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Final Environmental Assessment

PROPOSED AMENDMENT TO PRESIDENTIAL PERMIT PP-63 AND ASSOCIATED MODIFICATIONS TO 500 KV INTERNATIONAL TRANSMISSION LINE

Forbes, Minnesota to Manitoba, Canada

Northern States Power Company

U.S. DEPARTMENT OF ENERGY

Washington, DC 20545

February 1992

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NSP ENVIRONMENTAL ASSESSMENT PRELIMINARY DRAFT

1.0 PURPOSE OF AND NEED FOR THE PROJECT

1.1 Introduction

Northern States Power Company, (NSP), a Minnesota investor owned utility has applied to the Office of Fossil Energy, United States Department of Energy, to amend Presidential Permit PP-63 to allow for alterations to the 500 kV transmission line and associated facilities currently regulated by this permit.

The alterations proposed for the 500 kV line owned by NSP are part of a long term effort sponsored by NSP to upgrade the existing NSP transmission system to allow for increased exchange of electricity with the Manitoba Hydro-Electric Board. (This long term effort is described in Section 1.4 of this report).

Presidential Permit PP-63 authorized NSP to construct, connect, operate and maintain a 500 kV line at the United States/Canadian border approximately seven-and-a-half miles west of Warroad in Roseau County, Minnesota. This line connects with a 500 kV line owned and operated by the Manitoba Hydro-Electric Board (MHEB), which extends from Dorsey, Manitoba, Canada to the United States/Canadian border. A map showing the existing 500 kV transmission line and related transmission facilities is presented in Figure 1-1.

NSP proposes to increase the electricity transfer capability of this transmission facility by constructing a new 80-acre substation on the existing 500 kV line in Roseau County (Section 33 of Lake Township), Minnesota, and upgrading the existing substation at Forbes (Section 1 of Lavell Township), Minnesota. The proposed Roseau substation would contain two 41.5 ohm series capacitor banks. In addition, static VAR compensators (SVC) are to be installed at the existing Forbes Substation. Approximately 5 acres would be added to the 30-acre Forbes site to house the additional equipment. No new lines would enter or exit the facility. NSP proposes to place the new Roseau Substation in service in May 1993 and to complete the upgrading of the Forbes Substation in March 1994.

The primary, initial purpose of these modifications is to enable NSP to import 400 megawatts (MW) of electric power from MHEB during the summer months to meet peak electrical demand in the Minneapolis-St. Paul area. It is expected that this power transfer would begin in 1993.

MANITOBA

DORSEY

KEY

- SERIES CAPACITOR INSTALLATION
- △ SHUNT CAPACITOR INSTALLATION
- STATIC COMPENSATOR INSTALLATION

DRAYTON △

ROSEAU COUNTY

□ LITTLEFORK

RAMSEY △

PRAIRIE □

△ WINGER

FORBES

△ PICKERT

SHEYENNE △

NORTH
DAKOTA

MINNESOTA

CHISAGO COUNTY

KOHLMAN LAKE △

RED ROCK △

KING

MINNESOTA MANITOBA TRANSMISSION UPGRADE

FIGURE 1-1

Dames & Moore

On an annual basis, NSP provides ten-year forecasts of demand for electrical power to the Minnesota Environmental Quality Board (MEQB). NSP's most recent report was submitted in July, 1991 (Minnesota-Wisconsin Power Suppliers Group, 1991). Current consumption in NSP's service area is 7.4 thousand megawatts. Including energy conservation program reductions, NSP estimates that the median growth in demand will be 2.5% per year. On this basis, total system demand would equal 7.7 thousand megawatts by 1993. By 1995, total system demand would equal 8.1 thousand megawatts. Increasing the electricity transfer capability of the 500 kV transmission line would help meet some of this demand.

1.2 Summary of the Proposed Action

Pursuant to Executive Order No. 10485, as amended by Executive Order No. 12038, the construction, connection, operation and maintenance of electrical facilities at the international border of the United States can only be authorized by Presidential Permit. The Office of Fossil Energy of the United States Department of Energy has been delegated authority to carry out the regulations implementing Executive Orders 10485 and 12038.

Prior to issuing or amending a Presidential Permit, the Department of Energy must evaluate the environmental impacts of the activities associated with any permit application or modification pursuant to the National Environmental Policy Act (NEPA). Thus the proposed action assessed in this Environmental Assessment (EA) is the granting or denial to NSP by DOE of applicable permit modifications to allow NSP to undertake activities associated with upgrading its 500 kV line. These activities are described below.

1.3 Proposed 500 kV Transmission Line Modifications

NSP proposes to add the following equipment to enhance its 500 kV transmission line:

500 kV Series Compensation

Series compensation reduces the opposition to power flow. Series capacitors are designed to increase power flow on the 500 kV transmission line, while at the same time, maintaining power flows at present levels throughout the rest of the associated electric transmission system. Series capacitors would be added in two locations along the 500 kV transmission line. Approximately midway along the Dorsey to Forbes line segment, a new substation called Roseau County would be built to accommodate series capacitors. The rest of the capacitors would be placed at the southern terminus of the 500 kV line, Chisago County Substation. The series compensation additions would be placed in service in the spring of 1993.

Static VAR Compensators (SVC)

Installation of fast acting, reactive power control devices called SVC's will prevent unacceptable voltage fluctuations in northern Minnesota and the Red River Valley area. SVCs are a series of capacitors and reactors that are controlled by electronically operated switches. SVC installations include a step down transformer to provide power for the equipment from the transmission system. Monitoring equipment senses disturbances on the transmission system and, within fractions of a second, activates the proper combinations of capacitors and reactors to prevent unacceptable voltage fluctuations. SVC installations are proposed at Forbes Substation along the 500 kV transmission line. SVC installations would be placed in service in 1993 and 1994.

500 kV Ring Bus

In addition to SVC installation, a 500 kV ring bus would be installed at the Forbes Substation. This equipment would allow increased system reliability and maintenance of equipment without 500 kV line outages.

Chisago County 500/345 kV Transformer Addition

A second 500/345 kV transformer is planned for the Chisago County Substation as part of this project. The new transformer is necessary to accommodate increased power flows into the transmission system that serves the Minneapolis/St. Paul metropolitan area. The transformer would be placed in service in November 1993.

Minneapolis/St. Paul Shunt Capacitors

These capacitors will maintain voltage levels in the metropolitan area during increased power flows on the 500 kV line. They would be located on the 115 kV transmission system at two existing substations, Kohlman Lake in Maplewood, and Red Rock in Newport. These capacitor additions would be placed in service in May 1993. These additions would be accommodated within the existing fenced boundaries of the Kohlman Lake and Red Rock Substations.

1.4 Relationship of the Proposed Action to Related Projects

As mentioned above, the proposed alterations to the 500 kV line are part of an overall effort sponsored by NSP to increase the exchange of electricity between the United States and Canada, thereby enabling both utilities to meet projected demand for electric power. Eventually, NSP and MHEB plan not only to import to the United States 400 MW during the summer months, but also to export 400 MW to Canada during the winter months to meet the Canadians' peak electrical demand. However, the increased export of electric power to Canada is not expected to occur until 1995.

Other projects related to this overall effort include upgrading transmission facilities on two connected 230 kV transmission lines. One 230 kV line is permitted by Presidential Permit PP-45 issued to NSP on September 22, 1969. This line extends from Grand Forks, North Dakota to the Canadian border. The other 230 kV transmission line extending from Hibbing, Minnesota to the Canadian border is permitted under a Presidential Permit issued on July 6, 1976 to the Minnesota Power Cooperative. However, DOE has not received applications to modify the Presidential Permits for these two 230 kV lines, therefore, this EA will only address changes to the 500 kV line governed by Presidential Permit PP-63. The following reasons explain why improvements to the 500 kV system are separate and distinct from improvements to the 230 kV system.

- Improvements to the 500 kV line include construction of a new substation called Roseau County, an expansion of existing substations at Forbes and Chisago County, and additions of new equipment without physical expansion of existing substations at Kohlman Lake and Red Rock.
- Improvements to the 230 kV line consist of expansion at as many as 11 other substations in Minnesota and North Dakota.
- The import of additional power requires improvements to the 500 kV line, but does not require improvements to the 230 kV lines.
- The two actions are significantly separated in time. The import of additional power would begin in 1993. The export of power to Manitoba would not occur until 1995.
- The import and export of electricity are separable and independent actions. The design, construction and operation of facilities to enable the import of electricity would go forward regardless of the final disposition of permitting associated with the 230 kV improvements that would enable increased export of electricity.
- The facilities associated with the 230 kV improvements will not be designed until mid - late 1992. Environmental review would take place then.
- The reliability of the system for increased import of electricity from Manitoba does not require improvements to the 230 kV line.
- Other utilities are involved in ownership of the 230 kV facilities. Other utilities hold export licenses and border crossing permits for the 230 kV lines affected by 230 kV system improvements. This EA will address only changes to facilities governed by Presidential Permit PP-63.

Pursuant to NEPA, the environmental impacts associated with the 230 kV line modifications will be assessed by DOE upon receipt of the applications to modify the Presidential Permits cited above.

2.0 ALTERNATIVES CONSIDERED, INCLUDING THE PROPOSED ACTION

2.1 Introduction

Pursuant to CEQ regulations implementing NEPA (10 CFR 1500-8), several alternatives to the Proposed Action are being evaluated. These alternatives are:

1. Substation Site Alternative
2. New Routing Alternative
3. No Action Alternative

Under the No Action Alternative, DOE would not grant NSP the permit modification and NSP would not upgrade its existing 500 kV transmission line. Other approaches to meet existing and projected electric power demands would be evaluated, along with the consequences of maintaining the status quo.

The New Routing Alternative entails the construction of a new 500 kV line between the Minneapolis/St. Paul area and the United States/Canadian border. It is assumed that such a line would extend a distance of approximately 200 miles and would require roughly 800 towers.

Most of the environmental impacts of the Proposed Action are related to the construction of a new substation, since other modifications would be to existing facilities. Under the Substation Site Alternative, the consequences of constructing a new substation at a different location than that currently proposed in Roseau County will be assessed.

For each Alternative, the short term and long term consequences of both construction and operation of related facilities will be evaluated. In addition, the impacts of maintaining the status quo and/or meeting electrical demand through other means (e.g. conservation, additional generating capacity) will be considered as the No Action Alternative.

2.2 The Proposed Action

The following construction and testing activities would be associated with the proposed action (Alders, 1991; Gustafson, 1991).

2.2.1 Construction and Testing Sequence

Development of a new substation or modification of an existing one, involves construction of a gravel pad for the equipment, erection of steel supporting structures, and installation and testing of new equipment. Construction and testing activities at the Roseau

County, Forbes, and Chisago County substations generally follow the same sequence. Land to be developed or added to the substation is graded and compacted. Stone and gravel fill is laid down for the substation pad. "Drilled pier" foundations for the steel structures are put in place by drilling three-foot circumference holes ranging from six to fifteen feet deep, and filling the holes with concrete. Steel structures to hold the equipment and to carry the lines that tie the substation into the 500 kV line are erected on the concrete foundations. The equipment is installed, and after a lengthy period of testing, brought into service.

Construction activities at the Red Rock and Kohlman Lake substations omit the initial steps of grading and filling because modifications to the substation will occur on the existing pad inside the fenced area. The other construction and testing activities at these two sites are similar to those to be implemented at the Roseau County, Forbes, and Chisago County sites.

Detailed descriptions of the activities at each station together with the labor force, transportation, and materials and equipment requirements are provided in the following sections.

2.2.2 Roseau County Substation

The proposed Roseau County substation is a new facility that would be constructed on an 80-acre site approximately four miles west of Warroad on the south side of Minnesota Highway 11. The site currently consists of a wheat field bounded to the west by another farmed field, to the east by woods, to the south by woods and to the north by Highway 11. Both the 500 kV line and a 230 kV line intersect the site. The substation would occupy an 800' by 800' area directly under the 500 kV line (see Figures 2.1 through 2.4). New site access roads or off-site lay/down areas would not be required.

Over a one- to two-month period, the top layer of soil containing organic matter would be removed, the subsoil compacted, and a two to three foot layer of stone and gravel fill put in place. The pad would require approximately 100,000 cubic yards of fill, all of which would be brought to the site by the contractor hired to do the construction. Sand and gravel pits are abundant in the area. To meet NSP's construction schedule, approximately 2000 cubic yards, or 115-120 truckloads, would be delivered to the site each day. Given the size of the site, the grading operation would probably require no more than six persons. The fill operation would require a work force of 10-12 people, with an additional 10-12 truck drivers. Most of these individuals would be employees of the construction contractor. It is anticipated that local and Minneapolis area firms would bid on the contract.

Current construction plans call for the installation of 120 drilled piers over a period of three months. The workforce would be small, probably 10 persons or fewer. The total volume of concrete to be used is approximately 1000 cubic yards, or 65-70 truckloads. Two to four truckloads of concrete would be delivered to the site each day.

FIGURE 2-1

FIGURE 2-2
ROSEAU COUNTY SUBSTATION

FIGURE 2-3

FIGURE 2-4

Erection of steel structures and installation of electrical equipment would require a total work force of 20-30 people over a ten month period. This work force is composed of skilled workers and unskilled workers. Not all would be present on the site at one time. The maximum number of workers on site at a time would be 12 to 15. Following installation, the equipment would be tested. Testing requires a work force similar in size to the work force erecting the steel structures, although the testing work force would be composed of electricians and electrical technicians. It is likely that the installation and testing of the electrical equipment would be conducted by NSP employees, not contract workers.

