



# **Marshall Solar Energy Project Environmental Assessment**

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**In the Matter of the Application of Marshall Solar, LLC for a Site  
Permit for the Marshall Solar Energy Project and Associated  
Facilities in Lyon County, Minnesota**

**Minnesota Public Utilities Commission Docket no. IP6941/GS-14-1052**

**Office of Administrative Hearings Docket no. 82-2500-32499**

**September 2015**

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## **Abstract**

Marshall Solar, LLC (Marshall Solar) submitted an application to the Minnesota Public Utilities Commission (Commission) for a Site Permit to construct to construct 62.25 MW of photovoltaic (PV) solar generation on approximately 515 acres of agricultural land in Stanley Township in Lyon County, approximately four miles east of Marshall. Preliminary estimates of the developed area range of approximately 364 acres. Marshall Solar anticipates that the Project would be operational by the end of 2016.

Marshall Solar submitted its Site Permit Application to the Commission on March 4, 2015. The Site Permit Application was accepted as complete by the Commission on April 27, 2015. The docket number for the Site Permit proceedings is E6941/GS-14-1052.

Under the Power Plant Siting Act (Minn. Statute 216E), a site permit from the Commission is required to construct a large electric power generating plant. Department of Commerce, Energy Environmental Review and Analysis (EERA) staff is responsible for conducting the environmental review for site permit applications submitted to the Commission (Minn. Rules 7850). Accordingly, EERA staff has prepared this environmental assessment (EA) for the Marshall Solar Project. This EA addresses the issues required in Minnesota Rule 7850.3700, subpart 4, and those identified in the Department's scoping decision of June 26, 2015.

Persons interested in this project can place their names on the Project Mailing List by contacting the Public Advisor: Tracy Smetana at [consumer.puc@state.mn.us](mailto:consumer.puc@state.mn.us), 651-296-0406 or 1-800-657-3782. Documents of interest can be found on the eDockets system: <https://www.edockets.state.mn.us/EFiling/search.jsp> (enter the year "14" and the number "1052").

Following release of this environmental assessment, a public hearing will be held in Marshall, Minnesota on October 20 and 21, 2015. The hearing will be presided over by Administrative Law Judge Barbara J. Case, from the Office of Administrative Hearings. Upon completion of the environmental review and hearing process, the record compiled on the site permit application will be presented to the Commission for a final decision. A decision on a site permit for the Marshall Solar Project is anticipated in early 2016.

## **Acronyms, Abbreviations and Definitions**

ALJ	Administrative Law Judge
Site	the land under Marshall Solar's control
BMP	Best Management Practice
Commission	Minnesota Public Utilities Commission
dBA	A-weighted sound level recorded in units of decibels
DNR	Minnesota Department of Natural Resources
EA	Environmental Assessment
ECS	Ecological Classification System
EERA	Department of Commerce Energy Environmental Review and Analysis
EMF	electromagnetic field
FAA	Federal Aviation Administration
kV	kilovolt
mG	milligauss
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
NAC	noise area classification
NHIS	Natural Heritage Information System
NLCD	National Land Cover Database
NPDES	National Pollutant Discharge Elimination System
PV	Photovoltaic
PWI	Public Waters Inventory
ROI	Region of Influence
SHPO	State Historic Preservation Office
Site	Area for which Marshall Solar has site control
SPCC	Spill Control and Countermeasure
SWPPP	Stormwater Pollution Prevention Plan
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

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## 1. Introduction

Marshall Solar, LLC (Marshall Solar) has made an application to the Minnesota Public Utilities Commission (Commission) for a site permit for the proposed 62.25 MW Marshall Solar Project (Project). The permit application was made pursuant to Minn. Statutes Section 216E and Minnesota Rules Chapter 7850.

The Department of Commerce (Department) Energy Environmental Review and Analysis (EERA) staff is tasked with conducting environmental review on applications for site permits before the Commission. The intent of the environmental review process is to inform the public, the applicant, and decision-makers about potential impacts and possible mitigation measures for the proposed project.

This environmental assessment (EA) addresses the issues noted in Minnesota Rule 7850.3700, subpart 4, and those identified in the Department's scoping decision for this project (Appendix A), and is organized as follows:

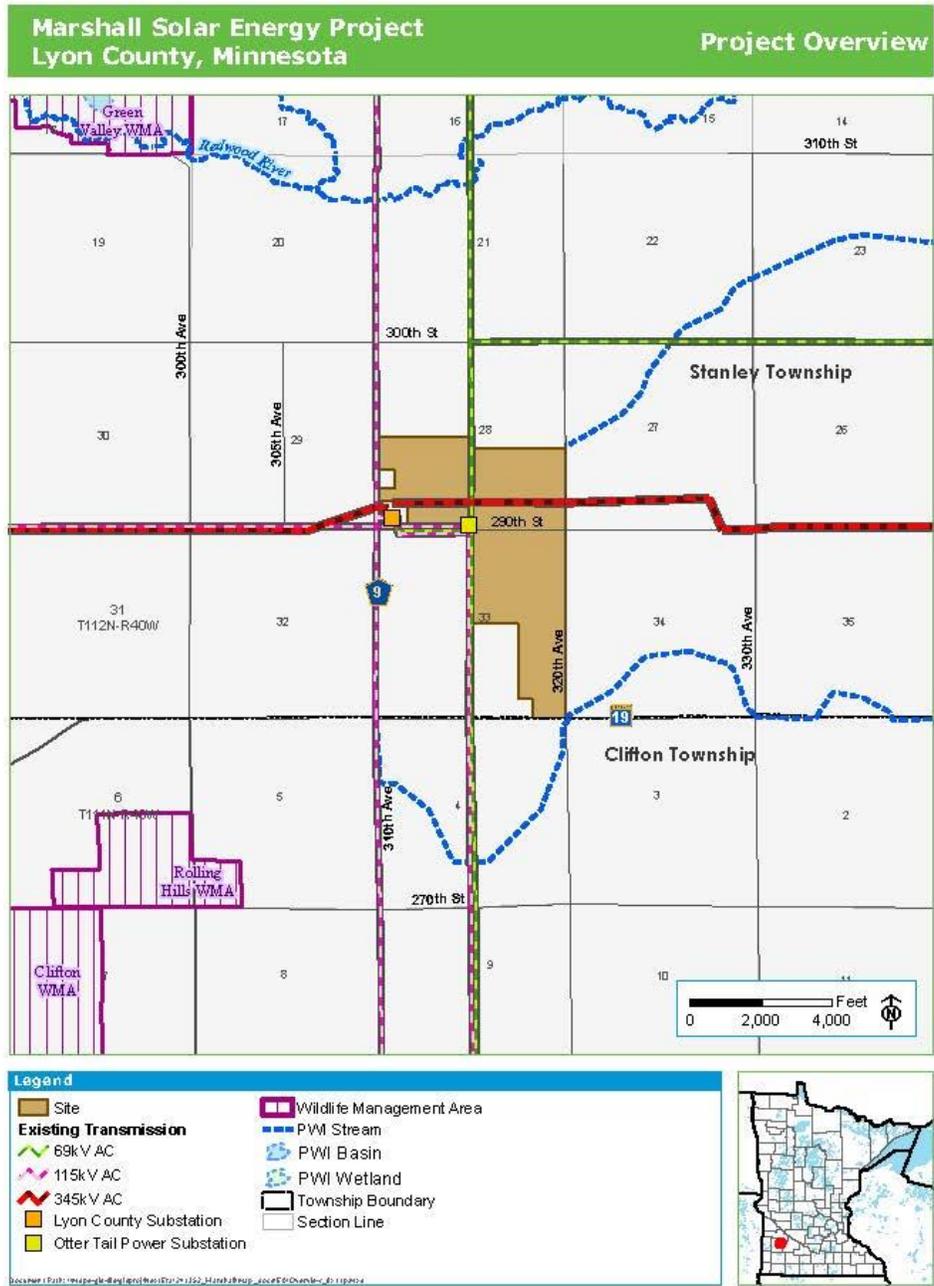
**Table 1: Organization of Environmental Assessment**

Section	Topic	Focus
1	Introduction	Overview of this document and of the proposed Project.
2	Regulatory Framework	Delineation of the regulatory requirements and milestones associated with permitting and operation of the Project
3	Proposed Project	Description of the Project as proposed by Marshall Solar, including PV arrays, roads and the electrical system.
4	Alternative Sites	Description of sites considered and rejected for further consideration in the EA.
5	Potential Impacts of Proposed Project	Detail of the potential impacts of the proposed Project to human and natural environments and measures that could be implemented to avoid, minimize, or mitigate the impacts
6	Application of Siting Factors	Application of the information and data available in the record to date to those factors described in Minnesota Rule 7850.4100.

### 1.1 Project Description

Marshall Solar proposes to locate 62.25 MW of photovoltaic solar generation on a 515 acre site in Stanley Township in Lyon County (**Figure 1**). The proposed site is located on agricultural land, approximately four miles east of Marshall. Marshall Solar anticipates that the Project would be operational by the end of 2016.

Figure 1: Project Location



## **1.2 Project Purpose**

Marshall Solar proposed the Project in response to Xcel Energy's request for proposals to acquire up to 100 MW of large-scale photovoltaic (PV) solar generation resources. The Project was one of the three projects that Xcel Energy selected through the RFP process. The Commission approved Xcel Energy's power purchase agreement with Marshall Solar in its order dated March 24, 2015.<sup>1</sup>

## **1.3 Sources of Information**

Much of the information used in this EA is derived from documents prepared by Marshall Solar, including the Site Permit Application (Application) and responses to questions from EERA staff. In addition to material provided by Marshall Solar, information from scoping comments and from EERA's GIS analysis of the project and surrounding area was used to prepare this document.

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<sup>1</sup> Commission, Marsh 24, 2015, *Order Approving Solar Portfolio*, eDocket Document ID: [20153-108501-01](#)

## 2 Regulatory Framework

Persons seeking to construct and operate a large electric power generating plant in Minnesota must seek permission to do so from the Commission.

### 2.1 Certificate of Need

Under Minnesota Statute 216B.243, subdivision 2, no person may construct a large energy facility in Minnesota without a certificate of need from the Commission. The Marshall Solar project is considered a large energy facility because it is a power generating plant capable of 62.25 megawatts of generating capacity.

However, Minnesota Statute 216B.243, subdivision 9 exempts wind and solar electric generating facilities from the certificate of need requirements if they are intended to be used to meet the obligations of Minnesota Statute 216B.1691.

While the proposed project meets the definition of a large energy facility requiring a certificate of need, the Commission found that the proposed project is exempt from certificate of need requirement because it, along with two additional solar projects, represents “a cost-effective, reasonable, and prudent approach for the Company to meet its obligations under the Solar Energy standard.”<sup>2</sup>

### 2.2 Site Permit

Minn. Statutes Section 216E.03, subd. 1, provides that no person may construct a large electric power generating plant without a site permit from the Commission. Under Minnesota Statutes, Section 216E.01, subd. 5, a large electric power generating plant is defined as electric power generating equipment and associated facilities designed for or capable of operation at a capacity of 50,000 kilowatts or more. The proposed project is a large electric power generating plant and therefore a site permit is required prior to construction.

On March 4, 2015 Marshall Solar submitted the site permit application for the proposed Marshall Solar Project pursuant to the provisions of the alternative permitting process outlined in Minnesota Rules 7850.2900.<sup>3</sup> The alternative permitting process includes environmental review and public hearings.

A copy of the site permit application, along with other relevant documents, can be reviewed at the Department’s web page at:

<http://mn.gov/commerce/energyfacilities/Docket.html?Id=34083>.

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<sup>2</sup> Commission, *Order Approving Solar Portfolio*, March 24, 2015, eDocket, Document ID [20153-108501-01](#).

<sup>3</sup> Marshall Solar, *Marshall solar Energy Project: Site Permit Application*, March 4, 2015, eDocket Document ID: [20153-107920-01](#), [20153-107920-02](#), [20153-107920-03](#), [20153-107920-04](#), [20153-107920-05](#), [20153-107920-06](#), [20153-107920-07](#), [20153-107920-08](#)

The Department, through EERA staff, is responsible for evaluating the site permit application and administering the environmental review process. The Commission is responsible for selecting the project site and issuing the site permit.

## 2.3 Environmental Review

Environmental review under the alternative permitting process includes public information/scoping meetings and the preparation of an environmental review document, the EA (Minnesota Rule 7850.3700). The EA is a written document that describes the human and environmental impacts of the power plant project (and selected alternative sites) and methods to mitigate such impacts.

The Deputy Commissioner of the Department determines the scope of the EA. The EA must be completed and made available prior to the public hearing.

### 2.3.1 Scoping Process

On April 10, 2015, Commission staff sent notice of the place, date and times of the Public Information and Scoping meeting to those persons on the General List maintained by the Commission, the agency technical representatives list and the project contact list.<sup>4</sup> Notice of the public meeting was also published in the local newspaper.<sup>5</sup>

On April 27 and 28, 2015, Commission staff and EERA staff jointly held public information and scoping meetings in Marshall, Minnesota.

