO_2 = sulfur dioxide
SO_x = sulfur oxides
yr = year

8.1 References

NRC (U.S. Nuclear Regulatory Commission). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437. Office of Nuclear Regulatory Research. Washington, D.C. May.

9.0 STATUS OF COMPLIANCE

9.1 PROPOSED ACTION

9.1.1 GENERAL

Table 9.1-1 lists environmental authorizations that Northern States Power (NSP)[1] has obtained for the current operations of Monticello Nuclear Generating Plant (MNGP). In this context, Nuclear Management Company, LLC (NMC) defines "authorizations" as permits, licenses, approvals, or other entitlements. NMC expects NSP to continue renewing these authorizations during the current license period and throughout the license renewal period. Based on the new and significant information review described in Chapter 5 of this Environmental Report (ER), NMC concludes that MNGP is in compliance with all applicable environmental standards and requirements.

Table 9.1-2 lists additional environmental authorizations and consultations related to U.S. Nuclear Regulatory Commission (NRC) renewal of the MNGP operating license. As indicated, NMC anticipates needing relatively few such authorizations and consultations. Sections 9.1.2 through 9.1.6 discuss some of these items in more detail.

9.1.2 THREATENED OR ENDANGERED SPECIES

Section 7 of the Endangered Species Act (16 USC 1531 et seq.) requires federal agencies to ensure that an agency action is not likely to jeopardize any species that is listed or proposed for listing as endangered or threatened. Depending on the action involved, the Act requires consultation with the U.S. Fish and Wildlife Service (FWS) regarding effects on non-marine species, the National Marine Fisheries Service (NMFS) for marine species, or both. The FWS and NMFS have issued joint procedural regulations that address such consultations at 50 CFR 402.14, Subpart B, and the FWS maintains the joint list of threatened and endangered species at 50 CFR 17.

As discussed in Section 4.7 of this ER, NMC does not expect the continued operation of MNGP to impact the population of any federal or state threatened or endangered species or natural communities in the vicinity of the MNGP site. Although federal law and NRC regulations do not require it, NMC invited specific comment from FWS and the Minnesota Department of Natural Resources (MNDNR) regarding potential impacts that MNGP license renewal might have on species of concern. In addition, NMC desired to facilitate NRC's consultation process and considered potential impacts to species having special status at both the federal and state level. Attachment C includes copies of relevant correspondence with these agencies. Based on the assessment presented in Section 4.7 of this ER, including consideration of correspondence with agencies

[1] Northern States Power is a wholly owned utility operating subsidiary of Xcel Energy Inc.

(Attachment C), NMC and the relevant agencies contacted concur that MNGP license renewal would not result in any significant adverse impact to threatened or endangered species or critical habitats.

9.1.3 HISTORIC PRESERVATION

Section 106 of the National Historic Preservation Act (16 USC 470f et seq.) requires federal agencies having the authority to license any undertaking to, prior to issuing the license, take into account the effect of the undertaking on historic properties and to afford the Advisory Committee on Historic Preservation an opportunity to comment on the undertaking. Committee regulations provide for establishing an agreement with any State Historic Preservation Officer (SHPO) to substitute state review for Committee review (36 CFR 800.2). Although not required by federal law or NRC regulation, NMC has chosen to invite comment by the Minnesota SHPO. Attachment E includes copies of NMC correspondence with the SHPO.

9.1.4 WATER QUALITY (401) CERTIFICATION

Federal Clean Water Act Section 401 requires that an applicant seeking a federal license for any activity that might result in a discharge into navigable waters must provide the licensing agency with a certification from the state that the discharge complies with applicable Clean Water Act requirements (33 USC 1341). NRC has indicated in the Generic Environmental Impact Statement (GEIS) that issuance of a National Pollutant Discharge Elimination System (NPDES) permit implies certification by the state (NRC 1996). In 1974, the U.S. Environmental Protection Agency (EPA) granted the State of Minnesota authority to issue NPDES permits through the Minnesota Pollution Control Agency (MPCA) (EPA 2004). NMC is applying to NRC for license renewal to continue MNGP operations. Attachment B contains two letters of certification from the MPCA (1973 and 1977) and the current MNGP MPCA authorized NPDES permit, which authorizes plant discharges. Consistent with the GEIS, MNGP is providing its NPDES permit as evidence of state water quality (401) certification. The 1977 MPCA letter explicitly acknowledges that issuance of the NPDES permit by the state and compliance with that permit and any other applicable agreements by MNGP constitutes Section 401 certification.