When completed and brought into service, the substation would not require an operating work force. NSP substation operations are normally monitored by computer. Routine walk-throughs would be conducted by NSP personnel or by local utility employees.

The current budget allocated to construction of the Roseau substation, including purchase and installation of the electrical equipment, is 8.4 million dollars. Of this amount, approximately \$5-6 million would be used to purchase the capacitor banks and other electrical equipment. Of the remaining funds, approximately one-half would be used for grading and filling, and one-half for construction of steel structures.

2.2.3 Forbes Substation

Unlike the other installations, NSP would not build and test the addition to the Forbes substation with its own work force. Current plans call for this work to be contracted through a "turnkey" contract. NSP would identify performance requirements for the substation, and require bidders to demonstrate that their proposed design will meet the performance requirements. The contract would include both civil and electrical engineering work (grading, filling, construction of steel support structures, installation and testing of equipment). It is anticipated that alternative designs for the substation will be submitted. The winning bidder would agree to provide NSP with a substation which has been tested and is ready to be brought into service. Because of this turnkey arrangement, the precise manpower and material requirements cannot be identified. However, it is possible to identify a range of requirements based on comparison with the other sites being evaluated in this EA. The Forbes Substation currently consists of an area approximately 950 by 1,350 feet, and is situated in a rural area characterized by mixed hardwood and pine woods. No new access roads or off site lay/down areas would be required.

To accommodate the new electrical equipment, 240,000 sq. ft. (400' by 600') would be added to the north side of the Forbes substation (see Figures 2.5 and 2.6). This area is less than half of the total area of the proposed Roseau substation (640,000 sq. ft.). The north side of the existing substation is approximately six feet above grade. From an engineering standpoint, it is possible to backfill the expansion area either level with or below

FORBES, INC.		DATE		BY	
FORBES SUBSTATION		DATE		BY	
PROPOSED ADDITION TO SUBSTATION		DATE		BY	
NORTHERN STATES POWER COMPANY		DATE		BY	
CONSTRUCTION AGREEMENT		DATE		BY	
ND-E-90AT05-P1		DATE		BY	

FIGURE 2-5

Demo & Moor

FIGURE 2.6
FORBES SUBSTATION

the existing substation grade. If the expansion area is graded and filled to the level of the existing substation, more than twice as much backfill as that projected for use at Roseau would be required. If the expansion area is graded and filled lower than the existing substation, it would require less than half of the backfill required for the Roseau site.

Site grading and foundation work would begin in June, 1992, and would continue over a six-month period. During that period, the average number of fill trucks per day would range between 100 and 250, depending on whether the addition is below existing substation grade or level with the grade. The total volume of concrete required would range between 1000 and 2,500 cubic yards. If the former, two to four trucks per day would deliver concrete to the site. If the latter, the number of trips per day could reach as many as ten. The total work force for the fill operation would range from ten to twenty, with as many as thirty drivers required for the level fill option.

Construction of steel structures, installation of electrical equipment, and testing of equipment would occur concurrently over a ten to eleven month period. These activities would require a work force ranging between 15 and 45 people at the site, depending on the work phase. The work force would be composed of skilled and unskilled laborers, electricians, and electrical technicians.

The Forbes substation would not require a permanent operational staff. Operations would be monitored through computer and occasional on-site inspections.

The estimated cost of the Forbes substation is \$23,325,000. Because this would be a turnkey contract, it is not known how much of this amount would be used for local construction activities. However, NSP engineers indicate that the equipment to be installed at Forbes substation is expensive and probably would account for most of the budget.

2.2.4 Chisago County Substation

The existing substation is at the southern end of the 500 kV line, where it connects with two 345 kV lines that carry electricity for distribution in the Minneapolis-St. Paul metropolitan area. The site currently consists of an area approximately 850 feet by 645 feet. The area of the substation would be expanded to accommodate a bank of series capacitors and an additional set of transformers. One expansion area, located at the northeast corner of the existing substation, is approximately 150,000 sq. ft. (375' by 400'). The other expansion will add 270,000 sq. ft. (300' by 900') to the west side of the station (see Figures 2.7 and 2.8). No new access roads or off site lay/down areas would be required.

Prior to grading, removal of trees would be required for both areas. There is a small woodlot on the east side of the station. According to current plans, the expansion area on the northeast side would extend about 6-10 feet along the northern border of this woodlot.

On the west side, the station is bordered by an evergreen grove that shields the station from the road. The grove is about 600' wide. The west side expansion would require removal of about half of the grove for the length of the station. NSP would contract with a woodcutter to remove these trees.

Because the ground is more level and the soils are different than at the Roseau County site, less grading and backfilling would be required. In the northeast corner, grading and backfilling would be done over a three-month period scheduled to begin in 1992. Grading on the west side would begin in June, 1992, and continue over a six-month period. Approximately 15,000 cubic yards of stone and gravel would be brought in for backfill. One third of this fill would be used for the northeast corner; the remainder would be used on the west side. In all, about 875-900 truckloads of fill would be used. The maximum number of truckloads of fill per day delivered to the site would not exceed 30. The total work force for grading and filling is estimated to be 10-12 people. Up to 8-10 drivers may be used, depending on the contractor's decision to use both day and night shifts.

The Chisago County substation would require about the same number of drilled pier foundations as the Roseau County site (120), and would require about the same amount of concrete. About one-third of the concrete would be used in the northeast corner expansion; two-thirds would be used when the west side expansion is undertaken in 1992. When the foundations are in place, erection of the steel support structures and installation of the electrical equipment would begin. NSP anticipates that an average of two to four truckloads per day of concrete would be delivered to the site. The entire work force for the foundations and the steel structures is estimated to be approximately 10-20 people.

The Chisago County substation would not require a permanent operational work force. As with other substations, performance would be monitored through computer reports and occasional walk-throughs.

Modifications to the Chisago County substation are currently estimated to cost \$16,500,000. Of this amount, approximately \$14,000,000 would be used for the purchase of electrical equipment. The remainder would be used for the construction activities at the site.

2.2.5 Red Rock and Kohlman Lake Substations

Shunt capacitors would be installed at both of these substations in the St. Paul metropolitan area. In both cases, installation would occur within the existing fenced boundaries. No grading or backfilling would be required. At each substation, from 20 to 30 drilled foundations would be installed, steel supporting structures erected, and the shunt capacitors installed and tested. The equipment would be brought into service in May, 1993. At each substation, the total work force is estimated to be approximately 10-12 people. About 150-175 cu. yards of concrete (10-15 truckloads) would be used at each facility. No permanent operating work force would be required.

2.3 The New Substation Alternative

The first alternative to the proposed action is the new substation alternative. This alternative is similar to the proposed action, except that a different site for the Roseau County substation would be identified and developed.

The initial step in implementation of this alternative would be to locate an alternative that meets project requirements. The most important of these requirements is that the site be located on the transmission line approximately mid-way between Forbes, Minnesota, and Dorsey, Manitoba. In order for the series compensation to work most effectively, it must be located close to the midpoint of the Dorsey-Forbes segment of the 500 kV line.

Once a site is located, it would have to be purchased and mapped. In preparation for construction, a soil and foundation investigation would be undertaken.

Depending on the location and characteristics of the site, construction activities might include building of an access road and off site lay/down area, grading and backfilling of the site, and construction of drainage. The electrical equipment to be installed at this site would remain as specified in the proposed action.

The site development and construction activities and the installation of new electrical equipment for the other substations (Forbes, Chisago County, Red Rock, and Kohlman Lake) would remain as identified in the description of the proposed action.

2.4 The New Routing Alternative

One alternative to the proposed action that was considered in 1980 was the construction of a new 500 kV line to provide an additional means of international transfers of electricity. When the existing 500 kV line was developed, several alternative routes suitable for development were identified. These routes are marked out in Chapter 2.0 of the 1980 Environmental Impact Statement (DOE/EIS-0032, January 1979). One alternative to modifying the existing 500 kV line would be to develop one of these 1980 proposed routes, or to develop an entirely new route from Manitoba to Grand Forks and Fargo, North Dakota.

The construction process for a new 500 kV line consists of several steps. In Minnesota, determination of acceptable routes for power lines greater than 200 kV is under the authority of the Minnesota Environmental Quality Board (MEQB), which implements the state's Power Plant Siting Act (PPSA). MEQB has identified environmental, land use, and public acceptance criteria which must be addressed to receive approval for a proposed transmission line. In developing the existing 500 kV line, NSP first examined environmental and land use constraints (based on criteria in the PPSA) for areas of northern Minnesota through which the transmission line might pass. Over an 18-month period, the results of this examination and other issues were discussed at public meetings and hearings held in several

potentially affected communities in northern Minnesota. These meetings and hearings led to a recommendation regarding the proposed route. The recommendation was presented to the MEQB, which determined the route to be developed and prepared an environmental report. Following approval by MEQB, NSP applied for a Presidential Permit to construct and operate the line. Associated with the Presidential Permit was the requirement to produce a NEPA compliance document.

In North Dakota, determination of acceptable routes is under the authority of the State's Public Service Commission. As in Minnesota, approval by the North Dakota Public Service Commission would include a review of environmental impacts associated with the proposed route. Following Public Service Commission approval, NSP would apply to the Department of Energy for a Presidential Permit to construct and operate a transmission line crossing the border of the United States.

In general, the land and construction requirements associated with the development of a new 500 kV line are similar in many ways to the existing 500 kV line. A 200 foot right-of-way is required. The existing line occupies approximately 4,355 acres, of which 1,150 acres are private land. Approximately 800 towers and two substations are required. Those requirements would apply to any of the proposed routes considered by NSP in 1980, as well as to a route for a line from Manitoba to Fargo.

The process of siting and construction of the existing line occupied seven years. Assuming a similar schedule, a new 500 kV line would be available for international transfers of electricity in 1998.

2.5 The No Action Alternative

Under the No Action Alternative, DOE would not approve NSP's application for modifications to Presidential Permit PP-63. NSP would meet the anticipated need for additional power through other means. These would include increased emphasis on energy conservation programs and acceleration of existing plans for adding to base load generating capacity.

2.5.1 Energy Conservation

NSP currently conducts several kinds of programs whose aim is to manage the demand for electric power. These Demand Side Management (DSM) programs include the following (MWPSG, 1991: F-4):

- **Customer Service.** Appropriate rate applications and bill assistance, service designs and policies, general promotion of cost control, and utilization of assistance programs.
- **Conservation.** Controlling total energy costs through improved efficiency.

- **Peak Reduction.** Reducing NSP peak operating costs through selective interruption of end use loads.
- **Load Shifting.** Improving NSP generation resource use by promoting thermal or other potential storage methods, or re-scheduling end-use loads to off-peak periods.
- **Valley Filling.** Improving use of NSP resource by offering off-peak discounts and ways to make appropriate efficient use of off-peak electricity.

In 1989, NSP expanded its DSM program to a system wide goal of 1000 MW by 1995 (MWPSG, 1991: F-20). As of 1991, over half of this goal has been accomplished. About three-fourths of the reductions achieved to date stem from load-shifting and peak-reduction. The remaining reductions result from conservation programs. As a result, at least one survey has rated NSP as the third most aggressive U.S. utility in implementation of DSM programs.

NSP has projected that continued implementation of DSM programs would reduce the growth in electricity demand. As noted earlier (see Section 1.4), NSP forecasts that implementation of DSM programs would reduce growth in demand to an average of 2.5% per year. However, the total amount of anticipated reduction would still remain below the level of total anticipated demand that led to the initiation of the current proposed action (MWPSG, 1991: Figure NSP-A on p. F-2). Therefore, as an alternative to the proposed action, NSP would further expand and accelerate implementation of DSM programs.

2.5.2 Accelerate Plans for Base Load Generating Capacity

In its most recent forecast of facility development, NSP has stated that additional generating capacity will be required to meet the demand for electrical power forecast for the next decade. NSP's planning assumption is that new generating facilities would be coal-fired plants of at least 400 MW capacity. However, the development of a base load generating plant is still in the planning stage. No specific sites have been approved for development.

The potential sites for such facilities could be located anywhere within NSP's service area (Minnesota, Wisconsin, North Dakota, and South Dakota). In Minnesota, approval of new power plant construction is under the authority of the MEQB, and the process for development would be similar to that for transmission lines. Similar processes exist in the other states within NSP's service area. In addition, the development of such facilities would have to meet NEPA and Clean Air Act requirements.

Currently, NSP estimates that the minimum time required to bring a coal-fired generating plant into service is eight years. Assuming this time frame, such a facility would be available in 1999, if begun now.

3.0 THE AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the environment that may be affected by the development of the new substation in Roseau County and by the modifications planned for the substations at Forbes, Chisago County, Red Rock, and Kohlman Lake. As already noted, only the Roseau County substation would be a completely new facility. Substations at Forbes and Chisago County were developed as a part of the construction of the 500 kV line. A description of the affected environment of the 500 kV line is contained in the EIS completed in 1979. The substations at Red Rock and Kohlman Lake have existed for many years. Modifications to these sites will affect previously developed locations, therefore, the description of the affected environment in this EA will focus on the development of the new facility at Roseau County.