The purpose of the meetings was to provide information to the public about the proposed project, to answer questions, and to allow the public an opportunity to suggest alternatives and impacts that should be considered during preparation of the EA. Approximately 80 people in total attended the meetings. A court reporter was present at the meetings to document oral statements.<sup>6</sup>

A total of 14 written comments were received by the end of the scoping comment period on May 15, 2015.<sup>7</sup> Scoping comments addressed a variety of topics including: use of prime farmland for a solar project; impacts of the proposed facilities on property values of nearby properties; costs and fees paid to local governments; human health impacts from the

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<sup>4</sup> *Notice of Public Information/Scoping Meeting*, April 10, 2015, eDocket Document ID: [20154-109177-01](#), [20154-109177-02](#)

<sup>5</sup> Marshall Solar, Affidavit of Publication, June 1, 2015, eDocket Document ID: [20156-111025-01](#)

<sup>6</sup> Oral Comments Received During Scoping, May 12, 2015, eDocket Document ID: [20155-110332-01](#), [20155-110332-02](#)

<sup>7</sup> Public Scoping Comments Received by May 15, 2012, eDocket Document ID: [20155-110582-01](#), [20155-110515-01](#), MnDOT Comment, eDocket Document ID: [20155-110412-01](#), Clean Energy Organizations EA Scoping Comments, eDocket Document ID: [20155-110436-02](#)

Project,; incremental impacts from the number of large energy facilities in the project area; potential to expand the proposed project or locate additional solar projects in the area; impacts to wildlife; overall appearance of the solar installations and the potential for glare; noise during construction and operation of the facilities; impacts to communication systems (land lines and cell phones, ham radios); impacts to agriculture; vegetation for the project established after construction; impacts to surface and ground waters and stormwater runoff; impacts to installed drainage systems on adjacent lands; impacts to wetlands; and the health, environmental and social benefits of solar power.

The Minnesota Department of Transportation (MnDOT) clarified that MnDOT does not consider a solar generating project to be a public utility for transportation purposes and consequently would not allow Marshall Solar to place connecting lines along trunk highways, although electric lines are permitted to cross trunk highways. MnDOT also identified the need for the Project to receive access permits from the appropriate road permitting agency once access point(s) for the Project are determined.<sup>8</sup>

These items and issues were incorporated into the EERA staff's recommendation to the Department's Deputy Commissioner on the EA Scoping Decision. The EA Scoping Decision is included as Appendix A of this document.

### **2.3.2 Scoping Decision**

On June 19 2015, after considering what action, if any, the Commission should take in regard to the alternatives put forth during the scoping process the Commission elected to take no action in this matter.

After consideration of the comments, the Deputy Commissioner issued a Scoping Decision on June 26, 2015.<sup>9</sup> A copy of this decision is attached in Appendix A. The items and issues brought forth during the scoping process were incorporated into the Scoping Decision.

## **2.4 Public Hearing**

The Commission is required by Minnesota. Rule 7850.3800 subp 1 to hold a public hearing once the EA has been completed. The hearing will be conducted by Administrative Law Judge (ALJ) Barbara Case and is scheduled to be held at 6:00 p.m. on October 20 and at 11:00 a.m. on October 21, 2015 at Southwest State University in Marshall.<sup>10</sup>

The hearing was noticed separately from the EA, and details can be found online at <http://mn.gov/commerce/energyfacilities/Docket.html?Id=34083>. Interested persons may comment on the EA at the public hearing. Persons may testify at the hearing without being

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<sup>8</sup> MnDOT Scoping Comment, May 15, 2015, eDocket ID: [20155-110412-01](#).

<sup>9</sup> Department of Commerce, *Scoping Decision*, June 26, 2015, eDocket ID: [20156-111802-01](#)

<sup>10</sup> Commission, September 25, 2015, *Notice of Public Hearing*, eDocket ID: [20159-114274-01](#)

first sworn under oath. The ALJ will ensure that the record created at the hearing is preserved and will provide the Commission with a report setting forth findings, conclusions and recommendations on the merits of the proposed project applying the siting criteria set forth in statute and rule.<sup>11</sup>

Comments received on the EA become part of the record in the proceeding. EERA staff is not required to revise or supplement the EA document. A final decision on the site permit will be made by the Commission at an open meeting following the public hearing and filing of the ALJ's report.

## 2.5 Final Decision

The Commission's obligation is to choose sites that minimize adverse human and environmental impacts while ensuring continuing electric power system reliability and integrity, and also while ensuring that electric energy needs are met and fulfilled in an orderly and timely fashion. Site permits contain conditions specifying siting, construction and operation standards; a site permit template prepared for the Project by Commission staff is attached in Appendix B.

There are a number of potential impacts associated with power plants that must be taken into account on any large electric power generating plant project. Minnesota Rule 7850.4100, A through N, identifies 14 factors that the Commission must consider when designating a site for a large electric power generating plant:

- a. *effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services;*
- b. *effects on public health and safety;*
- c. *effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;*
- d. *effects on archaeological and historic resources;*
- e. *effects on the natural environment, including effects on air and water quality resources and flora and fauna;*
- f. *effects on rare and unique natural resources;*
- g. *application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity;*
- h. *use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries;*
- i. *use of existing large electric power generating plant sites;*

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<sup>11</sup> Commission, *Order Accepting Site Permit Application as Complete, Extending Time for Final Decision, and Referring Application to the Office of Administrative Hearings*. May 11, 2014, eDocket ID: [20155-110291-01](#)

- j. use of existing transportation, pipeline, and electrical transmission systems or rights-of-way;*
- k. electrical system reliability;*
- l. costs of constructing, operating, and maintaining the facility which are dependent on design and route;*
- m. adverse human and natural environmental effects which cannot be avoided;*  
*and*
- n. irreversible and irretrievable commitments of resources.*

Some factors identified in Minnesota Rule 7850.4100 are related to the routing of high-voltage transmission lines, and not power plant sites. The proposed project does not include any high voltage transmission lines, and therefore these factors are not considered applicable to the proposed Project:

- Factor H: Use or paralleling of existing rights-of-way, survey lines, natural division lines and agricultural field boundaries; and
- Factor J: Use of existing transportation, pipeline and electrical transmission systems or rights-of-way.

In addition to the factors identified in Minnesota Rule 7850.4100, Minnesota Rule 7850.4400, Subpart 4 provides that, in most areas of the state, no more than 0.5 acres of prime farmland per MW may be used to site power plants unless there is no feasible and prudent alternative:

*No large electric power generating plant site may be permitted where the developed portion of the plant site, excluding water storage reservoirs and cooling ponds, includes more than 0.5 acres of prime farmland per megawatt of net generating capacity, or where makeup water storage reservoir or cooling pond facilities include more than 0.5 acres of prime farmland per megawatt of net generating capacity, unless there is no feasible and prudent alternative. Economic considerations alone do not justify the use of more prime farmland. "Prime farmland" means those soils that meet the specifications of Code of Federal Regulations 1980, title 7, section 657.5, paragraph (a). These provisions do not apply to areas located within home rule charter or statutory cities; areas located within two miles of home rule charter or statutory cities of the first, second, and third class; or areas designated for orderly annexation under Minnesota Statutes, section [414.0325](#).*

At the time the Commission makes a final decision on the permit application, the Commission shall determine whether the EA and the record created at the public hearing address the issues identified in the scoping decision.

The Commission shall make a final decision on a site permit within 60 days after receipt of the record from the ALJ. A final decision must be made within six months after the

Commission's determination that an application is complete. The Commission may extend this time limit for up to three months for just cause or upon agreement of the applicant.

## 2.6 Other Permits

The Public Utilities Commission site permit is the only State permit required for construction of a large electric power generating plant, but other permits or approval may be required for certain construction activities such as construction activities within wetlands or new driveways. **Table 2** identifies potential permits that may be required for Marshall Solar to complete this project.

**Table 2: Potentially Required Permits**

Regulatory Authority	Permit/Approval
<b>Federal Permits and Approvals</b>	
U.S. Army Corps of Engineers (USACE)	Wetland Delineation Approvals Jurisdictional Determination
U.S. Fish and Wildlife Service	Review for Threatened and Endangered Species - informal coordination
Federal Energy Regulatory Commission	Exempt Wholesale Generator Self Cert. (EWG) Market-Based Rate Authorization
<b>State of Minnesota Permits and Approvals</b>	
Board of Water and Soil Resources	Wetland Conservation Act Approval
Minnesota Department of Labor and Industry	Building Plan Review and Permits
Minnesota Public Utilities Commission	Site Permit for Power Plant Site Exemption from Certificate of Need for Power Plant
Minnesota State Historic Preservation Office (SHPO)	Cultural and Historic Resources Review and Review of State and National Register of Historic Sites and Archeological Survey
Minnesota Pollution Control Agency (MPCA)	National Pollutant Discharge Elimination System Permit (NPDES) – MPCA General Stormwater Permit for Construction Activity – one per facility Very Small Quantity Generator (VSQG) License – Hazardous Waste Collection Program
MPCA via U.S. Environmental Protection Agency	Spill Prevention Control and Countermeasure (SPCC) Plan
Minnesota Department of Transportation (MnDOT)	Overweight Permit for State Highways – for transport of transformers, inverters
<b>Local Permits and Approvals</b>	
Lyon County	Right-of-way permits, road access permits, driveway permits for access roads and electrical collection system, Wetland Conservation Act Approval

## 2.7 Issues Outside the Scope of the EA

The EA does not consider the following:

- No-build alternative

- Issues related to Project need, size, type or timing
- Any site alternatives not specifically identified in the scoping decision
- The manner in which landowners are compensated for the sites

### **3 Proposed Project**

Marshall Solar proposes to locate the Project on up to 364 acres of a 515 acre site in Stanley Township in Lyon County (**Figure 2**).<sup>12</sup> Marshall Solar anticipates that the Project would be operational by the end of 2016. Project design has not been finalized, but is anticipated to be of the same size and similar to the preliminary layout shown in **Figure 2**.

#### **3.1 Project Components**

The Project will be comprised of south-facing PV modules grouped into arrays, power conversion stations (PCS) comprised of inverters and transformers, electrical cables and conduit, SCADA systems and metering equipment, a project substation, and roads providing access to the equipment. A perimeter fence will surround the project components. Access to the Project will be through a main gate along County Road 9, north of the Lyon County Substation, with additional access points along 290<sup>th</sup> Street and 320<sup>th</sup> Avenue.<sup>13</sup>

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<sup>12</sup> Appendix C, response to Question 1 dated September 2, 2015

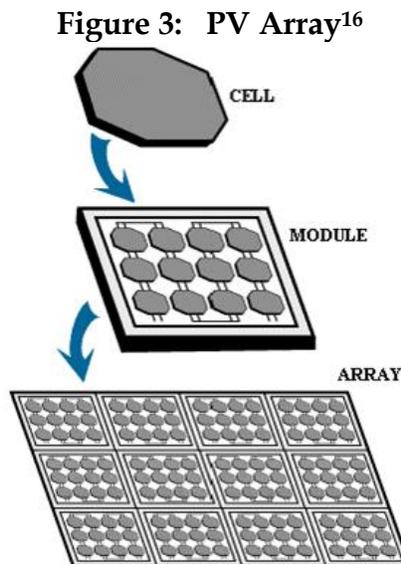
<sup>13</sup> Appendix C, response to Question 2 dated September 2, 2015



### 3.1.1 PV Arrays

The most visible component of the Project will be the PV modules of approximately 6.5 feet long and 3.3 feet wide mounted on stationary south-facing racking.<sup>14</sup> Once mounted the bottom of each module would be approximately one to three feet above grade and the top would be approximately eight to twelve feet above grade.<sup>15</sup> The modules will be grouped into arrays.

While there are different technological variations, the most common PV cells consist of a specially treated conductor made up of two layers with relative positive and negative charges. This conductor is between two contacts that are connected to an external load. As shown in **Figure 3**, individual PV cells can be combined as a module or solar panel to generate greater quantities of electricity and then further grouped as arrays.



PV systems convert both direct and indirect solar energy (direct and scattered sunlight) to electrical energy by capitalizing on nature's inherent desire to keep electrical charges in balance.<sup>17</sup> At the most basic level, electrical current is the flow of electrons through a conductor. When solar radiation strikes a PV cell some of it is absorbed exciting electrons

<sup>14</sup> Appendix C, response to Question 2 dated September 2, 2015

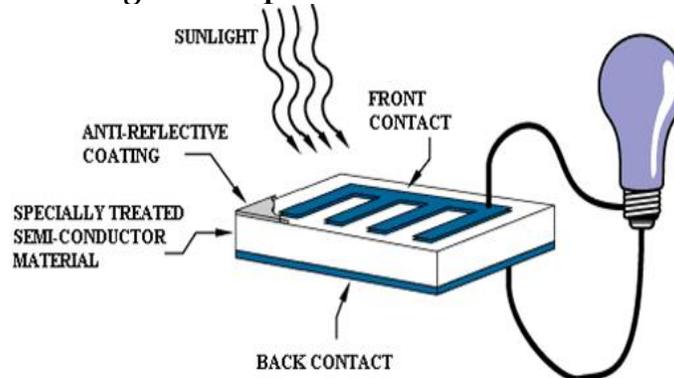
<sup>15</sup> Application, at p. 13

<sup>16</sup> National Aeronautics and Space Administration. 2011. *How Do Photovoltaics Work?*  
<http://science.nasa.gov/science-news/science-at-nasa/2002/solarcells/>

<sup>17</sup> US Department of Energy, Office of Energy Efficiency and Renewable Energy. 2013. *Photovoltaic Technology Basics*. <http://energy.gov/eere/energybasics/articles/photovoltaic-technology-basics>; National Aeronautics and Space Administration, 2011

within the cell. Some of these electrons move freely between layers from negative to positive. In the process, electrons from the positive layer are disrupted and “flow” back to the negative layer through the external load creating a continuous flow of electrons, or, a continuous flow of electric current as depicted in **Figure 4**.

**Figure 4: Operation of a PV Cell<sup>18</sup>**



PV systems can be configured as a “fixed” or “tracking” system. Permanently mounted in a stationary position, fixed systems are aligned to gather the greatest level of solar radiation over the course of the year. These systems are often subject to site-specific constraints, e.g., roof angle, which limit their overall efficiency.

While more expensive than fixed-tilt systems, tracking systems can increase system efficiencies by as much as 33%.<sup>19</sup> There are two general types of tracking systems: single axis and dual axis. Single axis systems track the sun from east to west throughout the day. Dual axis systems track the sun both east to west throughout the day and north to south throughout the year.