9.1.5 CLEAN WATER ACT

The Federal Clean Water Act, Section 316(b) [33 USC 1326] provides requirements to ensure that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

Since submittal and approval of the original 316(b) demonstration for MNGP, the EPA promulgated new regulations in July 2004 governing the implementation of

Section 316(b) of the Clean Water Act for large electric generators (40 CFR 125, Subpart J). These new regulations are technology based with performance criteria stipulating required levels of reduction of entrainment and impingement mortality at cooling-water intake structures (CWIS). Each facility will be required to reevaluate their CWIS and develop plans for reducing entrainment and impingement mortality. Any actions addressing the new regulations will be governed by state permitting agencies or EPA regional offices, and keyed to the facility's NPDES permit renewal cycle.

9.1.6 STATE OF MINNESOTA ENVIRONMENTAL REVIEW PROGRAM

NSP filed a Certificate of Need (CON) with the Minnesota Public Utility Commission (PUC) in early 2005 to allow construction of an Independent Spent Fuel Storage Installation (ISFSI) on the MNGP site. Minnesota Statute Chapter 216B.243 Subdivision 3b(b) requires that the CON address the impacts of continued operation during the period covered by the renewed license. Minnesota Statute Chapter 116C.83 Subdivision 6(b) requires that an environmental impact statement (EIS) be prepared by the Minnesota Environmental Quality Board (MEQB) pursuant to the requirements of Chapter 116D for the construction and operation of an ISFSI. This EIS will be prepared by the MEQB and submitted to the PUC for consideration in the PUC's CON determination.

9.2 FEASIBLE ALTERNATIVES

The coal- and gas-fired generation power alternatives that Section 7.2.2 of this ER discusses could be constructed and operated so as to comply with all applicable environmental quality standards. NMC notes that increasingly stringent air quality protection requirements could restrict construction of a larger fossil-fueled power plant in many locations.

Although construction and operation details for the purchase power alternative (see Section 7.2.2.1 of this ER) are not known, it is reasonable to assume that any facility offering power for purchase would be in compliance with all applicable environmental quality standards.

TABLE 9.1-1
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT OPERATIONS

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
Minnesota Department of Natural Resources[a]	Minnesota Statutes Chapter 103G.271	Water Appropriations Permit	67-0083	NA	Groundwater withdrawals from Well #1 and Well #2
Minnesota Department of Natural Resources[a]	Minnesota Statutes Chapter 103G.271	Water Appropriations Permit	66-1172	NA	Surface water withdrawals
Minnesota Department of Natural Resources	Minnesota Statutes Chapter 97A.401	Division of Fish and Wildlife Special Permit	12674	12/31/05	Collection of fish for biological evaluation
Minnesota Department of Natural Resources	Minnesota Statutes Chapter 97A.401	Division of Ecological Services Special Permit	12683	12/31/08	Collection of mussels for radioactive exposure analysis
Minnesota Pollution Control Agency	Minnesota Statutes Chapters 115 and 116	National Pollutant Discharge Elimination System (NPDES) Permit	MN0000868	07/31/07	Discharge of wastewaters to waters of the State
Minnesota Pollution Control Agency	Minnesota Statutes Chapters 115 and 116	General Stormwater Permit for Industrial Activity	MN G611000	10/31/02	Discharge of stormwater to waters of the State. Permit renewal application submitted April 16, 2002
Minnesota Pollution Control Agency	Minnesota Rules Chapter 7045.0225	Hazardous Waste Generator License	MND000686139	06/30/05	Authorizes facility to operate as a hazardous waste generator
Minnesota Pollution Control Agency	Minnesota Rules Chapters 7007.0105	Air Emission Permit	17100019-003	08/16/05	Operate air emission facility (oil- and gas-fired heating boiler, 4 emergency diesel generators, and a emergency fire pump diesel engine)

TABLE 9.1-1 (CONTINUED)
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT OPERATIONS