3.2 Roseau County Substation

3.2.1 Topography and Soils

The site of the proposed substation is located in an area of flat farmland approximately 5 miles southwest of the town of Warroad and Lake of the Woods. Elevations in the general area of the site range from 1,075 ft to 1,100 ft. Elevation of the site is approximately 1,087 ft.

A wetlands investigation of the site was conducted in September, 1991. Detailed information regarding the topography and soils of the site and immediate vicinity were compiled as a part of the wetlands investigation. That information is included in Section 3.2.3.

3.2.2 Terrestrial and Aquatic Ecology

The Roseau County site is characteristic of north-central Minnesota. The dominant habitat type on this site is agricultural. Approximately 67% of the total acreage has been farmed in wheat. Other types of plant communities associated with this site are provided in Figure 3.1.

This type of habitat is capable of supporting a variety of upland birds and mammals. In general, bird species that may be found on this site include (but are not limited to) the following (DOE, 1979):

Goshawk
Merlin
Philadelphia vireo

Evening grosbeak
Purple finch
Pine siskin

Warblers
Great gray owl
Black-backed three-toed woodpecker
Northern three-toed woodpecker
Olive-sided flycatcher
Common raven
Red-breasted nuthatch

Crossbills
Grouse
Sparrows
Chickadees
Winter wren
Swainson's thrush

Additionally, various waterfowl and birds-of-prey may be present during migratory periods.

Mammals that may be present on-site include, but are not limited to the following (DOE, 1979):

White-tailed deer
Gray squirrel
Cottontail rabbits
Fox
Gray Wolves
Porcupine

Raccoon
Opussum
Skunk
Moose
Bear
Snowshoe Hare

Amphibians observed on-site include a green frog and leopard frog.

Finally, there are no streams, rivers, ponds, or lakes on the property.

3.2.3 Wetlands

An investigation was conducted on September 5, 1991 at the Northern States Power proposed substation site. On U.S. Geological Survey Topographic Maps (USGS, 1967), this site is located in the west 1/2 of the SW 1/4 of section 33, T136N, R37W, Lake Township, Roseau County, Minnesota. The purpose of the field investigation was to determine whether any Section 404, Federal Water Pollution Control Act (FWPCA), jurisdictional wetlands existed at or near the proposed construction site. Two small areas were identified that satisfied the wetland mandatory criteria found in the *Federal Manual for the Identification and Delineation of Jurisdictional Wetlands* (1989). Neither area is within the proposed construction disturbance zone and should not be impacted, if current construction plans are followed. The approximate area of the two wetlands is less than 1/2 acre. The approximate location and extent of the wetlands is shown on Figure 3.2.

3.2.3.1 Wetland Delineation

The identification and delineation of jurisdictional wetlands requires the assessment of three mandatory technical criteria:

Figure 3.1: Plant Communities, Roseau County Site

Community Type	Dominant Species	Typical Associated Species
Crop and pasture	agricultural crops and pasture species	common weedy forbs and grasses.*
Shrub associations	willows, alders	black ash, black spruce, tamarack, creeping snowberry sphagnum,* starflower, goldthread, twinflower, bunchberry, white cedar, bog birch,* bog rosemary, bladderwort, sedges,* pitcher plant, cottongrass, bluegrass,* Labrador tea, reindeer moss.*
Spruce-Fir	white spruce bassam fir	white and red pine, white cedar,* paper birch,* quaking aspen,* mountain ash, balsam poplar, beaked hazel, bush honeysuckle, speckled alder,* mountain maple, dewberry, bishop's cap, blueberry, bunchberry, bedstraw,* clintonia, large leaved aster, goldthread, starflower, sarsaparilla, Canada mayflower.
Wet marsh	bullrush and cattail	arrowhead, common reed,* water arum, water parsnip,* sweet flag, wild rice,* water lilies, water milfoil, lesser duck weed, pondweeds, sedges, wild iris.

* Observed at the site. Other species listed are those typically found in various plant communities in the vicinity (DOE, 1979).

1. Wetland hydrologic regime: Water found at or near the surface for periods sufficient to produce oxygen-free soil conditions during the growing season. The period necessary is generally greater than 7 days. A finding of wetland hydrology is based on the actual presence of standing water and (or) saturated soils, or other indications that water is present for long periods.
2. Hydric soils: Soils with a substantially organic (peat, muck) layer at the surface or highly oxygen-reduced mineral soils. Hydric mineral soils are normally colored gray and/or mottled. Hydric soil criteria have been developed by the U.S. Soil Conservation Service and summarized in the National Hydric Soil Technical Criteria Listing. A finding that hydric soils exist is based either on this list or a field investigation to identify hydric indicators.
3. Hydrophytic vegetation: Plants adapted to life in oxygen-free conditions for all or part of their life-cycle. There are over 7,000 North American plants that occur in wetlands. Their preferential tendency to do so is summarized by their *indicator status* as listed in the U.S. Fish and Wildlife Service List of Plants that Occur in Wetlands. A finding that hydrophytic vegetation exists is based on a determination that plants with high likelihood of occurrence in wetlands dominate the site, (make up >50%), or would during the appropriate growing season, if not recently disturbed.

3.2.3.2 Wetlands Near the Substation Site

The assessment of wetland technical criteria requires consideration of site physical features. The 80 acre tract, further referenced as the "substation site", is flat-lying agricultural land. Slopes are less than 1.5%. Highest elevations, near 1087', on the north and along the center of the site cause drainage to flow toward the east, south and west, to drainage ditches dug by the farmer who previously owned the site. Ditches range from 3-5 feet deep, with the lowest elevations about 1080'. The site water table is roughly defined by this ditch depth.

Most soils at the site have a sandy-organic surface layer, 4-12" deep. Below is a somewhat firm, yellow to light gray-brown sand to 20-24 inches. A very loose, yellow sand layer continues to below probe depth (3.5'). The lower sand layer and ditching allow the majority of the site to be well to moderately well drained. Sandy clay lenses are sometimes found below the surface organic layer and poor to very poor drainage conditions result.

Soils at the substation site have been preliminarily described by the Soil Conservation Service as a *Kratka-Enstrom-Northwood* soil complex (USDA/SCS, 1991: T163-164N R37W). The Kratka Fine Sandy Loam and the Northwood Muck series are listed hydric soils. The Enstrom Sandy Loam, an upland soil, is probably the dominant site soil.

The wetlands found at the substation site are noted on Figure 3.2 as unit A and unit B. Both have been disturbed by continuous farming activities, in existence prior to 1985. It is strongly speculated that wetlands once covered a much larger portion of the site but were removed by ditching some time ago.

Farm ditching effectively removes the wetland hydrologic regime from most of the site as long as ditches are maintained. Cultivation routinely replaces successional hydrophytic vegetation with row crops, however, harvesting allows late-sprouting hydrophytes to re-invade.

The two wetland units are further described in terms of wetland criteria satisfaction.

Unit A

Unit A is a shallow, water-retaining depression, about 1500 square feet in area, with hydric mineral soils. Soils at the surface are saturated, gray-brown, strongly red-mottled sandy clays. Within a few inches of the surface, soils become uniformly dark gray clays. The plant community is dominated by species with high affinity for wetlands including:

Barnyard Grass	(<u>Echinochloa crus-galli</u>)
Willow-herb	(<u>Epilobium coloratum</u>)
Spike-rush	(<u>Eleocharis</u> spp.)
Lurid Sedge	(<u>Carex lurida</u>)
Cattail	(<u>Typha latifolia</u>)

Unit B

Unit B is about 20,000 square feet of remnant fen or blanket-bog. Soils are peat to muck in the upper 18-24 inches, lying on a dark gray sandy clay. This may be an inclusion of the *Northwood Muck* soil series. Water is retained within the muck layer for very long periods due to the impedance of the clay layer. Recent maintenance of the west ditch line may allow this unit to drain.

Present vegetation is a mix of hydrophytic and upland plants. Timothy has sprouted in the wheat stubble but is less dense than in other parts of the site due to vigorous competition by late-emerging hydrophytes. Canary-grass is the dominant hydrophytic plant. Other species found are:

Bebb Willow	(<u>Salix bebbaus</u>)
Pussy Willow	(<u>S. discolor</u>)
Hairy Buttercup	(<u>Ranunculus sardous</u>)
Barnyard Grass	(<u>Echinochloa crus-galli</u>)
Willow-herb	(<u>Epilobium coloratum</u>)
Sedge	(<u>Carex</u> spp.)

Pale Smartweed
Curled Dock
Slender Nettle
Swamp Thistle
Golden Rock
Water Parsley
Red Goosefoot
Hispid Buttercup
Foxtail
Canary Grass

(Polygonum lapthifolium)
(Rumex crispus)
(Urtica gracilis)
(Cirsium muticum)
(Rumex persicarioides)
(Sium suave)
(Chenopodium rubrum)
(Ranunculus hispidus)
(Alopecurus carolinianus)
(Phalaris arundinaceae)

3.2.4 Threatened or Endangered Species

There are no plant or aquatic species on the current Federal list of protected species found on this property.

The Sandhill Crane (Grus canadensis), a state special concern species, has been identified in Roseau County but not observed specifically on-site (Coffin and Pfannmuller, 1988: 279). These cranes nest in wetlands and feed in upland areas such as old fields and croplands that contain waste grain. They are most sensitive to disturbance from human activities in proximity to nesting areas during the breeding season (March 1 through June 30).

3.2.5 Land Use

Roseau County is a largely rural county. County-wide, the predominant land use is farming. Substantial portions of land in the county are within the boundaries of Hayes Lake State Park and Island State Forest. The nearest of these public lands, Hayes Lake State Park, is approximately ten miles from the site of the proposed facility.

The site itself is currently agricultural land. On the south side of the parcel of land owned by NSP there is a woodlot. The west side is bordered by another small grain farm. Highway 11 borders the site on the north, and the land directly across the highway is an open field. The nearest residential area to the site is on the east. Seven houses approximately one quarter mile away, are separated from the site by a small woodlot (see Figure 3.3). The nearest community is Warroad, approximately four miles away.

3.2.6 Floodplains

Discussions with Roseau County officials indicate that the substation site is not located in a 100-year floodplain.

**FIGURE 3-3
LOCAL INDUSTRY AND
MAILBOXES OF NEAREST HOUSING DEVELOPMENT
ROSEAU COUNTY SITE**

**TABLE 3-1: POPULATION AND HOUSING FOR
ROSEAU, ST. LOUIS, AND CHISAGO COUNTIES,
1990**

<u>COUNTY</u>	<u>TOTAL POPULATION</u>	<u>HOUSING UNITS</u>	<u>VACANT UNITS</u>
Roseau	15,206	6,236	821
St. Louis	198,213	95,403	16,502
Chisago	30,521	11,946	1,395

Source: Minnesota Department of Jobs and Training, 1991b.

TABLE 3-2: EMPLOYMENT AND INCOME BY INDUSTRIAL SECTOR
FOR ROSEAU, ST. LOUIS, AND CHISAGO COUNTIES, FOURTH
QUARTER 1990

<u>COUNTY AND INDUSTRY</u>	<u>UNITS</u>	<u>AVERAGE EMPLOYMENT</u>	<u>TOTAL WAGES</u>
<u>ROSEAU COUNTY</u>			
Agriculture	22	58	280,631
Construction	30	84	400,821
Manufacturing	164	5,453	32,917,575
Transportation, Utilities, and Trade			
Finance, Insurance, Real Estate	26	123	761,302
Services	85	711	2,303,683
Government	47	984	4,613,576
Total, All Industries	374	7,414	\$41,277,588
<u>CHISAGO COUNTY</u>			
Agriculture	19	65	211,980
Construction	113	550	4,224,738
Manufacturing	64	1,900	11,692,425
Transportation and Utilities	26	222	1,327,174
Trade	186	1,692	4,704,814
Finance, Insurance, and Real Estate	60	303	1,196,110
Services	147	2,282	9,119,501

<u>COUNTY AND INDUSTRY</u>	<u>UNITS</u>	<u>AVERAGE EMPLOYMENT</u>	<u>TOTAL WAGES</u>
CHICAGO COUNTY (CONTINUED)			
Government	61	1,595	7,904,450
Total, All Industries	676	8,608	\$40,381,192
ST. LOUIS COUNTY			
Agriculture	49	313	1,282,002
Mining	23	5,368	48,518,541
Construction	424	3,296	24,455,426
Manufacturing	267	6,970	40,100,363
Transportation and			
Utilities	229	4,078	28,873,406
Trade	1,724	20,055	68,397,142
Finance, Insurance, and			
Real Estate	399	2,807	14,752,246
Services	1,645	20,762	100,541,598
Government	389	17,630	101,482,776
Total, All Industries	5,149	81,277	\$428,404,100

Source: Minnesota Department of Jobs and Training, 1991a.

**TABLE 3-3: LABOR FORCE AND UNEMPLOYMENT
FOR ROSEAU, ST. LOUIS, AND CHISAGO COUNTIES,
1990**

<u>COUNTY</u>	<u>LABOR FORCE</u>	<u>EMPLOYMENT</u>	<u>UNEMPLOYMENT</u>
Roseau	9,333	8,905	428
Chisago	15,103	14,102	1,021
St. Louis			
Total	93,812	88,226	5,586
Duluth Area	40,400	38,302	2,098
Balance of County	53,412	49,924	3,488

Source: Minnesota Department of Jobs and Training, 1991a.

3.2.7 Socioeconomics

Data provided by the Minnesota Department of Jobs and Training, Research and Statistics Office, provides the basis for a profile of the 1990 county population and existing units of housing, as well as the current income and employment levels (see Tables 3-1, 3-2, 3-3).