The Project will use a fixed mounted system. The PV arrays will be supported by galvanized steel posts spaced approximately 10 to 20 feet apart. Preliminary project design anticipates that the steel posts will be pile-driven to an approximate depth of six to 10 feet. Depths may vary depending upon soil conditions and further geotechnical analysis.<sup>20</sup>

### 3.1.2 Roads

Access to the site will be from the existing road network (State Highway 19, county Highway 9, 290<sup>th</sup> Street and 320<sup>th</sup> Avenue). The main access to the project will be through a gate off of County Highway 9, to the north of the Lyon County Substation. Marshall Solar will also

<sup>18</sup> National Aeronautics and Space Administration, 2011

<sup>19</sup> Appleyard, D. *Solar Trackers: Facing the Sun*. 2009.

<http://www.renewableenergyworld.com/rea/news/article/2009/06/solar-trackers-facing-the-sun>

<sup>20</sup> Application, at pp. 11-13.

construct secondary access gates along 290<sup>th</sup> Street and 320<sup>th</sup> Avenue.<sup>21</sup> No new roads will be constructed to access the site. Marshall Solar would construct turn-outs or driveways to allow for the entrance to the Project. The main access road between County Highway 9 and the Project Substation will be paved. Within the site, Marshall Solar will construct approximately 25,000 to 28,000 feet of unpaved access roads of compacted road base and approximately 20 feet wide, to provide access to the facility equipment for maintenance and, when necessary, emergency vehicles.<sup>22</sup>

### 3.1.3 Electrical System

PV cells generate direct current (DC) electricity, which must be converted to alternating current (AC) electricity prior to the end user. The Project's PV modules will be connected in series (string) by wiring that connects the modules to a combiner box. Each combiner box will collect DC power from several strings and feed into a power conversion station (PCS) through underground DC cabling. Trenches for the DC cables will be approximately three feet deep, and may vary in width from one to four feet. The cabling will be laid in the bottom of the trenches and surrounded by clean fill, while the remainder of the trench will be back-filled with soil from the site and compacted to minimize settling.

Each PCS unit contains several power inverters. The inverters change the DC output received from the combiner boxes to AC electricity. The transformers located adjacent to the PCS units will upgrade the AC current to collection voltage, expected to be 34.5 kV, for delivery to the Project Substation. Marshall Solar anticipates that the PCS units will be approximately eight to ten feet in height and approximately 40 feet in length. The PCS units will be mounted on concrete pad foundations designed to meet site-specific geotechnical conditions. The transformers, anticipated to be approximately 6.5 feet in height, will also be mounted on the concrete slab, but will be outside the enclosure housing the inverters.

Electricity from the collection circuits will be delivered to the Project Substation through underground 34.5 kV collectors. At the Project Substation, the voltage will be stepped up to 115 kV and delivered to Xcel Energy's Lyon County Substation through a 115 kV gen-tie line.

The Project substation will be constructed on one to two acres located near Xcel Energy's existing Lyon County Substation<sup>23</sup>. The final location and configuration of the Project Substation and length of the gen-tie line will be determined based on Xcel Energy's final interconnection design, Marshall Solar anticipates that the new substation will be located directly east of the Lyon County Substation. Marshall Solar anticipates that the gen-tie line will be less than 1,500 feet.<sup>24</sup>

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<sup>21</sup> Appendix C, response to Question 12 dated September 9, 2015

<sup>22</sup> Application, at p. 15; Appendix C, response to Question 11 dated September 2, 2015

<sup>23</sup> Application, at p. 13-14

<sup>24</sup> Application, at p. 14

The substation site will be enclosed by an eight-foot fence. The Project Substation will contain a 34.5 /115 kV transformer, one 115 kV and multiple 34.5 kV breakers, motor-operated and manually operated switches, instrument transformers, galvanized steel support structures, and a control enclosure of approximately 15 by 45 feet housing protection and control, metering, and communications equipment. The area inside the fenced area the ground will be covered by washed rock.<sup>25</sup>

### 3.1.4 Facility Control and Monitoring Systems

Project components will be fitted with sensors to allow the Project to be controlled on-site and at the NextEra headquarters in Florida.

## 3.2 Project Construction

Marshall Solar anticipates that construction will begin in early 2016, with commissioning of the facility by December 2016 (Table 3).

**Table 3: 2016 Construction Activity Milestones<sup>26</sup>**

Task	Anticipated Timeframe
Site preparation	March - May
Installation of Posts and Foundations	April - August
Construction of Racks	May - September
Installation of Solar Panels	May - September
Installation of Major Electrical Equipment	July - October
Construction of Project Substation	April - August
Installation of Wiring and Cable	April - October
Testing	October - December
Project Commissioned	December

Marshall Solar anticipates an average of 225 workers (laborers, craftsmen, supervisory personnel, support personnel, and construction management personnel) at the Project site during construction. During peak construction periods up to 275 workers may be employed at the site.<sup>27</sup> Marshall Solar plans for construction activities to occur between six a.m. and seven p.m., Monday through Saturday. In some cases, construction activities may occur outside of these hours.

Marshall Solar anticipates that construction activities will occur during daylight hours. In situations where activities such as testing or commissioning need to be performed outside of daylight, temporary lighting for these activities will be provided by portable generator-

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<sup>25</sup> Appendix C, response to Question 9 dated September 2, 2015

<sup>26</sup> Application, at p. 16

<sup>27</sup> Application, at p. 20

powered light towers, vehicle headlights or portable shop lighting.<sup>28</sup> After construction permanent motion-activated or timer-based lighting will be installed near the O&M building, the main gate, and the Project Substation. During operation, lighting for the Project will be kept to the level required for safety and security and shielded and directed to focus on safety and security requirements and minimize off-site lighting.<sup>29</sup>

Varying pieces of construction equipment will be used at different phases of construction. Marshall Solar anticipates construction equipment may include:

- Flat-bed trucks
- Concrete trucks and pumpers
- All-terrain vehicles
- Hydraulic ram
- Cranes
- Trenching machines
- Compaction equipment
- Forklifts
- Boom trucks
- Vehicle-mounted power auger or backhoe
- Disking machines
- Rollers
- Tensioners and/or pullers
- Line trucks
- Wire trailers
- Tractors<sup>30</sup>

### **3.2.1 Site Preparation**

Once necessary permits are obtained, Marshall Solar will begin preparing the site for construction. Prior to the start of actual construction activities, land surveyors will use the plan information to establish alignments benchmarks, and elevations necessary to guide construction. Surveyors will also stake the site to mark existing utilities and other avoidance areas. Areas with environmentally or culturally sensitive resources will be marked (flagged, roped, staked or fenced) in the field for avoidance during construction.<sup>31</sup>

Woody vegetation will be cleared in areas where Project components (PV arrays, substation, roads) will be constructed. The home and outbuildings in the parcel located near the center of the site will be removed. Debris from woody vegetation and the buildings will be removed from the site and disposed of at a designated off-site location. Additional site preparation

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<sup>28</sup> Appendix C, response to Question 22 dated September 25, 2015

<sup>29</sup> Application, at p. 36

<sup>30</sup> Application, at p. 20

<sup>31</sup> Application, at p. 16

tasks include the improvement of access to the site, establishment of internal access roads, some localized grading, and establishment of a staging/laydown area. Marshall Solar anticipates that the laydown area will be established at the site, although it is possible that another nearby area that provides suitable access to the site may be used.<sup>32</sup>

When compared with solar tracking designs, the Project's fixed racking design will minimize the need for grading and allow the existing topography to remain largely intact. Marshall Solar anticipates that any grading would be localized to proposed access or service roads, the Project Substation, location of PCS units and areas where there are small gullies or sections that are impassible to vehicles.<sup>33</sup>

The proposed grading process would include cutting, filling, and compaction of earth in isolated areas to meet the final design requirements. Higher areas would be excavated (cut) and the material used to raise the surface (fill) of nearby lower areas. Although the preliminary design does not anticipate grading of larger areas, if future design modifications require the grading of larger areas a disc and roll technique would be used to reduce the impacts associated with cut and fill grading over large areas. The disc and roll technique is a two-step process that first passes over the targeted area with tractors to till the soil and level out low spots, and then passes again with drum rollers to compact the soil.

Marshall Solar anticipates that most of soils from the site will be suitable for use as fill for general site needs and filling the trenches used for cables. In some cases engineered fill may be brought to the site and used to ensure a stable base for inverter and substation pad locations and, in some areas, the collection system trenches.<sup>34</sup>

After grading an 8-foot chain link fence will be installed around the developed areas of the site. The areas north and south of 290<sup>th</sup> Street will be fenced separately, with at least two access gates for the northern and southern portions of the Project.

### **3.2.2 Solar Arrays**

Following site preparation, solar arrays will be constructed in blocks of approximately 4 MW rated nameplate capacity.<sup>35</sup> The blocks will be separated by access roads.

PV panels will be installed on south-facing fixed-tilt racking supported by steel pile foundations driven directly into the ground with a hydraulic ram. Marshall Solar does not anticipate the need for concrete foundations at the site.<sup>36</sup>

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<sup>32</sup> Appendix C, response to Question 10 dated September 2, 2015

<sup>33</sup> Application, at p. 17

<sup>34</sup> Application, at p. 17

<sup>35</sup> Application, at p. 11

<sup>36</sup> Appendix C, response to Question 2 dated September 2, 2015

PV panels shipped to the site would be delivered to a central lay-down area. Flatbed trucks will deliver palletized boxes of PV panels from the laydown area to crews for installation. Crews would mount and secure each panel to the racks.

Concurrent with the PV module installations, other crews would excavate the locations where the PCS units would be installed and construct the foundations for the PCS units and transformers. PCS equipment would be installed using cranes.

### **3.3 Project Substation**

Marshall Solar anticipates that construction of the Project Substation will take approximately five months. Following preparation and any grading required for the substation, materials and equipment will be delivered to the substation site.

Equipment at the substation will include a 34.5 /115 kV step-up transformer, 115 kV SF6 circuit breakers, multiple break disconnect switches and a rigid bus on post insulators and fittings. Concrete foundations will be installed to support the substation equipment. Electrical conduits will connect substation equipment to the protection, control and automation relay panes housed in the control enclosure. Auxiliary power for the switchyard control system will be supplied by batteries and battery chargers.<sup>37</sup>

### **3.4 Gen-Tie Line**

The Project will connect with the electrical grid at Xcel Energy's Lyon County Substation via a short gen-tie line from the Project Substation. Although the final alignment and other design features are dependent upon the interconnection agreement with Xcel Energy, Marshall Solar anticipates that line will use a set of self-supported monopole and/or H-frame structures with a height of 60 to 100 feet. Marshall Solar anticipates that the gen-tie line will not require crossing of any of the transmission lines line in the Project Area. Following excavation of the holes for the transmission structures, cranes will lift the structures with pre-assembled insulators, hardware, and stringing sheaves into place and gravel or concrete will be poured to backfill the holes and create a foundation. Marshall Solar anticipates that installation of the transmission structures will be accomplished in one to two work days.

A telecommunications line will be strung atop the gen-tie line between the Lyon County Substation and the Project Substation.

### **3.5 Post-Construction Restoration**

As construction is completed, areas disturbed during construction will be restored. The temporary staging and laydown area will be vacated and any rock used on the laydown area

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<sup>37</sup> Application, at p. 19

or interior roads will be removed. The laydown area would be de-compacted using a tractor and disc and topsoil will be re-spread over the laydown area. Areas between the rows of panels, between the arrays perimeter fencing and laydown areas will be de-compacted and cleared of weeds in preparation for re-seeding with a mixture of native prairie grasses and wildflowers.<sup>38</sup>

### **3.6 Project Operation and Maintenance**

The expected service life of the Project is 25 to 35 years.<sup>39</sup> The Project will be remotely operated through a real-time control system for most operations functions. Onsite operation will be performed from time to time as required for certain resets and troubleshooting activities. Operations personnel will monitor the performance of the Project through a regular (weekly or monthly) review of data.

Marshall Solar estimates that the Project will require 2 to 3 full-time permanent equivalent positions during the operational life of the Project. Operations and maintenance functions will be based off-site; either out of office and storage space in Marshall, or at an existing wind facility located approximately 30 miles to the southwest in Lincoln County. Operations staff will visit the Project on a regular basis.

All maintenance activities will be performed by qualified personnel. Regular maintenance of the Project facilities will include scheduled equipment inspections, road maintenance, vegetation maintenance including mowing the ground cover that is planted under the arrays at each facility, fence and gate inspection, lighting system checks, and PV panel washing as necessary (minimal to no washing is anticipated to be needed at Project facilities). Regular inspection for facility components will include inspection of:

- PV panels: visual examination of the panels and tracking system and surrounding grounds to verify panel and tracking integrity;
- Inverters, transformer and electrical panels: visual inspection of the devices including connection cabinets and the grounding network, check for presence of water and dust;
- Electrical inspection: measurement of insulation level and dispersion, inspection of main switches and safety devices (fuses);
- Cabling and wiring: visual inspection of buried and overhead electrical line and connection box to verify integrity; and
- General facility inspection: visual inspection for the presence of animals, integrity of the fencing, nests, noise check for abnormal sounds.

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<sup>38</sup> Appendix C, response to Question 16 dated September 23, 2015

<sup>39</sup> Application, at p. 25; Appendix C, responses to Question 13 dated September 17, 2015

Marshall Solar will operate the Project in accordance an Annual Facility Operating Plan incorporating NextEra’s best practices for PV facilities. The plan will include scheduled inspection of the major components and a scheduled maintenance cycle of the components that is expected over time. Once construction is complete, operations and maintenance personnel will visit the Project at intervals associated with the maintenance schedule during normal operations (Table 4).