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
Minnesota Pollution Control Agency	Minnesota Statutes Chapters 115 and 116	State Disposal System Permit	12915	NA	Construction and operation of a sanitary sewer extension
City of Monticello	City of Monticello Ordinance Title 14, Chapter 4	Sanitary Sewer Wastewater Discharge Agreement	001	NA	Discharge of domestic sanitary waste into the City of Monticello sanitary sewer collection system
Minnesota Pollution Control Agency	Minnesota Statutes Chapters 115 and 116	State Disposal System Permit	MN0058343	03/31/04	Maintenance dredging, dewatering, and settling system discharge, and dredged material disposal. Permit renewal application submitted 9/24/03.
Minnesota Department of Natural Resources	Minnesota Statues Chapter 103G.315 Minnesota Rule Chapter 6115.0200	State Dredging Permit	67-0743 GP-001-MN	NA[b]	Maintenance dredging, dewatering, and settling system discharge, and dredged material disposal
State of Tennessee Department of Environment and Conservation	TDEC 1200-2-10-.30	Radioactive Shipment License	T-MN002-L04	12/31/04	Shipment of radioactive material to a licensed disposal/processing facility within Tennessee. Permit renewal application submitted 10/15/04

TABLE 9.1-1 (CONTINUED)
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT OPERATIONS

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
South Carolina Department of Health and Environmental Control	South Carolina ADC 61-83	South Carolina Radioactive Waste Transport Permit	0026-22-04-X	12/31/04	Transport of radioactive waste into South Carolina. Permit renewal application submitted 9/14/04
U.S. Army Corps of Engineers	Section 10 of the Rivers and Harbors Act of 1899	General Permit	01-02982-GP-GAE	NA[b]	Maintenance dredging, dewatering, and settling system discharge, and dredged material disposal
U.S. Department of Transportation	49 USC 5108 (49 CFR 107.601)	Certificate of Registration for Transportation of Hazardous Materials	062504551041M	6/30/05	Transport of hazardous materials
U.S. Fish and Wildlife Service	16 USC 703-712 (50 CFR Part 13 and 50 CFR 21.27)	Special Purpose Permit	MB074020-0	03/31/06	Handling of injured and dead migratory birds
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011 et seq.), 10 CFR 50.10	Facility Operating License	Unit 1 – DPR-22	09/08/10	License to operate a nuclear power plant

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

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

CFR = Code of Federal Regulations

NA = Not Applicable

TDEC = Tennessee Department of Environment and Conservation

U.S. = United States

USC = United States Code

TABLE 9.1-2
ENVIRONMENTAL AUTHORIZATIONS FOR LICENSE RENEWAL[a]

Agency	Authority	Requirement	Remarks
Minnesota Historical Society	National Historic Preservation Act, Section 106 (16 USC 470f)	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with State Historic Preservation Officer (see Attachment E to this ER)
Minnesota Pollution Control Agency	Clean Water Act, Section 401 (33 USC 1341)	Certification	Requires State certification that the proposed action would comply with Clean Water Act standards. MNGP provides its original 401 certification and its NPDES permit (Attachment B) as evidence of state water quality certification.
U.S. Fish and Wildlife Service	Endangered Species Act, Section 7 (16 USC 1531)	Consultation	Requires federal agency issuing a license to consult with FWS (see Attachment C to this ER)
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011 et seq.)	License renewal	Environmental report submitted in support of license renewal application

a. No renewal-related requirements identified for local or other agencies.

ER = Environmental Report

FWS = U.S. Fish and Wildlife Service

USC = United States Code

9.3 REFERENCES

Note to reader: This list of references identifies web pages and associated URLs where reference data was obtained. Some of these web pages may likely no longer be available or their URL addresses may have changed. NMC has maintained hard copies of the information and data obtained from the referenced web pages.

EPA (U.S. Environmental Protection Agency). 2004. "National Pollutant Discharge Elimination System, Specific State Program Status." Available at http://cfpub2.epa.gov/npdes/statestats.cfm.

NRC (U.S. Nuclear Regulatory Commission). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plant*s. NUREG-1437. Office of Nuclear Regulatory Research. Washington, D.C. May.