3.2.7.1 Population and Housing

The total population of Roseau County in 1990 was 15,026 people. In general, the county is sparsely populated. The major towns are Roseau (the county seat), with a population of 2,272, and Warroad, with a population of 1,216. The 1990 census counted a total of 6,236 available housing units county-wide. Of these, 821 were vacant in 1990.

3.2.7.2 Employment and Income

The major employment sector in Roseau County is composed of manufacturing, transportation, utilities, and trade, with the government sector and services sector second and third, respectively. Products manufactured in the county include windows, snowmobiles, and hockey sticks.

Employment data indicates a steady annual increase in the labor force during the last five years of the 1980's. The labor force rose by 9.3%, 8.6% and 7.2% between 1986 and 1987, 1988 - 1989, and 1989 - 1990, respectively. Total labor force in the county was 9,333 in 1990. The manufacturing, transportation and utility sector accounted for 74% of total county employment, at an average of 5,453 jobs. Average weekly wages for Roseau County were \$428.29 during the fourth quarter of 1990. This figure lags behind the 1989 Minnesota state weekly average of \$429.

Based on a site reconnaissance undertaken in August 1991, the nearest town, Warroad (about 4 miles away) has an economy primarily supported by a Marvin Windows factory, a Christian Brothers Hockey Sticks manufacturing plant, and tourism (see Figure 3.3).

The unemployment rate in the county in 1990 was 4.6%.

3.2.8 Transportation and Traffic

The proposed site for construction of the substation in Roseau County is located on a parcel of land adjacent to Highway 11. Access to the site is directly from this highway via an existing field road. Since the site from which the stone and gravel backfill would be brought has not been identified, no analysis of traffic flow to and from the borrow area is possible. However, all of the materials would be brought to the site along Highway 11. Similarly, Highway 11 would be used by workers commuting to and from the job. Traffic

flow data for Highway 11 is available (MDOT, 1990b). Measurements of traffic volume along Highway 11 were taken by the Minnesota Department of Transportation in 1990. The average daily traffic count is 2,550 vehicles. Of these, 170 are commercial vehicles. The highway should be able to accommodate 2,000 passenger cars per hour, both directions, or 1,000 cars per hour in each direction.

3.2.9 Cultural Resources

No cultural resources survey of any of the sites has been undertaken. Two previous desktop investigations of archeological, historic and cultural resources that could be associated with the 500 kV line and substations have been completed.

The 1980 EIS for the 500 kV line noted that "Portions of northern Minnesota . . . have been historically important for French explorations, fur trading, logging, early pioneer settlements, and iron mining. . . The archeological sequence for Minnesota includes an Early, Middle, and Late Prehistoric Period which ranges from before 6000 BC to AD 1700 and includes Paleo-Indian, Archaic, Woodland, and Mississippian cultural traditions" (DOE, 1979: 3-31). The 1980 EIS also noted that a cultural resources survey for a transmission line corridor parallel to the 500 kV line had identified early trails and roads, a logging camp, a prehistoric camp, and other sites (DOE, 1979: 3-33).

As part of its application to the Minnesota Environmental Quality Board for approval of the modifications evaluated in this EA, NSP requested information from the State Historic Preservation Officer regarding records of historic or cultural resources in the areas of the substations. No records identifying cultural resources were found. Moreover, the recurrent farming activities on-site suggest that resources that may have been present at one time have been destroyed or disturbed by agricultural activities (NSP, 1991).

From these two previous investigations, and the extent of site disturbance, it appears plausible to conclude that while northern Minnesota does contain significant archeological, historic, or cultural resources, it is unlikely that such resources are associated with the sites proposed for development by NSP.

3.2.10 The Noise Environment

No measurements of existing noise levels at any of the sites have been taken. The kinds of man-made noise sources present at the Roseau County Substation include transmission line "hum"; traffic from State Highway 11; and agricultural machinery on a seasonal basis.

Transmission line noise is audible when standing directly under the lines, and appears to increase in volume during rain. It is not audible from any of the nearby sensitive receptors such as residences or travellers on Highway 11.

3.3 Forbes Substation

3.3.1 Topography and Soils

The area in the vicinity of the substation is relatively flat, with some gently rolling hills. The substation is located on a slight elevation (1350 ft.). The land slopes down on all sides from the substation. Within a quarter of a mile, elevation is 1320 ft. Within a mile, the elevation is approximately 1300 ft. There several small lakes in the vicinity of the site. The West Two river, a small stream, flows southeast into the St. Louis River. The West Two River passes about a half mile from the site, and the St. Louis River is approximately two miles away.

3.3.2 Terrestrial and Aquatic Ecology

The terrestrial ecology in the vicinity of the Forbes Substation is characteristic of north-central Minnesota. The dominant habitat types on this site are agricultural and woodlands. The various types of plant communities associated with this site are provided in Figure 3.4.

This type of habitat is capable of supporting a variety of upland birds and mammals. In general, bird species that may be found on this site include (but are not limited to) the following (DOE, 1979):

Goshawk	Evening grosbeak
Merlin	Purple finch
Philadelphia vireo	Pine siskin
Warblers	Crossbills
Great gray owl	Grouse
Black-backed three-toed woodpecker	Sparrows
Northern three-toed woodpecker	Chickadees
Olive-sided flycatcher	Winter wren
Common raven	Swainson's thrush
Red-breasted nuthatch	

Additionally, various waterfowl and birds-of-prey may be present during migratory periods.

Mammals that may be present on-site include, but are not limited to the following (DOE, 1979):

White-tailed deer	Raccoon
Gray squirrel	Opossum
Cottontail rabbits	Skunk
Fox	Snowshoe Hare
Porcupine	

Figure 3.4 Plant Communities, Forbes Substation

Community Type	Dominant Species	Typical Associated Species
Crop and pasture	agricultural crops and pasture species	Common weedy forbs and grasses.
Shrub associations	willows, alders	Black ash, black spruce, tamarack, creeping snowberry sphagnum, starflower, gold-thread, twinflower, bunchberry, white cedar, bog birch, bog rosemary, bladderwort, sedges, pitcher plant, cottongrass, bluegrass, Labrador tea, reindeer moss.
Pine forest	white pine red pine jack pine	White spruce, balsam fir, white cedar, paper birch, quaking aspen red maple, northern pin oak, beaked hazel, fly honeysuckle, mountain maple, wintergreen, blueberry, juneberry, sweet fern, sarsaparilla, feather mosses, bedstraw, Canada mayflower.
Northern hardwood or mixed hardwood-pine	sugar maple American basswood	Red maple, red oak, American elm, black ash, bur oak, paper birch, balsam fir, white pine, beaked hazel, mountain maple, red berried elder, Canada mayflower, sarsaparilla, twisted stalk, trillium.

Figure 3.4 (Continued) Plant Communities, Forbes Substation

Community Type	Dominant Species	Typical Associated Species*
Spruce-Fir	white spruce bassam fir	White and red pine,* white cedar, paper birch, quaking aspen, mountain ash, balsam poplar, beaked hazel, bush honeysuckle, speckled alder, mountain maple, dewberry, bishop's cap, raspberry, blueberry, bunchberry, bedstraw, clintonia, large leaved aster, goldthread, starflower, sarsaparilla, Canada mayflower.

* Observed at the site. Other species are those typically occurring local in plant communities (Doe, 1979).

Finally, there is no aquatic habitat on the site.

3.3.3 Wetlands

There are no wetlands associated with the site. However, there are wetlands in the general vicinity. The nearest one, according to the U.S. Geological Survey Map (USGS, 1969), is approximately one-half mile away on the other side of County Road 661.

3.3.4 Threatened or Endangered Species

There are no Federal or State threatened or endangered species recorded in the vicinity of this site.

3.3.5 Land Use

The southern portion of St. Louis county contains Minnesota's iron range. Low-grade iron ore is mined from open pit mines and processed into taconite. There are some open pit mines within a few miles of the site. St. Louis County also contains agricultural and forest land. Farms are typically smaller than in the more productive parts of the state. Forested land may be logged.

In the immediate vicinity of the site, land use is of three major types. The small town of Forbes contains a small number of residential and commercial structures. Within a mile of the site are small farms. Much of the land in the vicinity is either open land not currently used for farming, or forested with mixed hardwoods and pines. The site itself is bordered on all sides by forested land.

3.3.6 Floodplains

Discussions with St. Louis County planning officials indicate that the Forbes substation site is not located in a 100-year floodplain.

3.3.7 Socioeconomics

3.3.7.1 Population and Housing

The total population figure for St. Louis County was 198,213 in 1990 (see Tables 3-1, 3-2, 3-3). The major population centers in the county are in the southern end. Duluth, approximately 40 miles away, had a population of 82,830 in 1986. Closer to the site are the towns of Virginia (population 9,150), Eveleth (4,420), Hibbing (19,030), and Cloquet (10,520). Forbes, a village two miles from the site, has an estimated population of 50.

Of the 95,403 housing units in the county in 1990, 16,502 remained vacant.

3.3.7.2 Employment and Income

The services, trade, and government sectors were the leading sectors of employment in St. Louis County in 1990. Mining, manufacturing, transportation, and construction also account for substantial portions of total employment in the county.

The size of the labor force in St. Louis County fluctuated during the 1980's, decreasing from 101,998 in 1980 to a low of 89,343 in 1985, and eventually re-expanding to 93,812 in 1990. The unemployment rate decreased dramatically during the 1980's from a peak of 18.5% in 1983 to approximately 6.0% in 1990.

County average weekly wages for all industries during the fourth quarter of 1990 were \$405.45.

3.3.8 Transportation and Traffic

Access to the Forbes substation is gained from St. Louis County Roads 661 and 16, both of which are two-lane paved highways. County Road 16 connects to State Highway 37 and U. S. Highway 53. These are the routes that are most likely to be used by workers commuting from nearby towns, and by the trucks bringing gravel backfill, concrete, and steel equipment to the site. A 1987 survey of traffic along county roads shows 215 vehicles per day at the intersection of Highways 16 and 661 (MDOT, 1987). Along Highway 37, the average number of vehicles ranges from 2,400 to 2,800 per day. Along Highway 53, the average number of vehicles ranges from 6,500 to 10,600 per day.

3.3.9 Noise

The primary man-made noise sources at the Forbes Substation include transmission line "hum" and occasional traffic from County Roads 16 and 661.

3.3.10 Cultural Resources

Cultural resources for the general region are described in Section 3.2.9. No known cultural resources exist on-site.

3.4 Chisago County Substation

3.4.1 Topography and Soils

The area in the vicinity of the site is relatively flat, with elevations ranging from 867 ft. to 930 ft. The elevation of the substation is 890 ft. The general area contains several small lakes, many of which are bordered by streams and wetland areas. Although there are streams in the general area, the site itself does not intersect any streams.

3.4.2 Terrestrial and Aquatic Ecology

The terrestrial ecology of the Chisago County substation is characteristic of central Minnesota. The dominant habitat types on this site are agricultural and woodlands. The various types of plant communities associated with this site are provided in Figure 3.5.

This type of habitat is capable of supporting a variety of upland birds and mammals. In general, bird species that may be found on or adjacent to this site include (but are not limited to) the following (DOE, 1979):

Goshawk	Evening grosbeak
Merlin	Purple finch
Philadelphia vireo	Pine siskin
Warblers	Crossbills
Great gray owl	Grouse
Black-backed three-toed woodpecker	Sparrows
Northern three-toed woodpecker	Chickadees
Olive-sided flycatcher	Winter wren
Common raven	Swainson's thrush
Red-breasted nuthatch	

Mammals that may be present in the site vicinity include, but are not limited to the following (DOE, 1979):

White-tailed deer	Raccoon
Gray squirrel	Opossum
Cottontail rabbits	Skunk
Fox	Snowshoe Hare
Porcupine	

Finally, there is no aquatic habitat on the site.

3.4.3 Wetlands

There are no wetlands on the site. Two wetlands are near the site. Peterson Slough is approximately one-half mile south of the substation. A smaller, unnamed wetland is approximately one-half mile to the north.

3.4.4 Threatened or Endangered Species

There are no plant or aquatic species on the current Federal list of protected species found on this property.

Figure 3.5: Plant Communities, Chisago County Site

Community Type	Dominant Species	Typical Associated Species
Crop and pasture	agricultural crops and pasture species	common weedy forbs and grasses.
Shrub associations	willows, alders	black ash, black spruce, tamarack, creeping snowberry sphagnum, starflower, gold-thread, twinflower, bunchberry, white cedar, bog birch, bog rosemary, bladderwort, sedges, pitcher plant, cottongrass, bluegrass, Labrador tea, reindeer moss.
Pine forest	white pine red pine jack pine	white spruce, balsam fir, white cedar, paper birch, quaking aspen red maple, northern pin oak, beaked hazel, fly honeysuckle, mountain maple, wintergreen, blueberry, juneberry, sweet fern, sarsaparilla, feather mosses, bedstraw, Canada mayflower.
Northern hardwood or mixed hardwood-pine	sugar maple American basswood	red maple, red oak, cottonwood,* American elm, black ash, bur oak, paper birch, balsam fir, white pine,* beaked hazel, mountain maple, red berried elder, Canada mayflower, sarsaparilla, twisted stalk, trillium.

- * Observed at the site. Other species are those typically occurring in local plant communities (DOE, 1979).