**Table 4: Operations and Maintenance Tasks and Frequency<sup>40</sup>**

Component and Task	Anticipated Frequency
<b>Met Station</b>	
Clean Sensors	Weekly
Check Filters	Monthly
Level all Sensors	Monthly
Sensor Calibrations	Bi-annually
Reference Module cleaning	Weekly
Reference Module Calibration	Annually
<b>Panels</b>	
Module Inspection	Weekly
Module Cleaning	TBD – not more than Annually
Thermography Scan	Annually
<b>Inverters</b>	
Inspection	Weekly
Cleaning	Every 3 months
HVAC Inspection	Weekly
HVAC Maintenance	Annually
<b>Pad-Mounted Transformers</b>	
Inspection	Weekly
IR scan	Every 3 months
Oil Sample	Annually
<b>Control Room</b>	
Inspection	Weekly
Battery Cell Test	Every 3 months
HVAC Inspection	Weekly
HVAC Maintenance	Annually
<b>Switchyard</b>	
Inspection	Weekly
Switchyard IR Scan	Every 6 months
Breaker Maintenance	Bi-annually
Transformer Oil Sample	Annually
Revenue Meter Calibration	Annually
<b>Safety</b>	
Site Safety Audit	Monthly
Site Safety Assessment	Annually
First Aid Kit Quantity Inspection	Monthly
Fire Extinguisher Inspection	Monthly
Fire Extinguisher Recertification	Annually

<sup>40</sup> Application, at pp. 23-24

Protective Grounds Recertification	Annually
Voltage Rated Glove Recertification	Every 6 months
Switch Stick Recertification	Bi-annually
<b>Administrative</b>	
Spare Parts Inventory	Partial count every 3 months, full count annually
SCADA Inspection	Daily
SCADA Maintenance	Monthly
PI/Historian Inspection	Daily
PI/Historian Maintenance	Monthly

### 3.7 Project Costs

Marshall Solar estimates that construction of the Project as proposed will cost approximately \$100 to \$130 million.<sup>41</sup> Construction costs include development expenses, procurement of land and equipment, labor, and contractor expenses. Once operational, Marshall Solar anticipates annual operating costs to be approximately \$1.0 million. Operating costs include labor, materials, and applicable taxes.<sup>42</sup>

### 3.8 Decommissioning and Restoration

Marshall Solar anticipates the useful life of the Project to be approximately a minimum of 20 to 25 years, and potentially up to 35 years, or approximately 10 years beyond the term of the Power Purchase Agreement with Xcel Energy. Marshall Solar's determination of a facility's useful life is based on the expected degradation and durability of the facility's components (e.g. PV modules, power inverters, combiner boxes, transformers) as reflected in manufacturers' equipment warranties and independent engineering assessments.<sup>43</sup>

At the end of the Project's useful life Marshall Solar will determine whether to decommission the facility, consistent with the terms of the Site Permit, or to seek repowering of the facility. Marshall Solar will consider the performance of the facility, the cost of continuing operations (with the existing equipment or replacement equipment, and the availability of an interested customer for the power.<sup>44</sup>

Marshall Solar estimates that decommissioning tasks will require a workforce of approximately 30 workers and require approximately four months to complete. After removal components will be examined and either recycled or disposed of appropriately. Marshall Solar has provided the following breakdown of decommissioning tasks:

- Dismantling and removal of all above ground equipment (PV panels, racking, transformers, PCS units, project Substation, etc.);

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<sup>41</sup> Marshall Solar, Reply Comments, March 27, 2015, eDocket Document ID: [20153-108653-01](#)

<sup>42</sup> Application, at p. 9

<sup>43</sup> Application, at p. 25; See Also Appendix C, response to Question 13 dated September 17, 2015

<sup>44</sup> Appendix C, response to Question 13 dated September 17, 2015

- Excavation and removal of all below ground cabling;
- Removal of posts;
- Break-up and removal of concrete pads and foundations; and
- Scarification of compacted areas within and adjacent to the developed area.<sup>45</sup>

After all equipment is removed, the facility will be restored. Holes created by poles, concrete pads, and other equipment will be filled in with soil to existing conditions and seeded.

Marshall Solar has not formalized a plan for ensuring that funds are available to accomplish decommissioning, but anticipates that financial security for decommissioning would be accomplished either through surety bonds payable to an applicable local agency or through irrevocable letters of credit payable to an applicable local agency.<sup>46</sup>

Section 9 of the *Site Permit Template* filed by Commission staff (**Appendix B**) requires that Marshall Solar prepare a *Decommissioning Plan* prior to operation of the Project.<sup>47</sup> The *Decommissioning Plan* will document Marshall Solar's plan for decommissioning of the Project and restoration of the site, the estimated cost of decommissioning, and a description of how Marshall Solar will ensure that the financial funds necessary to decommission the Project are available.

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<sup>45</sup> Application, at pp. 25-26

<sup>46</sup> Application, at p. 25

<sup>47</sup> Commission staff, Generic Site Permit Template, June 11, 2015, eDocket ID; [20156-111368-01](#) , also available in Appendix B of this document.

## 4 Alternative Sites

NextEra (Marshall Solar's parent company) submitted a total of four projects for consideration in Xcel Energy's RFP process. Only the Marshall Solar proposal at the proposed location was selected for further consideration by Xcel Energy. Although NextEra did consider using different equipment (specifically single-axis tracking for the solar arrays rather than the fixed rack system proposed) for the Project, NextEra did not consider alternative sites for the Project.<sup>48</sup>

Marshall Solar and similar solar generating projects are unique in several ways that potentially limit the consideration of alternative sites:

- Marshall Solar does not have the right of eminent domain and must reach agreement with a willing landowner;
- Photovoltaic installations require an amount of land that is relatively large compared to thermal energy generation;
- Marshall Solar has an agreement with Xcel Energy to interconnect to the grid at the Lyon County Substation.

Given the particular requirements of the Project, EERA staff tried to solicit information on potential alternative sites by providing guidance to commenters in the public notice:

"In proposing an alternative site, please bear in mind that Marshall Solar does not have the right of eminent domain, and that the landowner would need to be willing to sell or lease the site. In addition, alternative sites should be of similar size to the proposed site, relatively flat and open with unimpeded views of the sun."<sup>49</sup>

No landowners came forward during the scoping process to offer their land as an alternative site. Public comments identified a strong preference that the Project should be not located on land classified as prime farmland, but no specific alternative sites for the Project were proposed. Commenters did identify a variety of issues that they wanted to see examined in the EA. However, with the exception of the proposed site's location on prime farmland, commenters did not identify issues with the proposed site that could be mitigated with a different site.

In developing alternative routes or route segments to transmission lines, EERA staff often works with commenters to identify and map potential routes that avoid or minimize anticipated impacts to be evaluated in comparison to the proposed route in an environmental review document. With the Marshall Solar project, EERA staff did not believe it was appropriate to identify specific alternative sites for at least two reasons:

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<sup>48</sup> Application, at p. 9

<sup>49</sup> *Notice of Public Information/Scoping Meeting*, April 10, 2015, eDocket Document ID: [20154-109177-01](#), [20154-109177-02](#)

- Unlike transmission routes which would potentially limit the use a strip of property for the landowner, a solar facility would potentially remove more than acres from the existing land use for several decades. Without the identification of a willing landowner, showing such an area on a map could understandably alarm some landowners; and
- As Marshall Solar does not have the power of eminent domain, EERA staff did not believe that analysis of an alternative site where there is no indication of a willing landowner would assist the Commission in determining the best site for the proposed facility.

Given the difficulty in identifying alternative sites for evaluation this EA only addresses the human and environmental impacts associated with the location proposed in Marshall Solar's Site Permit Application.

EERA staff used ARC GIS software to assist in comparing the site proposed by Marshall Solar to surrounding areas. These comparison areas vary by resource and are discussed in Section 5,

## 5 Potential Impacts of the Proposed Project

This section provides an overview of the resources and potential impacts and mitigation measures associated with the Proposed Project. Specifically, this section discusses and analyzes:

- The human and environmental resources affected by the project,
- Potential impacts to human and environmental resources, and
- Opportunities to avoid, minimize, or mitigate potential impacts.

### 5.1 Consideration of Potential Impacts

A potential impact is the anticipated change to an existing condition caused either directly or indirectly by the construction and operation of a proposed project. Potential impacts can be positive or negative, short- or long-term, and, in certain circumstances, can accumulate incrementally. Impacts vary in duration and intensity, by resource, and across locations.

Direct impacts are caused by the proposed action and occur at the same time and place as the action. An indirect impact is caused by the proposed action, but is further removed in distance or occurs later in time. It must be reasonably foreseeable, which means a reasonable person would anticipate or predict the impact. Cumulative impacts are the result of the incremental effects of the project in combination with other past, present, and reasonably foreseeable future projects.

#### 5.1.1 Potential Impacts and Mitigation

Section 5 explains potential impacts from the Proposed Project on various resources. In addition, impacts are put into context using the following concepts:

**Duration.** Impacts vary over time. Short-term impacts are generally associated with project construction. Long-term impacts are associated with the operational life of the project and usually end with project decommissioning. Permanent impacts extend beyond the decommissioning stage of the project.

**Size.** Impacts vary by size. Size is a measure of how big something is. To the extent possible, potential impacts are described quantitatively, for example, the number of impacted acres or the percentage of affected individuals in a population.

**Intensity.** Impacts vary in intensity. Intensity is a measurement of the severity of an impact on a resource condition or function. To the extent possible, potential impacts are described quantitatively, for example, the percentage of affected individuals in a population.

**Location.** Impacts are location dependent. For example, noise impacts decrease as distance from the source increases, or common resources in one location might be uncommon in another.

**Uniqueness.** Resources are different. Common resources occur frequently, while uncommon resources are not ordinarily encountered.

In combination with the anticipated on-the-ground effect, context is used to determine an overall resource impact level, and can range from highly beneficial to highly harmful. Impact levels are described using a qualitative scale, which is explained below. These terms are not intended as value judgements, but rather as a means to both ensure a common understanding among readers and compare resource impacts between alternatives.

**Minimal.** Minimal impacts do not considerably alter an existing resource condition or function. Minimal impacts might, for some resources and at some locations, be noticeable to an average observer. These impacts generally affect common resources over the short-term.

**Moderate.** Moderate impacts alter an existing resource condition or function, and are generally noticeable or predictable to the average observer. Effects might be spread out over a large area making them difficult to observe, but can be estimated by modeling or some other means. Moderate impacts might be long-term or permanent to common resources, but generally short- to long-term to uncommon resources.

**Significant.** Significant impacts alter an existing resource condition or function to the extent that the resource is severely impaired or cannot function. Significant impacts are likely noticeable or predictable to the average observer. Effects might be spread out over a large area making them difficult to observe, but can be estimated by modeling. Significant impacts can be of any duration, and affect common or uncommon resources.

This section also discusses opportunities to avoid, reduce, or mitigate the level of impact. These actions are collectively referred to as mitigation.

**Avoid.** Avoiding an impact means it is eliminated altogether by moving or not undertaking parts or all of a project.

**Minimize.** Minimizing an impact means to limit its intensity by reducing project size or moving the project from a given location.

**Mitigate.** Impacts that cannot be avoided or further minimized might be mitigated. Mitigating an impact means fixing it by repairing, rehabilitating or restoring the affected environment, or compensating for it by replacing or providing a substitute resource elsewhere.

Some impacts are avoidable or can be minimized; some might be unavoidable but can be mitigated; others might be unavoidable and unable to be mitigated.

### 5.1.2 Potential Impacts and Regions of Influence

Potential impacts to human and environmental resources are analyzed in this EA within specific spatial bounds or regions of influence (ROI). The ROI for each resource is the geographic area within which a particular impact may exert some influence; it is useful as the basis for assessing the potential impacts to each resource as a result of the Project. Regions of influence vary with the resource being analyzed and the potential impact. The ROI for resources analyzed in this EA are summarized in **Table 5** and shown in **Figure 5**.

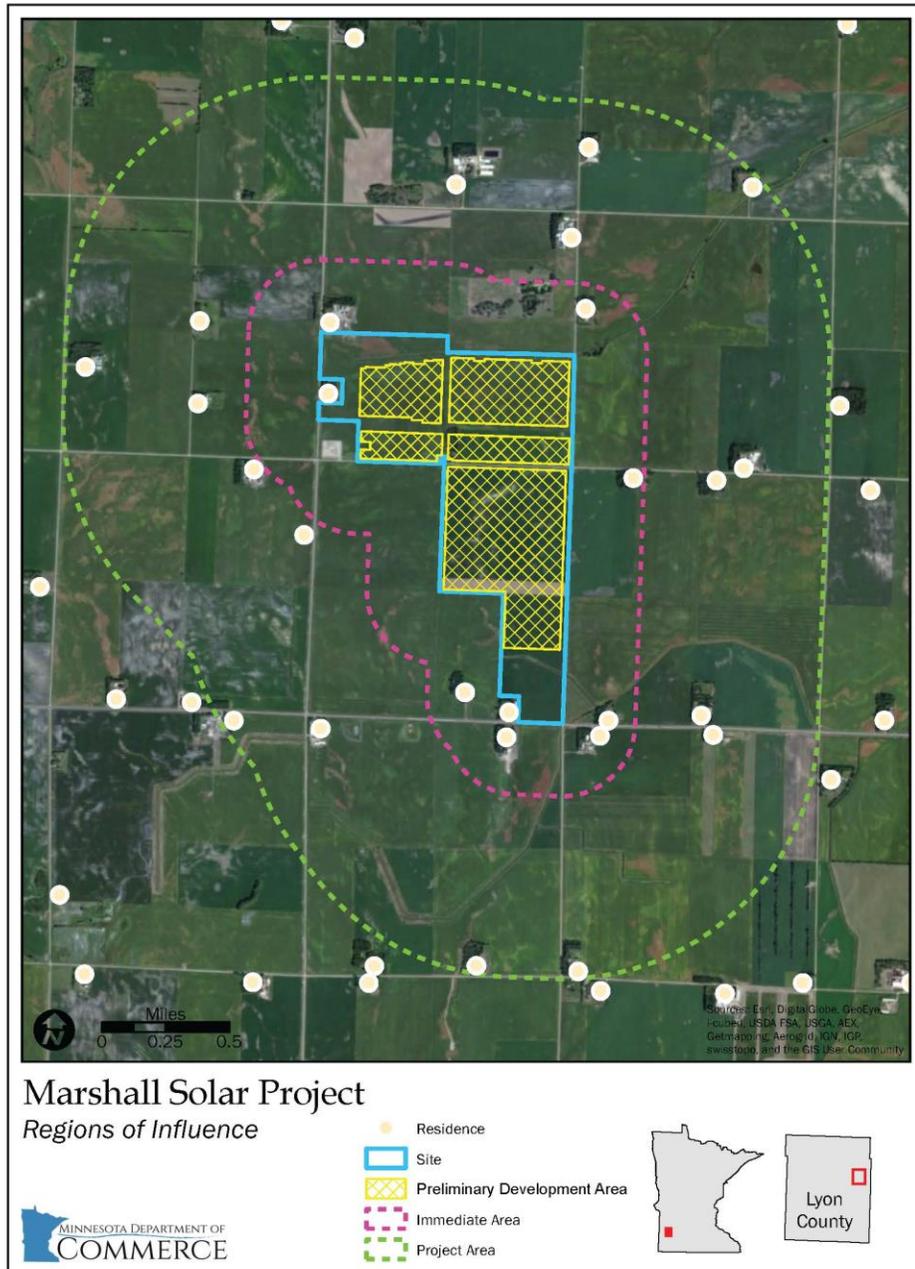
The ROI for most human and environmental resources is the permanent footprint of the Project. Resources within the footprint could be impacted by the construction and operation of the project. For example, soils could be compacted; trees could be removed. Other resources may be impacted at a greater distance from the project. In this EA, the following ROI will be used for these resources:

- **Site** (the land area for which Marshall Solar has site control). This EA analyzes the impacts of displacement, forestry, mining, topography, soils, and vegetation using the site as an ROI.
- **Immediate Area** (within 1500 feet of the site boundary). This ROI will be used for analyzing the potential aesthetic, noise, property value and electric and magnetic field impact. No impacts from these elements would be expected beyond this point.
- **Project Area** (one mile surrounding the project boundary). A distance of one mile from the Project is used as the ROI for analyzing potential impacts to surface water resources, wildlife, archaeological and historic resources, and rare and unique species. Direct impacts, if they occur, are anticipated to diminish relatively quickly such that the potential impacts outside the site would be minimal to moderate. However, indirect impacts may extend beyond the site. For example, indirect impacts to rare and unique species may extend beyond the Project footprint, particularly for wildlife species. Wildlife may move throughout the Project Area and may be impacted by limitations on their movement and their ability to access cover, food, and water.
- **Larger Area** (defined generally here as the county within which this Project occurs). Here, Lyon County will be used as the ROI for analyzing potential impacts to cultural values, socioeconomics, public utilities, airports, agriculture, air quality, and emergency services. These are resources for which impacts may extend throughout communities in the project area.

**Table 5: Regions of Influence for Human and Environmental Resources**

Type of Resource	Specific Resource/Potential Impact to Resource	Region of Influence (ROI)
Human Settlement	Displacement	Site
	Aesthetics, Noise, Property Values, Electronic Interference,	Immediate Area
	Socioeconomics, Cultural Values, Public Utilities, Airports, Emergency Services, Zoning and Land Use Compatibility	County
Public Health and Safety	Electric and Magnetic Fields	Immediate Area
Land-Based Economies	Forestry, Mining	Site
	Agriculture, Tourism and Recreation	Larger Area
Archaeological and Historic Resources	—	Project Area
Natural Environment	Topography, Soils, Vegetation	Site
	Air Quality, Wildlife, Water Resources	Project Area
Rare and Unique Species	---	Project Area

Figure 5: Regions of Influence



## 5.2 Description of Environmental Setting

The Project is located on a site of 515 acres located approximately four miles east of the city of Marshall in Stanley Township, Lyon County. The site is relatively flat and almost entirely covered by cultivated fields typically planted in corn and soybeans.

The Minnesota Department of Natural Resources and the U.S. Forest Service have jointly developed a system, the Ecological Classification System, for ecological mapping and landscape classification in Minnesota.<sup>50</sup> The site is located in the Minnesota River Prairie Subsection of the North Central Glaciated Plains Section of the Prairie Parkland Province. Prior to European settlement of the area, vegetation was primarily tallgrass prairie, with islands of wet prairie, and floodplain forests of silver maple, elm, cottonwood, and willow grew on along the Minnesota River and area streams. Although the Ecological Classification System is useful for understanding the distribution of native plant communities, vegetation in this subsection has changed substantially since European settlement and the landscape is now dominated by agriculture.

EERA staff used the National Land Cover Database (NLCD) to provide overview of vegetative cover at the site and in the surrounding area. The NLCD uses satellite imagery to display land cover across the United States. NLCD uses 16 classes of land cover. **Table 6** provides the NLCD definitions for the land cover classifications used in this document.<sup>51</sup>

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<sup>50</sup> Minnesota Department of Natural Resources, Ecological Classification System: Ecological Land Classification Hierarchy, <http://www.dnr.state.mn.us/ecs/index.html>

<sup>51</sup> United States Geological Service. *The National Map: Land Cover*. <http://nationalmap.gov/landcover.html> and National Land Cover Database 2011: Product Legend [http://www.mrlc.gov/nlcd11\\_leg.php](http://www.mrlc.gov/nlcd11_leg.php)

**Table 6: Land Cover Definitions**

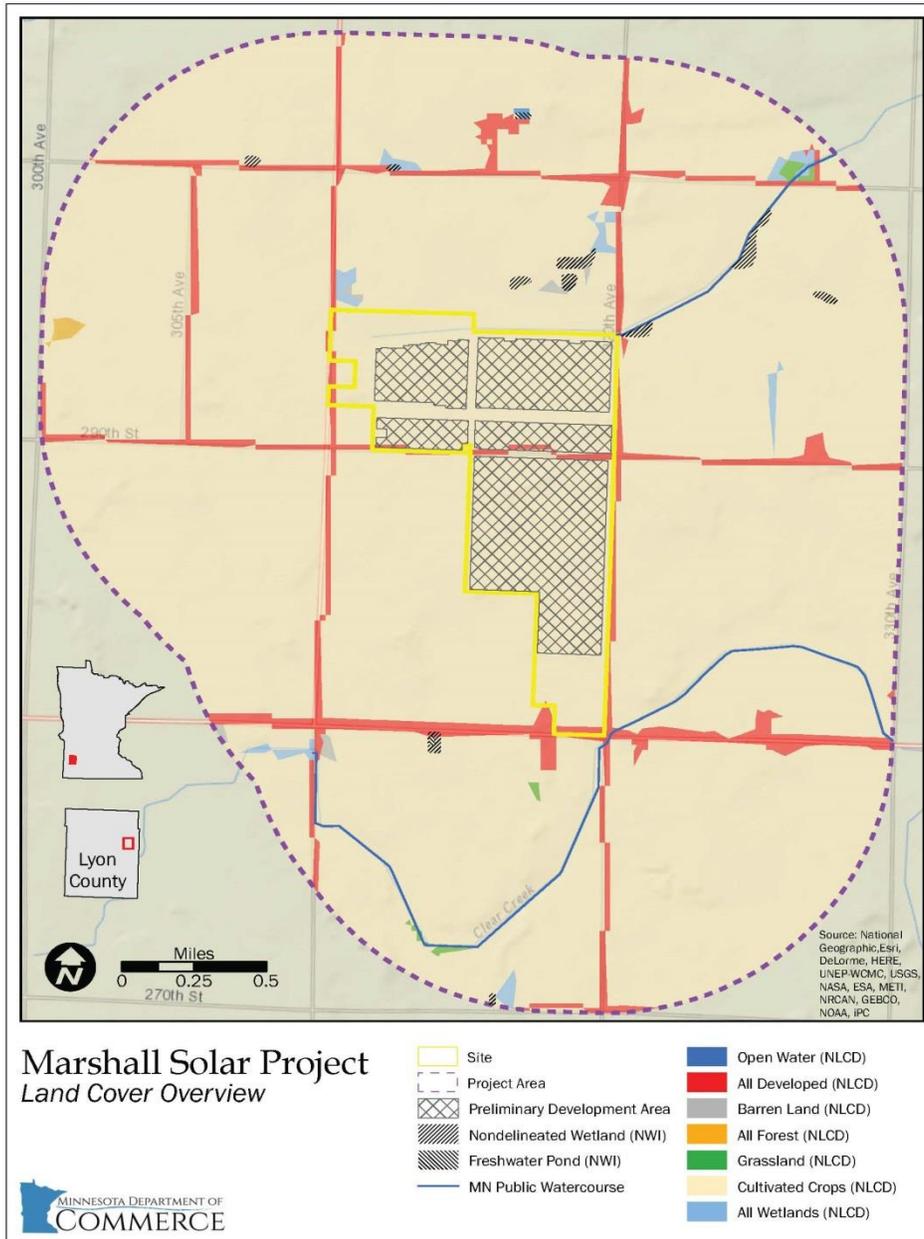
Classification	Definition
Open Water	All areas of open water, generally with less than 25% cover or vegetation or soil
Developed, Open Space	Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
Developed, Low Intensity	Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49 percent of total cover. These areas most commonly include single-family housing units.
Developed, Medium Intensity	Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79 percent of the total cover. These areas most commonly include single-family housing units.
Developed, High Intensity	Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover.
Barren Land (Rock/Sand/Clay)	Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.
Deciduous Forest	Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.
Evergreen Forest	Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.
Mixed Forest	Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover.
Shrub/Scrub	Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.
Grassland/Herbaceous	Areas dominated by grammanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.
Pasture/Hay	Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.
Cultivated Crops	Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.
Woody Wetlands	Areas where forest or shrub land vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
Emergent Herbaceous Wetlands	Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

As shown in **Figure 6** and **Table 7**, land cover at the site is dominated by cultivated cropland (approximately 97 percent), similar to the Project Area. Land Cover for Lyon County is shown in **Appendix D**.

**Table 7: Land Cover**

NLCD Classification	Site		Project Area		Lyon County	
	Acres	Percent	Acres	Percent	Acres	Percent
Open Water	0	0.0	1.1	0.0	7511.8	1.6
Developed, Open Space	16.5	3.2	238.5	4.4	23,653.8	5.1
Developed, Low Intensity	0.1	0.0	25.3	0.5	4,956.5	1.1
Developed, Medium Intensity	0.0	0.0	5.3	0.1	2,012.7	0.4
Developed, High Intensity	0.0	0.0	0.0	0.0	472.6	0.1
Barren Land	0.0	0.0	7.2	0.1	688.5	0.2
Deciduous Forest	0.0	0.0	4.3	0.1	3,774.3	0.8
Evergreen Forest	0.0	0.0	0.0	0.0	1.0	0.0
Mixed Forest	0.0	0.0	0.0	0.0	6.1	0.0
Shrub/Scrub	0.0	0.0	0.0	0.0	4.4	0.0
Grassland Herbaceous	0.0	0.0	7.1	0.1	17,316.3	3.8
Pasture/Hay	0.0	0.0	0.0	0.0	19,744.3	4.3
Cultivated Crops	497.6	96.8	5,113.4	94.1	366,969.0	79.4
Woody Wetlands	0.0	0.00	0.0	0.0	1029.7	0.2
Emergent Herbaceous Wetlands	0.0	0.00	29.3	0.5	13,943.1	3.0
<b>Total</b>	<b>514.2</b>	<b>100.0</b>	<b>5,431.5</b>	<b>100.0</b>	<b>462,084.1</b>	<b>100.0</b>

Figure 6: Land Cover



### 5.3 Effects on Human Settlement

Construction and operation of new generation facilities have the potential to impact human settlement. These impacts may be short-term, such as an influx of construction jobs, traffic impacts during the construction phase due to increased traffic or oversized loads or construction noise that is noticeable at neighboring residences or recreation facilities. Once constructed there may also be long-term impacts such as changes in land use, displacement of homes or businesses or an increase in the local tax base.

#### 5.3.1 Socioeconomic

The Project is located in a rural area of Lyon County, approximately four miles east of Marshall, in Stanley Township.

**Table 8: Population Characteristics<sup>52</sup>**

Jurisdiction	Population		Percentage		Median Household Income
	2010 Census	2013 Estimate	White Alone <sup>53</sup>	Individuals Below Poverty	
Minnesota	5,303,925	5,457,173	81.9	11.5	\$59,836
Lyon County	25,857	25,665	92.7	14.4	\$49,594
Stanley Township	264	255	96.9	10.6	\$73,750
City of Marshall	13,680	13,483	86.8	19.6	\$44,409

The Project is not located in an area of disproportionately high minority populations or low-income populations.

#### *Potential Impacts*

Socioeconomic impacts resulting from the project will be primarily positive with an influx of wages and expenditures made at local businesses during the construction of the project, increased tax revenue and increased opportunities for business development.

There will be a short-term influx of contractor employees during construction of the various aspects of the project. Marshall Solar anticipates that a monthly average of 225 workers, with a peak workforce of approximately 275, will be employed during the construction phase of the Project.<sup>54</sup>

<sup>52</sup> U.S. Census, <http://quickfacts.census.gov/qfd/states/27000.html>;

<sup>53</sup> Percent White Alone is self-reported by Census Responders and does not include those identifying themselves as Hispanic or Latino.

<sup>54</sup> Application, at p. 39.