The Blanding's turtle (Emydoidea blandingii) has been listed as threatened by the State of Minnesota (Coffin and Pfannmuller, 1988:332). This turtle has been identified in a wetland area in the vicinity of the project site but not specifically on-site. This is consistent with the lack of habitat on-site for such turtles. These turtles spend most of their time in shallow wetlands and move to sandy uplands to nest. Nesting takes place in June and eggs hatch in September.

3.4.5 Land Use

The site is located in a rural area, near several towns which serve as both suburbs of the Twin Cities metropolitan area and commercial/light manufacturing centers. The predominant land uses near the site are farming; recreation (in the Carlos Avery Wildlife Management Area nearby); and residential, commercial, and light industrial in the towns of Chisago City, Lindstrom, Center City, North Branch, and others.

The site itself is bounded on all sides by agricultural land. One area that would be developed is currently farmed. The other area is a woodlot. Peterson Slough, a wetland area, is approximately one-half mile to the south of the site, and beyond that is Carlos Avery Wildlife Management Area.

3.4.6 Floodplains

Discussions with Chisago County zoning officials indicate that the substation site is not located in a 100-year floodplain.

3.4.7 Socioeconomics

3.4.7.1 Population and Housing

The total 1990 population of Chisago County was 30,521 (see Tables 3-1, 3-2, 3-3). Towns nearby the site include North Branch (population 1,597), Lindstrom (population 1,972), Center City (population 458) and Chisago City (population 1,634). There were 11,946 available housing units in the county, with 1,395 vacant.

3.4.7.2 Employment and Income

Services, manufacturing, trade, and government account for a large portion of total employment in Chisago County. The manufacture of electric and transport equipment accounted for the greatest percentage of manufacturing jobs in the county.

A slow increase in the work force is evident, averaging 2% per year between 1985 and 1990. The unemployment rate decreased from a decade high of 9.1% during the 1982-

83 recessionary period to 7.3% in 1985, a low of 5.5.% in 1988, and an increase in the last two years of the decade to 7.2% in 1990.

The average weekly wage in the fourth quarter of 1990 was \$360.86 in Chisago County.

3.4.8 Transportation and Traffic

Access to the site is from County Highway 14, a two-lane paved road which runs between North Branch and Chisago City. County Highways 18 and 15, both two-lane paved roads, intersect with County 14 near the site. The other major road in the vicinity of the site is Interstate 35, a four-lane divided highway which is the major commuter route to the metropolitan area.

A 1989 traffic survey by the Minnesota Department of Transportation recorded an average traffic volume of 1700 vehicles per day traveling Highway 14 at the site (MDOT, 1989, 1990a). Daily averages along Highway 18 range from 730 to 900 vehicles. Daily averages along Highway 15 range from 445 to 580 vehicles. Along Interstate 35, the traffic flow ranges from 14,000 to 16,000 vehicles per day.

3.4.9 Cultural Resources

A description of general cultural resources in the region is provided in Section 3.2.9.

3.4.10 Noise

The principal man-made sources of noise at the site include transformer and transmission line "hum", traffic on County Highway 14, and agricultural implements on a seasonal basis. The transformer "hum" is barely audible from the road, since the station is surrounded by a protective corridor of trees.

3.5 Red Rock and Kohlman Lake Substations

3.5.1 Introduction

At both of these stations, modifications would occur inside the fenced boundaries. No land would be added to either of these substations. The structures to be erected are of the same kinds that already exist at both sites: maintenance buildings, steel towers with drilled pile foundations, and capacitor banks that would rest on poured concrete pads.

Because of the limited nature of the proposed modifications, the scope of the affected environment at these two sites is more restricted than at the other sites. The relevant environmental components tend to be the components of the human environment, with some exceptions noted in the following descriptions.

3.5.2 Terrestrial and Aquatic Ecology

The Red Rock site is located within a light industrial area. This site is developed and contains the existing substation and the regional Northern States Power headquarters. Additionally, the company also operates a cogeneration facility (trash to steam) on the property. The only areas of terrestrial habitat on this fenced site are associated with the landscaped grassy areas surrounding the buildings.

The Kohlman Lake site is located within a small field in a characteristically urban setting surrounded by a fence. The area includes extensive high-density residential developments and strip commercial developments. The various types of plant communities associated with this site are provided in Figure 3.6.

There are no aquatic habitats on these properties.

3.5.3 Wetlands

During an August 28th, 1991 site visit, wetlands were observed approximately 20 to 30 feet outside the northern fenced perimeter at the Kohlman Lake site. No wetlands are associated with the Red Rock site.

3.5.4 Threatened or Endangered Species

There are no plant or aquatic species on the current Federal list of protected species found on this property.

The Blanding's turtle (*Emydoidea blandingii*) has been listed as threatened by the State of Minnesota (Coffin and Pfannmuller, 1988: 232). This turtle has been identified in a wetland area in the vicinity of the project site but not specifically on-site. Again, this is consistent with the lack of suitable habitat on-site. These turtles spend most of their time in shallow wetlands and move to sandy uplands to nest. Nesting takes place in June and eggs hatch in September.

Finally, the Pig's Eye Scientific and Natural Area is located approximately 2 miles from the site.

3.5.5 Land Use

Both substations are located in the Twin Cities metropolitan area. The chief types of land use in the areas surrounding the station are residential, commercial, and light industrial. Red Rock Substation is located approximately two miles from Pigs' Eye Scientific and Natural Area, a public use area.

Figure 3.6: Plant Communities, Red Rock and Kohlman Lake Sites

Community Type	Dominant Species	Typical Associated Species
Crop and pasture	agricultural crops and pasture species	common weedy forbs and grasses.*
Shrub associations	willows, alders	black ash, black spruce, tamarack, creeping snowberry sphagnum, starflower, gold-thread, twinflower, bunchberry, white cedar, bog birch, bog rosemary, bladderwort, sedges, pitcher plant, cottongrass, bluegrass, Labrador tea, reindeer moss.

- * Observed at the site. Other species are those typically found in plant communities in the vicinity.

3.5.6 Floodplains

Discussions with the City of Newport officials indicate that the Red Rock site is not in the 100-year floodplain.

3.5.7 Socioeconomics

Red Rock and Kohlman Lake substations are located in suburbs of St. Paul, Minnesota. The 1990 population of Ramsey County was 485,765 (MDJT, 1991b).

3.5.8 Transportation and Traffic

Both substations are located at exits to the beltway around the Twin Cities, Interstate 494/694.

3.5.9 Cultural Resources

There are no cultural resources at either site.

3.5.10 Noise

The sources of noise include transformer and transmission line "hum" and traffic.

4.0 POTENTIAL IMPACTS OF THE PROPOSED ACTION

4.1 General Introduction

This chapter reviews the environmental impacts that may occur if the proposed action were implemented. The discussion is organized around each site associated with the proposed action.

4.2 Roseau County Substation

4.2.1 Topography and Soils

No impacts are expected to occur to site topography and soils.

4.2.2 Terrestrial and Aquatic Ecology

The development of a new substation on this 80 acre site would displace approximately 15 to 20 acres of agricultural/pasture land. The remaining 60 to 64 acres would remain undisturbed. Approximately 45 acres would continue to be used as agricultural land both during and after construction.

Because the site is already disturbed by agricultural activities, displacement of such activities by a utility substation would not result in the loss of significant habitat. Moreover, operation of the substation is not expected to result in any discharges to the environment which would pose a threat to the continued survival of any local wildlife species. Finally, there are no nearby streams, rivers, ponds, or lakes which would be affected adversely by this project. Therefore, the development should have no significant adverse impacts on the area's terrestrial plant communities.

4.2.3 Wetlands

Activities involving the placement of fill in wetlands are regulated under Section 404 of the Clean Water Act and additionally by the Minnesota Wetlands Protection Act (Minnesota Statutes Ch. 84-114a, 282 and 361, 1988), with some exceptions. Section 404 exempts wetland fills of less than one acre. The Minnesota law only protects certain classes of open-water wetlands over 2.5 acres.

The wetlands found at the proposed Roseau substation site appear to be outside of the area to be disturbed by the proposed substation construction and access road alignment, based on the plans prepared by Northern States Power Engineering Department and the staked foundation test hole locations. In accordance with Part 1022, Subpart A of the

Department of Energy Regulations (10 CFR Ch. X, 1-1-90), the avoidance of wetland impacts is mandated, if practically possible. Such avoidance should not be difficult to achieve on this site. Moreover, good engineering practices during construction and implementation of stormwater management techniques during operation should minimize any runoff impacts to these wetlands.

4.2.4 Threatened and Endangered Species

There are no plant or aquatic species on the current Federal list of protected species found on this property.

As stated previously, site work should not adversely affect the wetlands and will remove 15 to 20 acres of farm land. The Sandhill Crane (*Grus canadensis*) should not be affected by this project as their use of the site has never been confirmed (Coffin and Pfannmuller, 1988: 279). Although it is possible that Sandhill Cranes have used the site for feeding purposes, it is unlikely that such use is frequent or recurrent given the close proximity of the site to Minnesota Highway 11 and the abundance of more secluded grain fields in the area.

4.2.5 Land Use

The primary land use impact consists of the removal of approximately 15-20 acres from agricultural cultivation. The farmland to be removed from cultivation is rated as 4-5. In other words, it is not prime farm land according to the Farm Land Protection Act. Moreover, it is not expected that construction of the substation would have any indirect impacts on local or regional land use.

4.2.6 Socioeconomics

4.2.6.1 Population and Housing

During the construction phases of the project, population and housing impacts would consist of the temporary addition of a small work force to the county. If the construction contract is let to a local contractor, the additional population would be smaller than if the contract were let to a Minneapolis area firm. The maximum number of workers expected to be present on-site at anytime is 12-15. Thus no significant impacts to the local or county population levels is expected.

Because of the relatively small size and temporary nature of the work force, no significant adverse housing impacts are anticipated. It is expected that most workers would commute to the site from their current residences.

Since the substation does not require an operational work force, no long term population or housing impacts would occur.

4.2.6.2 Employment and Income

Wages and expenditures on construction materials could provide as much as an additional \$2 million to the county economy during the construction phase of the project. However, the actual amount expended locally would likely be less if the construction contractor is not a local firm.

During the operations phase, Roseau County government would experience a very small increase in tax revenues.

Because the population impacts during construction and operation are anticipated to be negligible, no additional community facilities and services would need to be provided.

4.2.7 Transportation and Traffic

During the construction phase of the project, a substantial number of vehicle trips (to carry backfill and concrete) would be added to existing traffic. Specifically 115 to 120 truck loads per day would be involved at peak construction. On some days, there may be an increase in commercial vehicle trips from 170 vehicles to 290 vehicles on Highway 11. The total average daily traffic count is 2,550 vehicles. However, this anticipated increase would still remain substantially below the rated carrying capacity of the road, estimated to be 2,000 vehicles per hour. In addition, this impact would occur over two periods of approximately three months each.

4.2.8 Noise Impacts

During the construction phase, there would be additional on-site noise generated by the construction machinery (bulldozers, dump trucks, drills, etc.). The nearest receptors are 7 residences located one-quarter mile from the site and Highway 11 travelers. The 7 residences have a stand of trees between them and the site which should serve as a buffer to some of this noise. Moreover, construction activities will be limited to daylight hours. Care would be taken to select equipment with noise attenuation features. Travelers in vehicles on Highway 11 passing the site would be exposed to the construction noise for less than 30 seconds.

Because the substation equipment is silent during operation, no on-site sources would generate additional noise during operations.

4.2.9 Cultural Resources

Because the site has been cultivated for many years, and the area is not in a location likely to support cultural resources (not along a river or stream bank, not on high ground, etc.) no cultural resources impacts are anticipated.

4.2.10 Air Quality

Short-term impacts (fugitive dust) at the site would result from construction activities. However, dust suppression techniques such as wetting and capping soils would be implemented. No long-term impacts would occur.

4.2.11 Floodplains

Discussions with Roseau County officials indicate that the substation site is not located in a 100-year floodplain.

4.3 Forbes Substation

4.3.1 Topography and Soils

No local impacts are expected to occur to topography and soils located on-site.

4.3.2 Terrestrial and Aquatic Ecology

The additional equipment to be placed on this site would increase the site's footprint from 30 acres to 35 acres. The addition to the present substation would take place on an already existent 500 kV right-of-way. Consequently, there should be few impacts to the area's terrestrial plant communities which have already been disturbed by activities designed to keep the right-of-way clear of certain vegetation.

The wildlife communities associated with this site are not expected to suffer any major adverse impacts due to the further development of this site. The displacement of or mortality of a small number of rodents such as field mice and cottontail rabbits may take place.

Finally, there is no aquatic habitat on site.

4.3.3 Wetlands/Floodplains

Neither wetlands nor floodplains are associated with the site.

4.3.4 Threatened or Endangered Species

There are no threatened or endangered species on the Federal or State of Minnesota lists that occur in this area.

4.3.5 Land Use

Since the land to be used for the substation addition is entirely within the existing transmission line right-of-way, no land use impacts would occur.

4.3.6 Socioeconomic Impacts

4.3.6.1 Population and Housing

The work force involved in construction would create a small, short-term population impact in St. Louis County during the construction period. Because the work force is small (40-50, including as many as 30 drivers), and would probably be drawn from the local area, no significant adverse population impact is anticipated.

Because the substation does not require a permanent operational work force, no long-term impacts would occur.

4.3.6.2 Employment and Income

Some positive impacts would occur during the construction phase. These would result from the spending of wages paid to workers and local purchases of materials. Because the project would be implemented through a turn-key contract, the total amount of local spending cannot be estimated at this time. Since the land is already utility-owned, no long-term tax revenue impact is anticipated.

4.3.7 Transportation and Traffic

During construction, the maximum number of vehicle trips carrying backfill and concrete (200 if the proposed substation addition is backfilled to a grade level with the existing substation) would nearly equal total current traffic levels. If the addition is backfilled to a level below the existing substation grade, the maximum number of vehicle trips is estimated at 100, about one-half the current traffic level of 215 trips per day. Both options would remain below rated carrying capacity for two-lane paved roads.

4.3.8 Noise Impacts

Construction noise generated by machinery would constitute the primary noise impact. The nearest sensitive receptors are in the village of Forbes, one mile away. No long-term noise impacts would occur.

4.3.9 Cultural Resources

The developed condition of the site suggests that cultural resources that might have occurred on-site at some time, have been damaged or destroyed by man's activities.

4.3.10 Air Quality

Short-term impacts (fugitive dust) at the site would result from construction activities. These would be mitigated by using dust suppression techniques. No long-term impacts would occur.

4.4 Chisago County Substation

4.4.1 Topography and Soils

No impacts are expected to local topography and soils.

4.4.2 Terrestrial and Aquatic Ecology

The additions to this substation would affect two types of habitat on the property: grassy areas and pine woods. The capacitor addition would be located in the grassy area located under the 500 kV transmission entering the site. The transformer addition would require the clearing of approximately one (1) acre of grasses and four (4) acres of pine woods.

Because of the general mix of field and forest on the site, the replacement of forest land with cleared land would be expected to have only minor impacts on either species composition or number. Some displacement of several species, such as squirrels, raccoons, and opossums, could be expected when clearing commences. This displacement could then lead to increased competition for habitat by these species. However, this impact is not expected to be significant due to the abundance of similar habitat surrounding the site.

Finally, there is no aquatic habitat on the site.

4.4.3 Wetlands/Floodplains

Neither wetlands nor floodplains are associated with this site.

4.4.4 Threatened or Endangered Species

There are no plant or aquatic species on the current Federal list of protected species found on this property.

The Blanding's turtle (*Emydoidea blandingii*), listed as threatened by the State of Minnesota, has been identified in a wetland area in the vicinity of the project site but not specifically on-site (Coffin and Pfannmuller, 1988: 332). This turtle is known to travel up to 400 meters (approximately 1/4 mile) from its residence area to breed, however this substation is 1/2 mile and 1 mile, respectively, from the wetland areas where the turtle has been observed. Consequently, no impacts on the Blanding's turtle are expected.

4.4.5 Land Use

The primary land use impact would involve removing less than 2 acres of non-prime farm land from cultivation. It is not expected that the proposed modifications would have any indirect impacts on the local area.

4.4.6 Socioeconomics

4.4.6.1 Population and Housing

Because of the small size of the anticipated work force (a maximum of 20 workers on-site during tower construction) and the availability of labor, no population or housing impacts are anticipated.

4.4.6.2 Employment and Income

Some local employment and income impacts would result, primarily from spending of wages and purchases of materials. NSP currently estimates that \$2 million to \$2.5 million would be used for on-site construction activities. Since workers would be drawn from the wider metropolitan area, the local economic impact would be less than the total expenditure for wages and purchases. No long-term employment and income impacts are anticipated.

4.4.7 Transportation and Traffic

Transport of construction materials and workers would increase the number of vehicle trips on County Road 14 and on other nearby roads. However, the volume of additional traffic during the construction phase would be well below both current traffic flow levels and the carrying capacities of the roads involved.

4.4.8 Noise Impacts

During construction, machinery use would generate additional noise. This additional noise is not expected to impact any communities in the vicinity. The nearest sensitive receptors are farm houses approximately one-half mile from the site. In the long-term, the additional transformers would add to the electrical "hum", but would not have a significant impact on sensitive receptors.

4.4.9 Cultural Resources

Because this site is an existing substation, it is probable that any cultural resources that may have existed have already been damaged or destroyed. Additionally, the Minnesota State Historic Preservation Officer had no existing record of historic and cultural resources in the immediate vicinity of this site.

4.4.10 Air Quality

Short-term air quality impacts (fugitive dust) over a period of three months at the site would result from construction activities. However, dust suppression techniques such as wetting and capping soils would be implemented. No long-term impacts would occur.

4.5 Red Rock and Kohlman Lake Substations

4.5.1 Topography and Soils

No significant adverse impacts are expected to local topography and soils since these would be mostly undisturbed by the proposed construction. Possible increases in run off will be mitigated by professional stormwater management practices.

4.5.2 Terrestrial and Aquatic Ecology

The Red Rock site has few terrestrial habitats. Based upon the type of construction (no grading or backfilling) planned for this site and that all work would take place inside the fenced area, it is not expected that adverse terrestrial impacts would occur.

The Kohlman Lake site is located in a small fenced field. Construction activities would be limited to the fenced-in area. Similar to the Red Rock site, there would be no grading or backfilling during construction. Consequently, the terrestrial ecology in this area is not expected to be significantly affected.

There are no aquatic habitats on the property.

4.5.3 Wetlands/Floodplains

There are some wetlands approximately 20 to 30 feet outside the northern, fenced-perimeter at the Kohlman Lake site. These wetlands should not be affected by the nature of the construction taking place on-site which would be limited to an area within the fence. As stated previously, run off would be controlled both during construction and operation. The sites are not located within the 100-year floodplain.

4.5.4 Threatened or Endangered Species

There are no plant or aquatic species on the current Federal List of protected species found on this property.

The Blanding's turtle (*Emydoidea blandingii*), listed as threatened by the State of Minnesota, has been identified in a wetland area in the vicinity of the project site but not specifically on-site (Coffin and Pfannmuller, 1988: 332). Although these turtles may move up to 400 meters to breed, it is believed that the fence surrounding the Kohlman Lake site

serves as an effective barrier to these animals, preventing them from using it.

Finally, the Pig's Eye Scientific and Natural Area is located approximately 2 miles from the Red Rock site. This distance, coupled with the duration and extent of construction activities, is expected to preclude significant adverse impacts.

4.5.5 Land Use

All land use impacts would occur inside the fenced area of the existing stations and the proposed modifications would not alter current land use.

4.5.6 Socioeconomics

4.5.6.1 Population and Housing

The small work force of 10-12 workers over a period of nine months would not be expected to affect the metropolitan area of Minneapolis/St. Paul.

4.5.6.2 Employment and Income

Some positive impacts to commercial establishments in the vicinity of the station would occur during construction. For example, construction workers could be expected to purchase food and some other personal consumption items during the period of construction. No long-term impacts are anticipated.

4.5.7 Transportation and Traffic

Since both sites are located on major roadways that have not approached vehicle capacity, no significant adverse impacts are expected.

4.5.8 Noise

As with the other sites, noise impacts would occur during construction. Nearby sensitive receptors include individuals who may be passing the site or shopping at nearby stores, as well as some residents near the Kohlman Lake site. The nearest residence is approximately 700 feet away from the substation fence. There are no residences near the Red Rock substation.

4.5.9 Cultural Resources

Since this is an existing site, it is probable that any cultural resources that may have been present have already been damaged or destroyed. Additionally, the Minnesota State Historic Preservation Officer had no existing record of historic and cultural resources in the immediate vicinity of this site.

4.5.10 Air Quality

Short-term air quality impacts (fugitive dust) over a three-month period at the site would result from construction activities (drilling and pouring foundations). However, dust suppression techniques such as wetting and capping soils would be implemented. No long-term impacts would occur.

4.6 EMF

4.6.1 Introduction

DOE is aware that potential health effects from exposure to electric and magnetic fields is of public concern. In response to this concern, DOE has sponsored a number of studies which examine this topic. At present, no conclusive evidence has been found which supports a conclusion of a health risk from EMF. Whether or not EMF has caused adverse health effects has been the subject of considerable study for over two decades.

4.6.2 Definitions

Electric Fields. Electric fields arise from the voltage (electrical pressure) on an object. Any object with an electric charge on it has a voltage (or electric potential) at its surface, caused by the accumulation of more electrons on that surface as compared to another object or surface. The voltage effect is not limited to the surface but exists in the space surrounding the object. The change in this voltage over a distance is known as the electric field. The units describing an electric field are volts per meter (V/m) or kilovolts per meter (kV/m). A field measured in volts per meter expresses the difference in electrical potential or voltage between two points that are one meter apart. The electric field becomes stronger near a charged object and decreases rapidly with distance away from the object.

Electric fields are a very common phenomenon. Static electric (or DC) fields can result from taking off a sweater or walking across a carpet. Body voltages have been measured as high as 16,000 volts due to walking on a carpet (Chakravarti and Pontrelli, 1976). The earth creates a natural static field in fair weather of about 150 V/m (0.15 kV/m) at ground level due to the 300 to 400,000 volt potential between the ionosphere and the earth (National Research Council, 1986; Veimeister, 1972). This means that a 6-foot tall person would have a static potential of about 275 volts between the top of the head and the bottom of the feet.

The normal fair weather potential gradient of the earth varies from month to month, reaching a maximum of about 20 percent above normal in January, when the Earth is closest to the sun, and falling to about 20 percent below normal by July, when the Earth is farthest from the sun. Much stronger static electric potentials can exist underneath clouds, where the electric potential with respect to Earth can reach 10 to 100 million volts. Natural static

electric fields under clouds and in dust storms can reach static field levels as high as 3 to 10 kV/m (CRC Handbook, 1981; National Research Council, 1986).

Almost all household appliances and other devices that operate on electricity create electric fields. The electric field is due to the voltage on the appliance and the field decreases rapidly with distance away from the device. The field due to point source household appliances generally attenuates more rapidly with distance than fields from line sources, such as power lines. Appliances need not be operated to create an electric field, but just plugged into an electrical outlet. Typical values measured 12 inches away from some common appliances are shown in Table 4-1 (Carstensen, 1985).

Magnetic Fields. An electric current flowing in an conductor (e.g., electric equipment, household appliance, power line) creates a magnetic field. The most common magnetic field unit of measurement is the Gauss (or mG = 0.001 Gauss), which is a measure of the magnetic flux density (intensity of magnetic field attraction per unit area).

The magnetic field near electric transmission lines is relatively low in comparison with measurements near many household appliances and other equipment. The magnetic field near a point source, such as an appliance, decreases rapidly with distance away from the device. The magnetic field also decreases with distance away from the linear sources, such as powerlines, but not as readily as with appliances. Since the magnetic field is caused by the flow of an electric current, a device must be turned on to create a magnetic field.

The magnetic field of a large number of typical household appliances was measured by Illinois Institute of Technology Research Institute for the U.S. Navy (Gauger, 1985) and by Eneritech Consultants (1985; Silva, 1989) for Electric Power Research Institute. Typical values are given on Table 4-2 in units of milliGauss (mG) or thousandths of a Gauss.

In terms of the project under review in this EA, it is important to separate out any EMF issues associated with this project from EMF issues related to the existing 500 kV line. As previously noted, this project entails the construction of a new substation and the modification of several existing substations. The environmental impacts of the 500 kV line were addressed in the EIS on that project (DOE, 1979). A summary of the electrical fields and magnetic fields associated with the existing 500 kV line is presented below. EMF issues associated with the substation construction/modifications described in this EA and the relationship between the substation and the 500 kV line are also examined below.

4.6.3 Electrical Fields Associated with the 500 kV Line

The MEQB construction permits issued for the 500 kV line establish a maximum electric field standard of 8 kV/m for the line. The electric field can cause a charge to build up on conducting objects that are well insulated from a ground. A well grounded person could experience a short circuit current when touching a conducting object. For example, a large bus or agricultural implement parked directly under the transmission line and

TABLE 4-1

**Typical Electric Field Values for Household Appliances
(at 12 Inches)**

Appliance	Electric Field (kV/m)
Electric blanket	0.25 ¹
Broiler	0.03
Stereo	0.09
Refrigerator	0.06
Iron	0.06
Hand Mixer	0.05
Phonograph	0.04
Coffee Pot	0.03

¹1-10 kV/m in the region adjacent to the blanket wires (Eneritech Consultants, 1985).

TABLE 4-2**Magnetic Field From Household Appliances**

Magnetic Field - milliGauss (1 mG = 0.001 G)		
Appliance	12 Inches Away	Maximum
Electric Range	3-30	100-1,200
Electric Oven	2-5	10-50
Garbage Disposal	10-20	850-1,250
Refrigerator	0.3-3	4-15
Clothes Washer	2-30	10-400
Clothes Dryer	1-3	3-80
Coffee Maker	0.8-1	15-250
Toaster	0.6-8	70-150
Crock Pot	0.8-1	15-80
Iron	1-3	90-300
Can Opener	35-250	10,000-20,000
Mixer	6-100	500-7,000
Blender, Popper, Processor	6-20	250-1,050
Vacuum Cleaner	20-200	2,000-8,000
Portable Heater	1-40	100-1,100
Fans/Blowers	0.4-40	20-300
Hair Dryer	1-70	60-20,000
Electric Shaver	1-100	150-15,000
Color TV	9-20	150-500
Fluorescent Fixture	2-40	140-2,000
Fluorescent Desk Lamp	6-20	400-3,500
Circular Saws	10-250	2,000-10,000
Electric Drill	25-35	4,000-8,000

Source: Silva, 1989.

somehow completely insulated from ground would be charged by the electric field of the transmission line. A person touching the bus would feel a current passing from the bus through him/her to ground. The 8 kV/m standard was established so that the short circuit current would not be harmful under the worst of circumstances.