Lyon County is expected to experience short-term positive economic impacts during the construction phase of the Project through the use of the hotels, restaurants and other consumer goods and services by the various workers, as well as purchase of some materials such as fuel, concrete and gravel from local vendors. It is anticipated that most of this economic impact would be in the Marshall area. Marshall Solar anticipates that approximately \$500,000 in sales and use taxes would accrue to the state of Minnesota during construction of the Project.<sup>55</sup>

Once operational, Marshall Solar anticipates that two to three permanent full-time equivalent positions will be required to operate and maintain the Project.<sup>56</sup>

In accordance with state and county law, Marshall Solar will pay property tax and production taxes on the land and energy production to local governments. Property taxes are calculated on the land underlying the facility; the value of the equipment at the facility is not included in the calculation. If the real property is used primarily for solar energy production s, the real property is classified as class 3a (commercial/industrial) for tax purposes.<sup>57</sup> In lieu of the personal property tax on the generation equipment, Minnesota has adopted a production tax of \$1.20 per megawatt-hour (MWh) paid to the local governments where the facility is located; 80 percent to the county and 20 percent to the city or township<sup>58</sup>. Based on Marshall Solar's estimated annual electricity production of approximately 100,000 to 130,000 MWh the Project would produce approximately \$120,000 to \$156,000 annually.<sup>59</sup>

The site is currently farmed. Based on the most recent preliminary layout, Marshall Solar anticipates that up to 364 acres being removed from agricultural production for at least the anticipated 25- year minimum useful life of the Project. Impacts to agriculture and on prime farmland are discussed further in Section 5.4.1, but the change in land use would result in a small annual loss of overall crop production in Lyon County (approximately 0.1 percent of the approximately 386,713 acres of agricultural land in the county) and in in the state generally. Marshall Solar will compensate landowners for the land used for the facilities, through purchase of the land.<sup>60</sup>

If a PV facility is abandoned or is not decommissioned properly at the end of its useful life, the responsibility for proper disposal of the project components and restoration may fall on the landowner.

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<sup>55</sup> Ibid.

<sup>56</sup> Application, at p. 39

<sup>57</sup> Minnesota Statutes, Section 272.02, subdivision 24,

<sup>58</sup> Minnesota Statutes, Section 272.0295

<sup>59</sup> Appendix C, response to Question 17 dated September 23, 2015

<sup>60</sup> Application, at p. 2

### *Mitigative Measures*

Socioeconomic impacts resulting from construction of the Project would be primarily positive with an influx of wages and expenditures made at local businesses during the construction.

Marshall Solar will compensate the landowners for loss of use of the site through lease payments or purchase of the land.

Section 9 of the *Generic Site Permit Template* (Appendix B) addresses decommissioning and site restoration, specifically:

- Section 9.1 would require Marshall Solar to file a *Decommissioning Plan* with the Commission prior to operation.
- Section 9.2 would establish Marshall Solar as the responsible party for carrying out decommissioning task and sets out minimum standards for restoration, and
- Section 9.3 addresses abandoned solar installations.

### **5.3.2 Land Use and Zoning**

Zoning is a regulatory tool used by local governments (counties, cities and some townships) to geographically restrict or promote certain types of land uses. Minnesota statutes provide local governments with zoning authority to promote the public health and general welfare.

The Marshall Solar Project is subject to permitting under Minnesota's Power Plant Siting Act. With respect to the role of state permitting of large energy facilities, Minnesota Statute 216E.10, subdivision 1 states:

*To assure the paramount and controlling effect of the provisions herein over other state agencies, regional, county, and local governments, and special purpose government districts, the issuance of a site permit or route permit and subsequent purchase and use of such site or route locations for large electric power generating plant and high-voltage transmission line purposes shall be the sole site or route approval required to be obtained by the utility. Such permit shall supersede and preempt all zoning, building, or land use rules, regulations, or ordinances promulgated by regional, county, local and special purpose government.*

Although Marshall Solar is not required to seek permits or variances from local government to comply with local zoning, inconsistency with local zoning has the potential to impact current and planned human settlement. The Commission considers impacts to human settlement as a factor in its siting decision.

The site is located in an area zoned as Agricultural by Lyon County. The site is not located in an area designated for orderly annexation or planned growth in the Lyon County Comprehensive Plan.

The Project is considered a Large Solar Energy System under Article 21 of the Lyon County Zoning Code.<sup>61</sup> Under Section 21.6 of the zoning code, Large Solar Energy Systems in areas zoned as Agricultural require a conditional use permit. The Lyon County Zoning Code requires the PV panels or racking for Large Solar Energy Systems to be set back 25 feet from road rights of way and neighboring property lines and 200 feet from public conservation lands and dwellings that are not owned by the project owner.

The Lyon County Zoning Code also requires that structures be set back at least 120 feet from the center line drainage ditches in agriculture areas and 100 feet from the ordinary high water level of “Tributary Streams,” such as the streams adjacent to the site.<sup>62</sup>

### ***Potential Impacts***

The Project is not anticipated to have an impact on growth patterns in the greater Marshall area and is not located in an area where extension of water, sewer, or other urban services is planned.

The proposed layout of the Project is consistent with setbacks identified for Large Solar Energy Systems in the *Lyon County Zoning Ordinance*.

The development of the Project would change the land use from a generally agricultural use to an industrial use for at least 25 years. After its useful life, the site could be restored for use as agricultural or other planned land uses with implementation of appropriate mitigation and restoration measures.

### ***Mitigative Measures***

Marshall Solar has stated its commitment to siting the Project consistent with *Lyon County Zoning Ordinance* regarding structure setbacks.<sup>63</sup>

A landscaping plan, described in Section 5.2.7, can be used to minimize visual impacts to adjacent land uses.

Section 4.2.9 of the *Site Permit Template* requires that Project structures be sited in compliance with shoreland ordinances as adopted and implemented by local governments unless there is no feasible and prudent alternative.

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<sup>61</sup> Lyon County, *Lyon County Zoning Code*. April 2015.

<http://www.lyonco.org/attachments/article/170/LyonCountyPZOrdinancev2015.pdf> see Article 21

<sup>62</sup> *Ibid.*, Section 8.5, subpart D, and Section 17.1, subpart B(1). See also Appendix C, Question 19, response dated September 23, 2015.

<sup>63</sup> Appendix C, response to Question 19 dated September 23, 2015.

### **5.3.3 Property Values**

Property values are influenced by a complex interaction of factors specific to individual parcels. These factors can include, but are not limited to, condition, improvements, acreage, or neighborhood characteristics, as well as proximity to schools, parks, and other amenities. In addition, local and national market conditions often influence property values. The presence of a utility-scale PV facility would become one of many interacting factors that could affect a property's value.

Electrical generating facilities have the potential to impact property values. Often, negative effects from these facilities are the result of impacts that extend beyond the immediate footprint. Examples include noise, emissions and visual impacts. Unlike fossil-fueled electric generating facilities, a PV facility is expected to have no emissions and no noise impacts to adjacent land uses during operation of the facility. The installation of PV facilities would create a visual impact, but lacking the height of smokestacks of wind turbines, the visual impact at ground level, or within a neighboring building, would be limited.

A review of the literature did not identify research specifically aimed at quantifying impacts to property values based solely on proximity to utility-scale PV facilities. As no comparably sized PV facilities exist in the Project Area or in Minnesota, comparable sales data do not exist. As the industry continues to develop comparable data should become available.

For these reasons, the impact to the value of one particular property based solely on its proximity to a utility-scale PV facility is difficult to determine. Widespread negative impacts to property values are not anticipated. In unique situations it is possible that individual property values might be negatively impacted.

#### ***Mitigative Measures***

Landscaping plans, described in Section 5.3.7, can be used to minimize visual impacts to adjacent land uses.

### **5.3.4 Public Services and Transportation**

Public services in the form of fire, law enforcement and emergency services are provided by the counties, municipalities and townships where the Project is located.

The existing public road system that services and provides access to the proposed project is generally located along section lines and is managed by state and local government units.

No railroads or airports are located on the site. The nearest airport, the Southwest Minnesota Regional Airport or Marshall/Ryan Field, is located approximately seven miles west of the site.<sup>64</sup>

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<sup>64</sup> Application, at p. 27

Telephone and electric services are delivered by electric utilities, and distribution and transmission lines are typically located along public roads. Xcel Energy's Lyon County Substation and Otter Tail Power's substation are located adjacent to the site. Communication services are provided through CenturyLink. No natural gas or petroleum pipelines cross the site.

The site does not have access to municipal water or sewer. Water service to nearby residences is provided through a private well or through Lincoln-Pipestone Rural Water and sanitary services are provided through private septic systems.

Fire, police, and emergency services are provided by Lyon County.

### ***Potential Impacts***

Construction activities may inadvertently disrupt utilities. Underground utilities are particularly vulnerable to disruption, as construction personnel may not be aware of their existence.

Marshall Solar does not plan to install any wells or septic systems for the Project. There is a well located at the homestead located to the east of the Otter Tail Power substation. After the home is removed, Marshall Solar will leave the well and pump in place to support any water requirements during construction. Following construction the well may be left in-service to support any water needs during the operations phase of the Project, or may be filled, capped and abandoned.<sup>65</sup>

No impact to electrical service is anticipated from the interconnection of the Project to Xcel Energy's Lyon County Substation.

No impacts to rail or air traffic are anticipated.

As PV facilities continue to be sited at and near airports, questions of their potential impacts on communications have been raised. A recent review of literature on electromagnetic interferences near airfields concluded that the PV facilities are unlikely to cause interference to most airfield electronic systems.<sup>66</sup>

Access to the Project will be from the public road network. Other than the establishment of various access points to the Project from the existing road system, no upgrades or changes to existing roadway systems are necessary for construction or operation of the Project.<sup>67</sup>

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<sup>65</sup> Appendix C, response to Question 6 dated September 2, 2015

<sup>66</sup> NAVFAC Engineering and Expeditionary Warfare Center. *Renewable Energy, Photovoltaic Systems Near Airfields: Electromagnetic Interference*. <http://www.nrel.gov/docs/fy15osti/63310.pdf>

<sup>67</sup> Application, at p. 43

Construction materials and personnel will be delivered to the site by existing roadways. Light-duty trucks would travel to the site daily during the course of construction. No impacts to roads would be expected during the operation of the facilities, as minimal traffic would occur during regular maintenance. During the construction phase of the Project, it is possible that congestion or local roadways may occur during peak construction period. Although only the main transformer is expected to require heavy haul permits, existing roadways could potentially be damaged during construction from the large volume of equipment deliveries.<sup>68</sup>

### *Mitigative Measures*

As part of the facility design process Marshall Solar will identify the locations of underground utilities and avoid impacts to underground utilities in final facility design. Prior to construction, utility locations will be marked on site plans and on the ground to avoid impacts from construction activities.

Marshall Solar will seek appropriate state and local permits for wells or septic system removal or abandonment.

New drives or access roads would require approval by appropriate local or state highway departments. Marshall Solar will coordinate with local road authorities to obtain a utility crossing permit for construction of the electrical collection system across 290<sup>th</sup> Street.

Prior to construction, Marshall Solar will document existing road conditions by photographs or video. Following construction, Marshall Solar would repair any damaged roads to pre-construction conditions.<sup>69</sup>

Section 4.2.15 of the *Site Permit Template* would require Marshall Solar to locate perimeter fencing and vegetative screening in a manner that does not interfere with routine road maintenance activities. The permit would also require Marshall Solar to coordinate with road authorities regarding use of roads during construction of the Project.

### **5.3.5 Displacement**

Because of the land requirements, solar facilities are generally sited away homes or business. In some cases, however, construction of solar facilities may require displacement of existing homes or businesses to allow for the efficient use of land.

### *Potential Impacts*

After reaching a purchase option with the landowner of the parcel located east of the Otter Tail Power substation, Marshall Solar has revised the preliminary layout to incorporate the

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<sup>68</sup> Application, at pp. 21, 43-44

<sup>69</sup> Application, at p. 43

additional parcel. The most recent site configuration for the Project anticipates removing the home and associated outbuildings located in the additional parcel.<sup>70</sup>

### *Mitigative Measures*

As the removal of the home is part of a voluntary agreement between Marshall Solar and the landowner, no additional measures are identified to mitigate the displacement.

### **5.3.6 Noise**

Noise, typically defined as a loud or unpleasant sound, is measured in units of decibels (dB) on a logarithmic scale. The A weighted decibel (dBA) scale corresponds to the sensitivity range for human hearing. For example, a noise level change of 3 dBA is barely perceptible to average human hearing while a 5 dBA change in noise level is noticeable. For the Project, noise would primarily be experienced during the construction phase of the Project and to a lesser extent during the operations phase from the inverters and transformers.

Recognizing that some level of noise is the necessary result of human activity, and that sensitivity to noise can reasonably differ depending upon the activity and site, the Minnesota Pollution Control Agency (MPCA) has established noise limits. Land use activities associated with residential, commercial and industrial land are grouped together into Noise Area Classifications (NAC). Residences, which are typically considered sensitive to noise, are classified as NAC 1. Each NAC is assigned both daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) noise limits for land use activities within the NAC. Table 9 shows the Minnesota Pollution Control Agency (MPCA) daytime and nighttime limits in dBA for each NAC. The limits are expressed as a range of permissible dBA within a one-hour period; L<sub>50</sub> is the dBA that may be exceeded 50 percent of the time within an hour, while L<sub>10</sub> is the dBA that may be exceeded 10 percent of the time within one hour.

Typical noise sensitive receptors include residences, churches, and schools. Current average noise levels in these areas are typically in the 30 to 40 dBA range and are considered acceptable for residential land use activities. Ambient noise in rural areas is commonly made up of farm equipment, wind, rustling vegetation and infrequent vehicles travelling along area roads. Higher ambient noise levels, typically 50 to 60 dBA, would be expected near roadways, urban areas and commercial and industrial properties in the project area.

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<sup>70</sup> Update of Marshall Solar, LLC, July 24, 2015 (herein after, *Marshall Solar Project Update*), eDocket Document ID: [20157-112718-01](#)

**Table 9: MPCA Daytime and Nighttime Noise Limits**

Noise Area Classification	Daytime		Nighttime	
	L <sub>50</sub>	L <sub>10</sub>	L <sub>50</sub>	L <sub>10</sub>
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

***Potential Impacts***

Noise concerns for the Project are related primarily to the construction phase as the result of heavy equipment operation and increased vehicle traffic associated with the transport of construction personnel to and from the work area. Marshall Solar anticipates that construction activities will occur between the hours of 6 a.m. and 7 p.m. on Monday through Saturday.<sup>71</sup> The MPCA nighttime noise limits would apply to the first hour of construction activities.

During operation of the Project, the primary source of noise will be from the inverters, transformers, and the Project Substation. Noise levels would be constant throughout the day and, as would be expected from a solar facility, lower during non-daylight hours.<sup>72</sup> All routine maintenance would be scheduled to be performed during daytime hours.<sup>73</sup>

Marshall Solar proposed to use GE 1500 V 4 MVA solar inverters and 4 MVA transformers. At full load, the combined noise level for the inverter and transformer would be 62 dBA at three feet.<sup>74</sup>

Based on the preliminary site layout (**Figure 2**), the closest home to the solar arrays would be approximately 1,054 feet from a PCS/Transformer unit. Assuming no sound mitigation from obstructions or terrain, the combined noise level from a single inverter and transformer unit at the nearest home would be approximately 11 dBA.<sup>75</sup>

Noise from the electric collection system and gen-tie lines is not expected to be perceptible.

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<sup>71</sup> Application, at p. 33

<sup>72</sup> Application, at p. 34

<sup>73</sup> Appendix C, response to Question 21 dated September 25, 2015.

<sup>74</sup> Application, at p. 34

<sup>75</sup> Project Update, July 24, 2015

### *Mitigative Measures*

Section 4.2.5 of the Site Permit Template would require Marshall solar to limit construction and routine maintenance activities to daytime working hours as defined in Minnesota Rule 7030.0200.

No mitigation measures are proposed for the operational phase of the project as operational noise levels are not predicted to exceed the state noise limits.

### **5.3.7 Aesthetics**

Aesthetics refer to the natural and built landscape that contribute to the public's experience and appreciation of their environment. Features, such as wetlands, surface waters, landforms, forests and vegetation patterns are among the natural landscape features that define an area's visual character. Buildings, roads, bridges and other structures represent the built environment imposed upon the natural landscape. The scenic value or visual importance of an area is a subjective matter and depends upon the perception and philosophical or psychological response of the viewer. The level of impact to visual resources is also subjective and generally depends on the sensitivity and exposure of a particular viewer. The perceived impact can vary greatly from one individual to the next.

The Project area is primarily cultivated agriculture with scattered rural residences. The terrain is generally flat with slight undulations with elevations of between 1,090 and 1,120 feet above mean sea level.

There are several existing pieces of electrical infrastructure that dominate the built environment in the Project Area:

- Xcel Energy's Lyon County Substation, located immediately west of the site at the northeast corner of the intersection of County Highway 9 and 290<sup>th</sup> Street,
- Otter Tail Power's Substation, located approximately one-half mile east of the Lyon County Substation,
- A 345 kV transmission line paralleling 290<sup>th</sup> street east of the Lyon County Substation,
- Two 115 kV transmission lines: One paralleling 290<sup>th</sup> Street in the western half of Section 28, and another running north and south along County Highway 9;
- Two 69 kV transmission lines running north and south in the center of the site and east to west along 290<sup>th</sup> Street in the western half of Section 28.

### *Potential Impacts*

Installation of the proposed solar facilities will result in visible landscape changes as land that is now primarily covered in corn and soybeans is converted to a solar facility. Marshall Solar anticipates a limited amount of tree-clearing for the Project; most of the clearing will occur on the parcel to the east of the Otter Tail Power substation. Based on preliminary

facility design up to 364 acres will be converted from its current use for at least 25 years, the minimum estimated useful life of a PV facility.

Solar arrays will comprise the largest visual change to the landscape. Arrays will be south-facing with a height of approximately 8 to 12 feet above ground and PCS units will be approximately 8 to 10 feet high. The arrays will be enclosed within an 8-foot chain-link fence; current project design does not contemplate the use of barbed wire on top of the fence.

In addition to the PV arrays, the Project will add a new substation of approximately 2 acres and 115 kV gen-tie line structures connecting the Project Substation and the Lyon County Substation. Gen-tie structures will be approximately 60 to 100 feet tall. Marshall Solar anticipates that collector lines between the PCS units and Project Substation will be buried

Because of their relatively low profile, the PV panels will not be visible from a great distance. Marshall Solar commissioned visual simulations of the Project from various key observation points.<sup>76</sup> Based on the results of the simulations, Marshall Solar anticipates that visibility of Project components would be limited beyond one-quarter mile.<sup>77</sup>

Aesthetic impacts will be experienced primarily by nearby residents and people using the roads adjacent the Project. As shown in **Figure 5**, there are currently 10 homes located within the Project's immediate area (1500 feet of the site boundary). As discussed in Section 5.3.5, the single home within the site will be removed, so following construction of the Project, 9 homes will be located within the immediate area. The nearest home is located approximately 650 feet from an array.

Existing solar facilities near Oronoco Minnesota and Lambton County, Ontario are shown in **Figures 7 and 8**.

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<sup>76</sup> Application, at Appendix B

<sup>77</sup> Application, at p. 36

**Figure 7: 517 kV Solar Facility - Oronoco MN<sup>78</sup>**



**Figure 8: 80 Acre Solar Farm, Lambton County Ontario<sup>79</sup>**



Marshall Solar anticipates that construction activities will occur during daylight hours. In situations where activities such as testing or commissioning need to be performed outside

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<sup>78</sup> Aurora Distributed Solar

<sup>79</sup> Aurora Distributed Solar

of daylight, temporary lighting for these activities will be provided by portable generator-powered light towers, vehicle headlights or portable shop lighting.<sup>80</sup> After construction permanent motion-activated or timer-based lighting will be installed near the O&M building, the main gate, and the Project Substation. During operation, lighting for the Project will be kept to the level required for safety and security and shielded and directed to focus on safety and security requirements and minimize off-site lighting.<sup>81</sup>

Unlike concentrating solar, which uses mirrors to concentrate the solar energy to create heat energy used to create electricity, PV panels are constructed of dark, light-absorbing material and covered with an anti-reflective coating in order to limit reflection. Because of the materials used, glare and reflection are expected to be minimal.

EERA staff utilized the Sandia National Laboratories *Solar Glare Hazard Analysis Tool* to assess potential glare from the PV panels.<sup>82</sup> Although this tool does have many limitations, it is helpful in providing a very high-level initial overview of the potential for visual impacts that may be experienced. The model provides a worst case scenario as it does not take into account on-the-ground obstacles (e.g. trees, hills, or buildings) which might reduce or eliminate glare. As shown on the satellite imagery, many of the homes in the immediate area of the Project have small woodlots surrounding the residences and providing a buffer between the residence and adjacent roadways and land uses. Nevertheless, the model is helpful in identifying when and where nearby observers may experience glare. The results of the model are presented in **Appendix E**, but can be summarized as follows:

- For homes and other observation points to the east of the Project, the potential for glare from the Project would be greatest for a period of approximately 30 minutes in the early evening hours between April and November;
- For homes and other observation points to the west of the Project, there is a potential for glare for a period of approximately 15 to 30 minutes at around 7 a.m., generally between April and October;
- Observers passing through the center of the Project, along 290<sup>th</sup> Street may experience some amount of glare during the early morning and early evening hours, primarily during the summer months; and
- Homes and other observation points to the north and south of the project can be little, if any, glare.

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<sup>80</sup> Appendix C, response to Question 22 dated September 25, 2015

<sup>81</sup> Application, at p. 36

<sup>82</sup> Sandia National Laboratories, *Solar Glare Analysis Hazard Tool*. The full technical reference manual and user's manual are available at: <https://share.sandia.gov/phlux/references/>

### *Mitigative Measures*

The primary strategy for minimizing aesthetic impacts is choosing sites where solar facilities are in keeping with the existing landscape, not immediately adjacent to homes or shielded from view by terrain or existing vegetation.

Landscaping plans can be developed to identify site-specific landscaping techniques including vegetation screening, berms or fencing to minimize visual impacts to adjacent land uses.

Section 4.2.6 of the *Site Permit Template* would require Marshall Solar to consider input from landowners about visual impacts prior to final site design.

### **5.3.8 Public Health and Safety Including EMF**

Safety issues at PV facilities are largely associated with construction. Safety concerns associated with the operation of a PV facility are limited.

### *Potential Impacts*

The manufacturing process for PV panels does involve the use of hazardous chemicals and proper disposal of the PV panels at the end of the Project is necessary to ensure that leaching of the materials, in particular lead used in the soldering of individual cells onto a module<sup>83</sup>.

Unauthorized access to PV facilities, both during construction and operation phases, could result in safety issues. As with any large construction project, there is a potential for construction accidents including falls, vehicle accidents, electrical accidents, and power tool accidents. Unlike wind turbine installations, construction activity occurs close to ground level and special emergency procedures for rescue in tall and confined spaces are not necessary.

As with any construction project, there is the potential that construction activities may disturb environmental hazards (e.g. old dumps, contaminated soils) that exist at the site. At Marshall Solar's direction, two Phase I Environmental Site Assessments were prepared for the Project to identify any existing hazardous material contamination. No environmental hazards identified as Recognized Environmental Conditions (as per ASTM Practice E 1527-13) were identified at the site.<sup>84</sup>

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<sup>83</sup> Oregon Department of Transportation, *Health and Safety Concerns of Photovoltaic Panels*, <http://www.oregon.gov/ODOT/HWY/OIPP/docs/life-cyclehealthandsafetyconcerns.pdf>

<sup>84</sup> Appendix C, response to Question 7 dated September 2, 2015

Compared to other solar technologies such as Concentrating Solar Power, PV installations such as those proposed for use in the Project are unlikely to create hazards to aircraft.<sup>85</sup>

The Southwest Minnesota Regional Airport (also known as Marshall/Ryan Field) is located approximately seven miles west of the site. Marshall Solar used the Federal Aviation Administration's (FAA) Notice Criteria screening tool to determine if further aeronautical study or FAA filing is needed. After incorporating information on the land elevation and the tallest possible structure height (up to 100 feet for the gen-tie structures), the Project did not exceed the Notice Criteria and further review from FAA is not required.

### **Electric and Magnetic Fields**

Voltage transmitted through any conductor produces both an electric field and a magnetic field in the area surrounding the wire. The electric field associated with electric transmission lines extends from the energized conductors to other nearby objects. The magnetic field associated with electric transmission lines surrounds the conductor. Together, these fields are generally referred to as electromagnetic fields, or EMF. These effects decrease rapidly as the distance from the conductor increases.

The Project will incorporate both 34.5 kV collector lines, and a short 115 kV gen-tie line connecting the Project Substation with electrical grid at the Lyon County Substation.

Voltage on any wire (conductor) produces an electric field in the area surrounding the wire. The electric field associated with a transmission line extends from the energized conductors to other nearby objects such as the ground, towers, vegetation, buildings and vehicles. The electric field from a transmission line gets weaker as one moves away from the transmission line. Nearby trees and building material also greatly reduce the strength of transmission line electric fields.

The intensity of electric fields is associated with the voltage of the transmission line and is measured in kilovolts per meter (kV/M). Transmission line electric fields near ground are designated by the difference in voltage between two points (usually 1 meter). Maximum conductor voltage is defined as the nominal voltage plus five percent. In low-voltage distribution lines of the type anticipated in this project, the maximum operating voltage would be 36 kV for a 34.5 kV line. Underground construction does provide a shield from electric fields. Based on material from other dockets before the Commission, electric fields would be very low, perhaps 0.15 kV/M near the centerline, rapidly disappearing to zero for overhead lines and zero for any portion of the line constructed underground.<sup>86</sup>

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<sup>85</sup> DOE & BLM. Solar Energy Development Environmental Considerations.  
<http://solareis.anl.gov/guide/solar/pv/index.cfm>

<sup>86</sup> Department of Commerce, *Environmental Report: Hollydale 115 kV Transmission Project*. February 2013, eDocket ID: [20132-83588-01](https://www.puc.state.tx.us/records/20132-83588-01)

Marshall Solar has modeled the electric field at and near the 115 kV gen-tie line based on the maximum operating voltage (nominal operating voltage plus 5 percent) as noted in **Table 10** below.

**Table 10: Calculated Electric Fields (kV/m) at One Meter above Ground<sup>87</sup>**

Electric Field Strength										
Structure Type	Maximum Operating Voltage (kV)	Distance to Centerline								
		-300'	-200'	-100'	-50'	0'	50'	100'	200'	300'
H-Frame 115 kV	121	0.003	0.011	0.076	0.453	0.698	0.453	0.076	0.011	0.003

There is no federal standard for transmission line electric fields. The Commission, however, has historically imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground. The standard was designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kV or greater.

Current passing through any conductor, including a wire, produces a magnetic field in the area around the wire. The magnetic field associated with a transmission line surrounds the conductor and decreases rapidly with increasing distance from the conductor. The magnetic field is expressed in units of magnetic flux density, expressed as milligauss (mG) and is dependent upon the current flowing through the conductor. In other proceedings before the Commission magnetic fields were estimated at up to 18.8 mG for 13.8 and 34.5 kV distribution line under typical operating conditions (171 Amps).<sup>88</sup>

Marshall Solar has modeled the magnetic flux density at and near the 115 kV gen-tie line based on the maximum operating voltage (nominal operating voltage plus 5 percent) as noted in **Table 11** below.

<sup>87</sup> Appendix C, response to Question 23, dated September 25, 2015.

<sup>88</sup> Ibid, at p. 60

**Table 11: Calculated Magnetic Flux Density (Milligauss)  
at One Meter above Ground<sup>89</sup>**

Magnetic Flux Density										
Structure Type	Average Current (amps)	Distance to Centerline								
		-300'	-200'	-100'	-50'	0'	50'	100'	200'	300'
H-Frame 115 kV	72.7	0.1	0.3	1.0	3.6	17.3	3.6	1.0	0.3	0.1

***Mitigative Measures***

Section 9 of the *Site Permit Template* requires that Marshall Solar prepare a *Decommissioning Plan*.