The maximum electric field associated with the 500 kV line under worst case operating conditions was originally calculated to be 7.67 kV/m. This maximum field level would occur only when the line was carrying its maximum power, during the hottest days of summer, and would occur only in a small area directly under the line where the conductors are closest to the ground. This calculation was also based on the assumption that the lines voltage rises to 110% of nominal. The calculation was based on the original layout of the line. Actual ground clearances of the line are greater than originally calculated. In reality, maximum electric fields along the 500 kV transmission line do not exceed 7 kV/m presently.

4.6.4 Electrical Fields Associated with this Project

Each of the substations has a complex layout of the electrical equipment inside the fenced boundary, the transmission line entrances and exits, and in some cases, distribution lines in the vicinity. Because of this complex geometry, reliable calculations of electrical field strength resulting from the proposed action are impossible. The Roseau Substation and each of the substation expansions will be designed and constructed to the same standards that were used for the original stations. For the existing substations, electric field exposure outside the substation fence would not increase measurably. Because the Roseau substation resembles the Forbes and Chisago County substations, it is reasonable to assume that the electrical fields at Roseau would be similar to those at Forbes and Chisago County.

The distances from each substation to the nearest residence are shown in Table 4-3. At Roseau, the nearest residence is one-half mile away; Forbes, one mile; Chisago County, one-quarter mile; Red Rock; one-half mile; and Kohlman Lake, 700 feet. Given the distance between the substations and the nearest residences, the level of potential continuous human exposure to electrical fields resulting from the proposed action at each of the substations would likely be minimal.

4.6.5 Magnetic Fields Associated with the 500 kV Line

Magnetic fields along the 500 kV line vary. For most of the line the fields are 151 milligauss directly under the line. For the 500 kV line, maximum magnetic fields directly under the conductors increase from 151 milligauss to 225 milligauss where guyed aluminum structures are used. These magnetic fields drop to 4-5 milligauss within 300 feet of the center line of the 500 kV transmission line. Actual current levels along the 500 kV line would be lower as a result of the substation construction/modifications. Therefore, actual magnetic field levels would be lower than the maximums stated above (NSP, 1991: Section X).

TABLE 4-3**Distance From Each Substation to the
Nearest Residence**

Substation	Nearest Residence
Roseau	Seven residences located one-half mile from proposed site.
Forbes	Forbes (pop. 60) is located one mile from the site.
Chisago County	One residence located one-quarter mile from the site.
Red Rock	Residential development one mile away; commercial development approximately 700 feet away.
Kohlman Lake	One residence located 700 feet from the site.

4.6.6 Magnetic Fields Associated with this Project

Because of the complex geometry of the electrical equipment in substations, magnetic fields that would result from the proposed action cannot be reliably calculated. Measurements of fields at the existing substations are shown in Table 4-4, keyed to the substation site plans in Figures 4-1 through 4-4. The range of magnetic field strength measured at these substations was 0.15 - 42.0 mG. This range compares favorably with the measurements of many household appliances documented by Silva (1989) shown in Table 4-2. Inspection of the measurements site by site indicates two patterns:

- In general, when no other source of magnetic field is documented, measurements show a decrease in magnetic field strength as distance from the fence increases. For example, comparison of data points A-B, C-D, and I-J all show such a decrease. Similar findings are evident at Forbes (A-C, J-K), Kohlman Lake (A-B, C-D, I-J), and Red Rock (A-B, C-D, E-F, I-J, M-N).
- Some measurements show an increase in magnetic field strength as distance from the fence increases. Examples of such measurements include Forbes (B-C, D-E, M-N), Kohlman Lake (B-B'), and Red Rock (G-H). In these cases, the increase in field strength appears to result from particular features of the substation layout, such as transmission line entrances and exits and the location of electrical equipment. These features are documented in the comment column of Table 4-4.

As shown in Table 4-3, all of the substations are located a significant distance from residences or other facilities that would expose humans to substation-generated magnetic fields on a continuous basis. In general, the range of measurements, the pattern of measurements identified above, and the distance to the nearest residence (Table 4-3) suggest that the potential for continuous human exposure to magnetic fields resulting from the proposed action would be minimal.

4.6.7 Biological and Health Effects

A decade ago, a substantial number of scientists may have doubted whether electric and magnetic fields could interact with biological mechanisms. Today, the existence of "biological effects" is accepted by a majority of scientists. However, such biological effects do not necessarily imply that there are "health effects."

While biological effects can be considered as established, health effects of electric and magnetic fields must be considered as unproven. Only if there are health effects, will the question of risk become relevant.

There is, however, much room for research to improve our understanding of this complex area. And indeed, research to investigate or replicate previous studies involving

TABLE 4-4
Magnetic Field Strength Near Chisago County,
Forbes, Kohlman Lake, and Red Rock Substations

Substation	Point	Field (milli gauss)	Comment
Chisago	A	0.6	
	B	0.28	near radio tower
	C	1.2	
	D	0.3	
	E	17.0	under line
	F	11.0	near line
	G	15.0	under line
	H	12.0	near line
	I	2.1	
	J	0.15	
Forbes	A	19.4	near 230 kV bus
	B	3.4	
	C	8.1	near line
	D	7.2	under line
	E	17.0	under line, mid span
	F	8.7	under line
	G	19.8	under line
	H	9.3	
	J	0.7	
	K	0.6	
	L	1.4	
	M	6.2	under line
	N	7.5	under line
Kohlman Lake	A	15.0	under line
	B	1.0	
	B'	23.0	house 700' from sub, dist lines
	C	4.6	
	D	0.7	
	E	5.0	
	F	8.2	closer to line than E
	G	15.0	under line
	H	9.0	at tower
	I	10.0	
	J	0.5	
	K	42.0	low line
	L	23.0	low line
Red Rock	A	20.0	under line
	B	7.0	near line
	C	35.0	near transformer
	D	7.0	near line
	E	19.0	under line
	F	13.0	under tower
	G	1.7	between lines; opposing fields cause reduction in field strength
	H	32.0	near lines, at midspan. Measurement taken from elevated roadway, so distance between meter and line was reduced.
	I	23.0	under lines
	J	5.0	
	K	13.0	
	L	0.8	
	M	16.0	under line
	N	7.0	near line

Note: Data points are identified in Figures 4-1 through 4-4.

Dames & Moore

FIGURE 4-3

FIGURE 4-4

electric and magnetic field exposure is continuing. There are nearly 50 studies on biological effects currently being funded in the United States; 18 of these studies are being funded by DOE. The work involves more epidemiologic investigation and basic laboratory work. DOE is currently conducting research on the effects of electric and magnetic fields on humans, baboons, small mammals (melatonin, stress, circadian rhythms), cell membranes, and cell and tissue physiology. Future studies will investigate the effects of mixed electric and magnetic fields, long-term effects on cell growth, and cell membrane interactions with electric and magnetic fields. Powerline epidemiological studies are continuing in the United States, as well as in Sweden and Great Britain. The National Cancer Institute is considering a large-scale childhood cancer study in the United States to investigate several environmental factors, including exposure to EMF. EPRI has also recently begun studies of cancer among electrical workers. Unlike previous studies, this research will include actual measurement of occupational EMF exposures. A large study of Canadian and French workers on high-voltage facilities is also just beginning. The approximate 1992 budget for the programs in the United States is approaching \$11 million.

The U.S. Environmental Protection Agency (EPA) Report. In December 1990, the EPA released a Review Draft Report entitled "Evaluation of the Potential Carcinogenicity of Electromagnetic Fields (EPA, 1990)." The report, dated October 1990, reviews and evaluates the available literature on the potential carcinogenicity of electromagnetic fields including extremely low frequency magnetic fields such as those produced by power lines. Though widely reported and quoted in both the print and electronic media, EPA has issued this report as a preliminary draft only, and cautions against citation, quotation, or characterization of the report as formal agency policy. Since this is the second draft of this document to contain substantially the same information and public familiarity with its issuance and findings is relatively high, the report is briefly summarized below. The reader is cautioned, however, that this is a Draft report, issued for comment.

The EPA report reviewed available literature pertaining to human epidemiologic studies relating to carcinogenesis, chronic exposure animal studies, and in vitro studies. The purpose of the document was to "evaluate the likelihood that exposure to nonionizing electromagnetic radiation poses a risk or is a risk factor for the development of cancer in humans."

With respect to human epidemiologic studies, the EPA found that the strongest link between exposure to 60 Hz magnetic fields and human cancer comes from childhood cancer studies. In examining seven case-control studies of childhood cancer, EPA found consistent, modest elevations of cancer risk for leukemia, cancer of the central nervous system, and lymphoma in children whose exposure to magnetic fields has been estimated by the types of wires near their homes (wiring codes) or where magnetic field measurements indicated fields of 2 mG or higher. However, measured dose response relationships were found to be contradictory and could not be substantiated. Particularly, EPA cites studies by Wertheimer and Leeper (1979) and Savitz (1987), as presenting the fewest difficulties with respect to bias, confounding, or other methodological problems. These studies estimate a

5.0 POTENTIAL IMPACTS OF THE ALTERNATIVES

5.1 General Introduction

As stated in Section 2.1, there are three alternatives to the Proposed Action. These include:

1. New Substation Alternative
2. New Routing Alternative
3. No Action Alternative

The potential impacts of each of these alternatives is discussed in the following sections.

5.2 New Substation Alternative

The New Substation Alternative only serves as an alternative to the construction of the Roseau County Substation. At the other sites (Forbes, Chisago County, Red Rock and Kohlman Lake) construction and installation activities will remain as identified in the description of the Proposed Action. If this alternative were selected, a new site would have to be located and purchased. Additionally, the new site may require construction activities such as the building of an access road and an off-site lay down area, grading and backfilling, and the construction of drainage/stormwater structures. As a result of these construction activities and consequent operational activities, a variety of impacts could occur including:

- removal of 20 to 100 acres of land from private and public use to accommodate the new substation site, right-of-way for linkages to the 500 kV line, and access roads if required;
- the potential loss of woodlands and grasslands to a greater extent than with the proposed action;
- the potential loss of species composition and numbers due to loss of habitat;
- the potential loss of wetlands and resultant necessity for implementing mitigation measures;
- if the substation is located on Highway 11, no change in traffic impacts will occur. If the substation is located on a county road, traffic impacts will occur at the same level but in a different location.

With the exception of these impacts, all other potential impacts resulting from implementation of this alternative would be the same as for the Proposed Action.

5.3 New Routing Alternative

The New Routing Alternative would be implemented by constructing a new 500 kV transmission line along one of three potential routes (see Section 2.4). Two of the routes were identified in the 1980 EIS for the Forbes-Manitoba line. These two potential routes are approximately parallel to the existing Forbes-Manitoba transmission line. The third potential route would run from Manitoba to Grand Forks, North Dakota and then to Fargo, North Dakota. Instead of running parallel to the existing line, this route would run through northwestern Minnesota and portions of eastern North Dakota. The New Routing Alternative would most likely have significant impacts to a variety of areas in north-central Minnesota, western Minnesota, or eastern North Dakota. This is due to the high level of construction activity and acreage requirements that are associated with the development of a new 500 kV line. It can be assumed that the physical requirements of a new route would be quite similar to the existing 500 kV line. The existing line occupies approximately 4,355 acres containing 800 towers and two substations.

5.3.1 Routes Identified in the 1980 EIS

The 1980 EIS identified two potential routes for the 500 kV line, in addition to the route designated as the proposed action and that was eventually constructed. Both routes run approximately parallel, one north of the existing 500 kV line, and one south of the line. For purposes of this analysis, these routes are designated as Route 1 and Route 2.

An extensive analysis of potential environmental impacts of these two routes was conducted for the 1980 EIS. Figure 5-1, which identifies some of the potential environmental impacts that would result from construction of a 500 kV line along routes considered in 1980, is based on data provided in Chapter 8.0 of the 1980 EIS (DOE, 1980).

Route 1. Construction of a new 500 kV line along Route 1 would require the clearing of 1,847 acres of forested land. According to the 1980 EIS, 63 cultivated fields would be impacted, with approximately 4.2 acres removed from cultivation to accommodate towers. An estimated 24.5 acres of wetlands would be impacted; presumably, these would require mitigation. Approximately one-quarter mile of the right-of-way would pass within one-quarter mile of lake shoreline.

In addition to these impacts to forests, agriculture, wetlands, and lake areas, the route passes through areas designated as prime habitat for the gray wolf, a Federally-protected species. Clearing of forest along the potential right-of-way could affect gray wolf habitat.

Because of the extensive amount of clearing of forest required, other impacts would occur if Route 1 were selected. Short-term impacts to air quality would occur from the cutting of trees, the disposal of brush by burning, construction of new access roads or upgrading of existing roads, and dust raised by the traffic transporting workers and materials to and from the site. Similarly, many of these activities would cause short-term noise

impacts as a result of the use of chain saws and construction machinery. As noted earlier (see Section 3.2.8), "Portions of Northern Minnesota...have been historically important for French explorations, logging, early pioneer settlements, and iron mining..." Development of this route could result in impacts to archeological and cultural resources.

Construction of a new 500 kV line would bring with it positive and negative economic impacts to some areas along this route. Expenditures for wages and materials would be spent in local economies. However, in remote areas, adverse impacts to housing could occur if a large number of non-resident workers were required.

Finally, the 1980 EIS indicated that construction of this route would potentially affect 42 houses located within 500 feet of the route.

Route 2. Construction of a new 500 kV line along Route 2 would require the clearing of 2,229 acres of forested land, and would result in the removal from cultivation of approximately 5.3 acres of land in 70 fields. Thirteen acres of wetlands would be impacted. As in the case of Route 1, impacts to wetlands would require mitigation. Approximately 31.7 miles of Route 2 right-of-way runs within one-quarter mile of lakefront.

In addition to these impacts to forests, agriculture, wetlands, and lake areas, impacts that would result from Route 2 are generally similar to those that would result from Route 1. Route 2 passes through areas designated as prime habitat for the gray wolf, a Federally-protected species. Clearing of forest along the potential right-of-way could affect gray wolf habitat.

Because of the extensive amount of clearing of forest required, other impacts would occur if Route 2 were selected. Short-term impacts to air quality would occur from the cutting of trees, the disposal of brush by burning, construction of new access roads or upgrading of existing roads, and dust raised by the traffic transporting workers and materials to and from the site. Similarly, many of these activities would cause short-term noise impacts as a result of the use of chain saws and construction machinery. As noted earlier (see Section 3.2.8), "Portions of Northern Minnesota...have been historically important for French explorations, logging, early pioneer settlements, and iron mining..." Development of this route could result in impacts to archeological and cultural resources.

Construction of a new 500 kV line would bring with it positive and negative economic impacts to some areas along this route. Expenditures for wages and materials would be spent in local economies. However, in remote areas, adverse impacts to housing could occur if a large number of non-resident workers were required.

Finally, the 1980 EIS indicated that construction of this route would potentially affect 144 houses located within 500 feet of the route.

Figure 5-1: Potential Environmental Impacts to Forest and Woodlands, Agriculture, Wetlands, and Lakes Associated with EIS Alternative Routes Identified in 1980

	Route 1	Route 2
Forest and Woodlands	1,847 acres of forest would be cleared.	2,229 acres of forest would be cleared.
Agriculture	4.2 acres in 63 cultivated fields would be impacted.	5.3 acres in 70 cultivated fields would be impacted.
Wetlands	24.5 acres of wetlands would be impacted.	13 acres of wetlands would be impacted.
Lakes	.25 miles of right-of-way within ½ mile of lakefront would be impacted.	31.7 miles of right-of-way within ½ mile of lakefront would be impacted.

5.3.2 A Route Not Identified in the 1980 EIS

As noted in Section 2.4, another potential route for a new 500 kV line would run from Manitoba to Grand Forks and Fargo, North Dakota. NSP has not mapped out a specific right-of-way for this route, but existing knowledge of the area can be used to identify categories of potential impacts. In northern Minnesota, a potential route would run through forest land for a short distance from the U.S.-Canadian border. Clearing of right-of-way would occur, although the extent of such clearing cannot be easily estimated because a potential route has not been designated. Much of the land in northwestern Minnesota between the current transmission line border crossing and Grand Forks is cultivated farmland or pasture. The section of the new 500 kV line between Grand Forks and Fargo would run entirely through the Red River Valley, an area of prime farmland used for growing potatoes, sugar beets, and sunflowers.

Between Manitoba and Grand Forks, the route would cross the watersheds of the Roseau River, the Tamarac River, the Middle River, the Snake River, Grand Marais Creek, and portions of the Red Lake River. If the route between Grand Forks and Fargo followed the Minnesota side of the Red River of the North, Maple Creek, Marsh River, the Wild Rice River system, and the Buffalo River would be crossed. On the North Dakota side, no significant rivers would be affected. The Red River of the North would be crossed at either Grand Forks or Fargo.

Construction activities associated with the new 500 kV line would impact prime farmland. These activities would also result in short-term impacts to air quality (fugitive dust from construction traffic and clearing of forest) and to noise levels (construction equipment). Expenditure of wages and salaries would have a positive impact on local economies. Because the area is not as remote as the areas referenced in Section 5.3.1, there is less likelihood for adverse impacts to housing.

5.4 No Action Alternative

5.4.1 Energy Conservation

Because this Alternative involves no new construction activities, or other alterations to NSP generating facilities, transmission lines, or substations, no environmental impacts are anticipated.

NSP's projections of future demand indicate that by 1993 (the target date for bringing the Proposed Action on line), an additional 300 MW of electricity will be required system wide. By 1995, an additional 600 MW will be required system wide. These estimates include projected system wide savings from energy conservation of 220 MW by 1993, and 450 MW by 1995. Implementation of the Energy Conservation Alternative would not meet projected future demand.

Further, it seems unlikely that energy conservation would be adequate to address localized increases in demand in the Minneapolis/St. Paul area, a chief beneficiary of the electricity to be imported from Canada. The total population of the Minneapolis/St. Paul area is over 2 million, compared with a total population of Minnesota of over 4 million, and a total population in NSP's service area of approximately 10 million.

5.4.2 Accelerated Plans for Base Load Generating Capacity

Under this Alternative, NSP would seek to construct new electric generating facilities. If this Alternative were selected, a variety of impacts could result from activities associated with the project. These include the following:

- the removal of up to 500 acres of land from public and private uses at the generating plant site, as well as sites for access roads, and transmission line right-of-way;
- the net loss of woodlands, grasslands, and/or farmlands to a greater extent than with the Proposed Action;
- the potential loss of species composition and numbers due to loss of from habitat;
- the potential impacts to rivers, streams, or other waterways depending on the site selected;
- the potential loss of wetlands thereby requiring some type of mitigation measures;
- short-term impacts to air quality resulting from construction activities and long term impacts resulting from the burning of fossil fuel and stockpiling of these fuels on-site (notably coal);
- short-term and long-term noise impacts resulting from construction activities and generating plant activities and operations;
- additional local economic impacts resulting from construction and operational expenditures for labor and materials;
- a work force of approximately 1,000 workers could result in potential adverse impacts to community facilities, services, and housing. These could occur if the potential site is a remote small town whose community facilities, services, and housing are at capacity. If the site is located in either North or South Dakota, such impacts are considered likely;

- potential transportation and traffic impacts in remote areas due to construction and operational activities;
- cultural resources impacts may occur, depending on the final route selection;
- all of these impacts are likely to occur over a number of years instead of months as is the case with the Proposed Action.

5.5 Comparison of Impacts Across All Alternatives

A comparison of the potential environmental impacts for the Proposed Action and each alternative is provided in Figure 5.2. This comparison indicates that if energy conservation is selected, no environmental impacts would occur. However, such measures would not meet anticipated demand. The potential for significant adverse impacts appears to be greatest for the new generating capacity and the new routing alternatives. While some environmental impacts are associated with the Proposed Action and the new substation alternative, these impacts do not appear to be significant or adverse.

Figure 5.2: Comparison of Potential Environmental Impacts

IMPACT CATEGORY	PROPOSED ACTION	NEW SUBSTATION
Terrestrial and Aquatic Ecology	Some impacts could occur due to loss of habitat; if such impacts do occur, they are not expected to be significant.	Some impacts could occur due to loss of habitat; if such impacts do occur, they are not expected to be significant.
Wetlands	No significant impacts to wetlands will occur.	No significant impacts to wetlands will occur.
Threatened and Endangered Species	No significant impacts are expected to occur.	No significant impacts are expected to occur.
Air Quality	Short-term impacts at the sites will result from construction activities. These can be mitigated.	Short-term impacts at the sites will result from construction activities. These can be mitigated.
Water Resources	No impacts are expected to occur.	Short-term impacts at the site may result from construction activities.
Land Use	Up to 25 acres of land would be removed from agricultural production.	Up to 25 acres of land would be removed from agricultural production.
Socioeconomics	Positive economic impacts will result from project expenditures for labor and materials. No impacts to population, housing, or community facilities are expected.	Positive economic impacts will result from project expenditures for labor and materials. No impacts to population, housing, or community facilities are expected.
Transportation and Traffic	Increases in traffic during construction will occur, but impacts are not significant.	Increases in traffic during construction will occur, but impacts are not significant.
Noise	Construction activities will result in short-term impacts which can be mitigated.	Construction activities will result in short-term impacts which can be mitigated.
Cultural Resources	No impacts are expected to occur.	No impacts are expected to occur.
Flood Plains	No impacts are expected to occur.	No impacts are expected to occur.

acts for Proposed Action and Alternatives.

	NEW ROUTE	NO ACTION	
		ENERGY CONSERVATION	ACCELERATE CONSTRUCTION OF GENERATING CAPACITY
due to acts ected	Potential significant adverse impacts (potential loss of habitat, species composition and numbers) could occur.	No impacts will occur; however, this alternative will not meet projected demand.	Potential significant adverse impacts (loss of habitat, species composition and numbers) could occur.
	Significant impacts may occur and require mitigation.	No impacts are expected to occur.	Significant impacts may occur and require mitigation.
	Depending on route selection impacts may occur.	No significant impacts are expected to occur.	Depending on site selection, impacts may occur.
se	Short-term impacts will result from construction activities. These can be mitigated.	No impacts are expected to occur.	Short and long-term impacts will result from construction activities and plant operations.
	Depending on site selection impacts could occur.	No impacts are expected to occur.	Depending on site selection, impacts could occur.
	Prime farmland could be impacted.	No impacts are expected to occur.	Several hundred acres of land could be removed from other uses.
will ures ing, or ected.	Positive economic impacts will result from project expenditures for labor and materials. Depending on route selection, impacts to housing could occur.	No impacts are expected to occur.	Positive economic impacts will result from project expenditures for labor and materials. Depending on site selection, impacts to population, housing, and community facilities could occur.
	Increases in traffic during construction will occur. In remote areas, short-term impacts could be significant.	No impacts are expected to occur.	Increases in traffic during construction will occur. Short and long-term impacts could occur resulting from construction and plant operations.
which	Construction activities will result in short-term impacts which can be mitigated.	No impacts are expected to occur.	Construction activities and plant operations may create short and long-term noise impacts.
	Depending on route selection impacts may occur.	No impacts are expected to occur.	Depending on site selection, impacts may occur.
	No impacts are expected to occur.	No impacts are expected to occur.	No impacts are expected to occur.

6.0 MITIGATION MEASURES

Because implementation of the Proposed Action is not expected to cause any significant adverse impacts, few mitigation measures are warranted.

However, there are four areas of concern that should be taken into account in NSP's planning and implementation. They are:

- **Control of runoff during construction and operation.**
- **Wetlands at the Roseau County site.** The wetlands identified at the Roseau County site are not extensive to require permitting and mitigation. However, planning of the site of the station can completely avoid wetlands that are present.
- **Species on the State of Minnesota's list of rare species in the general vicinity of Roseau County (sandhill crane) Chisago County (Blanding's turtle), and Kohlman Lake (Blanding's turtle).** Although known habitats of these species are located a sufficient distance away from the sites to avoid impacts, NSP should provide relevant information to site supervisors.
- **Cultural resources.** No cultural resource impacts are anticipated. NSP should provide properly trained site supervisors so that, if artifacts are discovered, appropriate mitigation measures can be implemented.

7.0 COMMITMENTS OF RESOURCES, SHORT-AND LONG TERM PRODUCTIVITY, AND CUMULATIVE IMPACTS

This chapter describes the irreversible and irretrievable commitments of resources, the relationship between short-term use of the land and long-term productivity, and cumulative and indirect impacts that would result from implementation of the proposed action.

7.1 Irreversible and Irretrievable Commitments of Resources

Implementation of the Proposed Action would result in the removal of less than 25 acres of cultivated farmland from production. No portion of this total is classified as prime farm land.

7.2 Relationship Between Short-term Use and Long-Term Productivity

As noted in Section 7.1, only a small amount of land would be removed from agricultural production (less than 25 acres), if the Proposed Action is implemented. In the long term, removal of this land must be weighed against the increased international exchanges of electricity that would occur to meet an increase in overall system demand and to address seasonal variations in demand in Minnesota, North Dakota, and Manitoba.

7.3 Cumulative Impacts

As noted in Section 5.0, the Proposed Action does not appear to have significant adverse environmental impacts. Pursuant to NEPA and to 40 CFR 1500-1508, the cumulative impacts of the Proposed Action must also be addressed.

The proposed modifications at the Roseau County, Forbes, and Chisago County sites occur in a predominantly rural or semi-rural setting. At this time, no other development projects are known to be planned in the vicinity of any of these sites. It appears reasonable to conclude that construction activities associated with these sites will not bring with them significant adverse cumulative impacts either in terms of the natural environment or in terms of the human environment.

In terms of the long-term operations of these substations, the additional transformer "hum" at the Chisago County Substation does not appear to contribute to significant adverse cumulative impacts.

The Red Rock and Kohlman Lake Substations will be constructed within the fenced boundaries of the existing substations. As noted in Section 2.0 and Section 4.0, the intensity of proposed construction activities and the resultant impacts would be minimal. It is unlikely that significant adverse cumulative impacts would result at these sites from implementation of the Proposed Action.

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9.0 AGENCY COORDINATION

In the course of conducting this environmental assessment, the Department of Energy has consulted with the U.S. Fish and Wildlife Service, Department of the Interior, and the State Historic Preservation Officer for the State of Minnesota.

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