Section 4.2.22 of the *Site Permit Template* requires Marshall Solar to provide educational materials about any restrictions or dangers associated with the Project to adjacent landowners and interested persons. This section of the *Site Permit Template* also requires the permittee to provide necessary safety measures to restrict public access and to submit the location of underground facilities to Gopher State One Call following completion of construction.

Construction will comply with local, state, and federal regulations regarding installation of the facilities and standard construction practices. Established industry safety procedures will be followed during and after construction of the Project.

The facility will be fenced to prevent unauthorized access.

Section 8.9 of the *Permit Site Template* requires Marshall Solar to prepare an *Emergency Response Plan* prior to Project construction. The *Emergency Response Plan* will identify procedures to be followed in the event of an emergency during construction.

There should be little or no change from the existing, ambient EMF outside the solar facility. Although the location of the gen-tie line has not been finalized, the nearest home is approximately 1200 feet from the anticipated location of the Project Substation, and would be on the other side of the existing 345 kV transmission line. Therefore, there would be no change from the existing EMF levels for any residence. In addition, based upon current scientific evidence, no adverse impacts from electric or magnetic fields associated with the Project solar or transmission projects are anticipated.

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<sup>89</sup> Appendix C, response to Question 23, dated September 25, 2015

Since no EMF impacts are anticipated, this EA does not contain an exhaustive discussion of current literature and findings. For the reader who has more interest in EMF, Stray Voltage and other related issues and potential impacts, further information is available in other EERA environmental documents. The author refers the reader as an example to the Environmental Assessment for the Elko New Market Cleary Lake Area 115 kV Transmission Upgrade.<sup>90</sup>

### **5.3.9 Recreation**

Outdoor recreational opportunities in the area include hiking, biking, camping, boating, canoeing, hunting, fishing, wildlife viewing, hiking, cross country skiing, snowmobiling.

There are no federal, county or state parks, scientific and natural areas or waterfowl production areas within one mile of the site. There are no designated snowmobile, biking or hiking trails within one mile of the site.<sup>91</sup> The Redwood River is approximately one mile north of the site and is designated water trail for canoeing.

The Minnesota DNR has established Wildlife Management Areas (WMAs) to provide wildlife habitat, improve wildlife production, and provide public opportunities for hunting and trapping. WMAs are open to the public for hunting, fishing, trapping and wildlife viewing but are closed to all-terrain vehicles and horses because of potential detrimental effects on wildlife habitat. The Rolling Hills WMA and Clifton WMA are adjacent to one another and are located approximately 1.5 miles southwest of the site, and the Green Valley WMA is located approximately 1.5 miles northwest of the site. These WMAs provide habitat for deer, small game, pheasants, waterfowl, and doves.<sup>92</sup>

#### ***Potential Impacts***

Since the site is located on entirely private land, no public recreational lands will be directly impacted by construction or operation of the Project. As discussed in Section 5.3.7, visual impacts are expected to be limited to those in close proximity to the Project – nearby residents and those travelling on roads adjacent to the Project. Because the nearest public recreational resources, the Redwood River Trail and the nearest WMAs, are more than a mile from the site, visual impacts are not expected for users of these resources. Visual impacts may affect individuals using public roads or private lands within or near the site. Temporary noise impacts could be experienced by individuals using the public roads or private lands during Project construction.

No impact to hunting activities is anticipated from the Project. The location of the PV facilities could potentially affect hunting activities on private land in close proximity to the

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<sup>90</sup> Environmental Assessment, EERA, February 21, 2014, eDocket no. [20142-96692-01](#) at Section 5.7

<sup>91</sup> DNR, [http://www.dnr.state.mn.us/snowmobiling/interactive\\_map/index.html](http://www.dnr.state.mn.us/snowmobiling/interactive_map/index.html)

<sup>92</sup> Minnesota DNR,

extent that they may constrain shooting directions in the immediate vicinity of the structures.

### *Mitigative Measures*

The Project will not have a direct impact on any public lands or identified recreational uses. No mitigative measures related to recreational activities are proposed.

## **5.4 Land-based Economies**

Installation and operation of a PV facility will result in a change of land use. The current land use would be displaced with the PV panels and the roads, fencing, inverters, electrical collection system and other infrastructure necessary to support the operation of the Project.

To the extent that the Project displaces other economic uses of the land, such as farming, mining or forestry, the facility will impact land-based economies at the site. Impacts on land-based economies on neighboring parcels are not anticipated.

### **5.4.1 Agriculture**

Given the siting requirements for ground-mounted PV projects, approximately 7 to 10 acres rural areas, with their relatively large parcels of relatively flat open land, tend to be attractive locations for developers seeking to site ground-mounted PV projects requiring 7 to 10 acres per MW.

Although much of the land in Lyon County has historically been used for agricultural purposes, there are differences in the quality and suitability of land for purposes of agricultural production. The United States Department of Agriculture (USDA) defines prime farmland as follows:

*Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding. Examples of soils that qualify as prime farmland are Palouse silt loam, 0 to 7 percent*

*slopes; Brookston silty clay loam, drained; and Tama silty clay loam, 0 to 5 percent slopes.*<sup>93</sup>

Although “prime farmland” characteristics are the same nationwide, the USDA also realizes that certain areas that do not meet the specific characteristics determined by soil classification data, are nevertheless important at a statewide level.

Additional farmland of statewide importance is land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Criteria for defining and delineating this land are determined by each state. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable. In some states, additional farmlands of statewide importance may include tracts of land that have been designated for agriculture by law.<sup>94</sup>

**Table 12** summarizes prime farmland by type. Prime farmland at the site and the Project Area are shown in **Figure 9**; a map showing prime farmland in Lyon County can be found in **Appendix D**.

**Table 12: Prime Farmland<sup>95</sup>**

Prime Farmland Classification	Site		Project Area		Lyon County	
	Acres	Percent	Acres	Percent	Acres	Percent
All areas prime farmland	186.6	36.3	1958.4	36.1	219,845.0	47.6
Farmland of statewide importance	33.9	6.6	339.0	6.2	34,498.1	7.5
Prime farmland if drained	291.2	56.6	3,041.3	56.0	146,523.2	31.7
Other prime farmland	0.0	0.0	0.0	0.0	15,696.4	3.4
Not prime farmland	2.5	0.5	92.9	1.7	45,555.0	9.9
<b>Total</b>	<b>514.2</b>	<b>100.0</b>	<b>5,431.6</b>	<b>100.0</b>	<b>462,117.7</b>	<b>100.0</b>

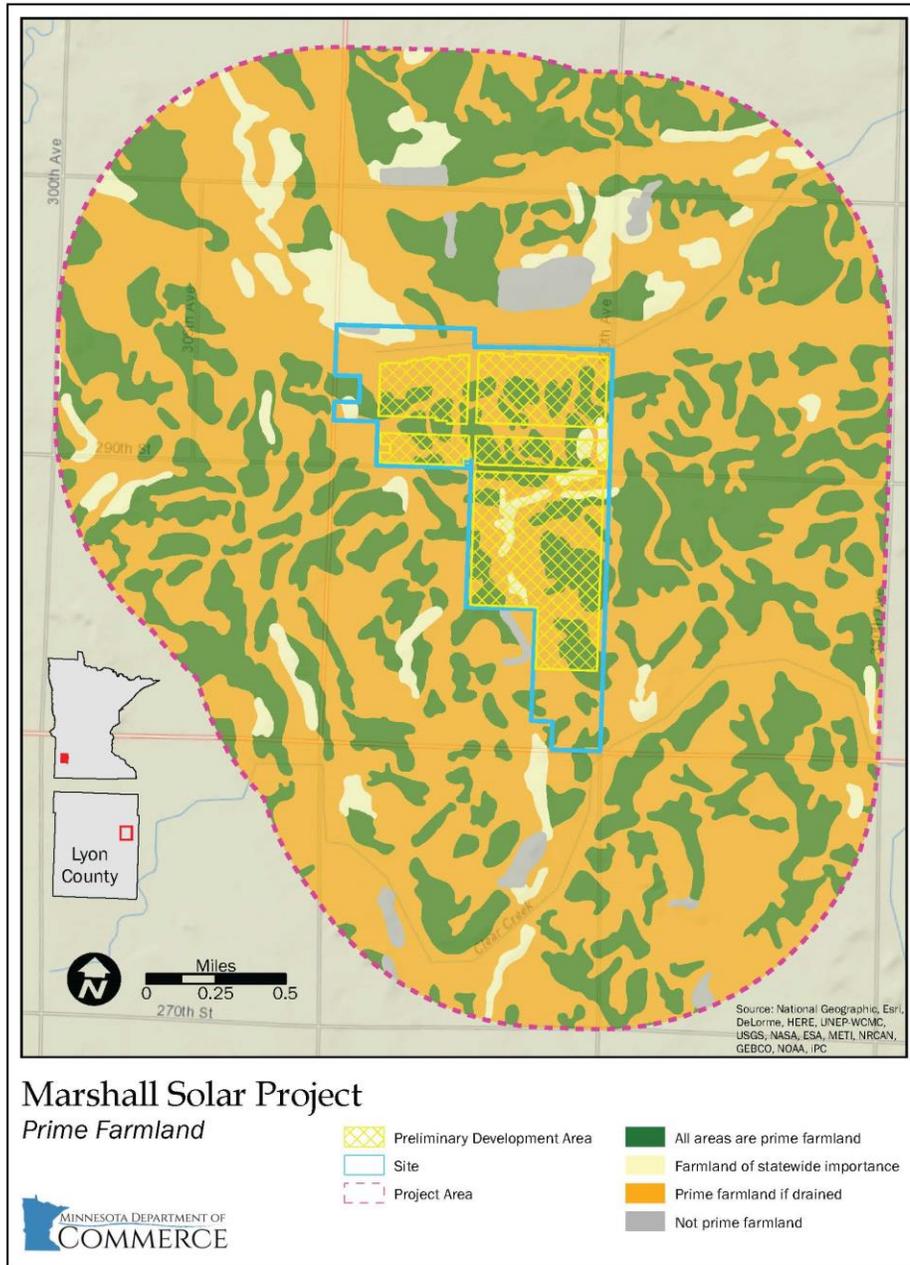
<sup>93</sup> U.S. Department of Agriculture, Natural Resources Conservation Service. *National soil survey handbook*, title 430-VI. Available online.. Sec. 657.5 Identification of important farmlands.

[http://www.soils.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2\\_054226#ex1](http://www.soils.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_054226#ex1)

<sup>94</sup> U.S. Department of Agriculture, Natural Resources Conservation Service. *National soil survey handbook*, title 430-VI. [http://www.soils.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2\\_054226#ex1](http://www.soils.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_054226#ex1)

<sup>95</sup> Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. *Web Soil Survey*. <http://websoilsurvey.nrcs.usda.gov/>.

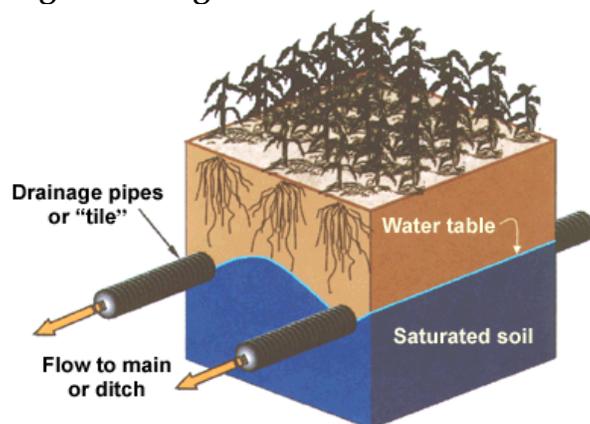
**Figure 9: Prime Farmland**



As discussed in Section 2.5, the rules governing the siting of power plants provide that no more than 0.5 acres of prime farmland may be used per MW in most areas unless there is no feasible and prudent alternative.<sup>96</sup>

Over the past century, many farmers have installed drain tile systems to enhance crop yield. Although subsurface drainage systems are designed to meet the individual characteristics of each site, **Figure 10** provides a simplified schematic of how a tiling system would be installed.

**Figure 10: Agricultural Tile Schematic**<sup>97</sup>



The developed area of the site is bounded by Lyon County drainage ditches to the north and south. The existing sub-surface drainage systems at the site drain to the Lyon County drainage ditches system at three locations, two locations to the northern ditch, and one to the southern ditch.<sup>98</sup>

### ***Potential Impacts***

As shown in **Table 7**, approximately 97 percent of the site (498 acres) is currently used for cultivated crops. This represents approximately 0.1 percent of the nearly 367,000 acres of cultivated cropland in Lyon County. Marshall Solar anticipates that up to 364 acres would be removed from agricultural production.<sup>99</sup> At the end of the Project's useful life, a minimum of 25 years, the Project may be decommissioned and the land could be restored to agricultural use.

<sup>96</sup> Minnesota Rule 7850.4400, Subpart 4

<sup>97</sup> Regents of the University of Minnesota, 2012, *Agricultural Drainage Systems: Issues and Answers*. <http://www.extension.umn.edu/agriculture/water/agricultural-drainage-publication-series/>

<sup>98</sup> Appendix C, see response to Question 14 dated September 17, 2015

<sup>99</sup> Project Update, July 24, 2015

As shown in **Table 12**, approximately 93 percent of the site (478 acres) is considered to be prime farmland or prime farmland if drained. In comparison, approximately 92 percent (5,000 acres) of the Project Area and 79.3 percent (366,368 acres) in Lyon County are considered to be prime farmland or prime farmland if drained. The site comprises approximately 0.1 percent of prime farmland in Lyon County. Marshall Solar anticipates that up to 364 acres would be used for the proposed Large Electric Power Generating Power Plant. Application of Minnesota Rule 7850.4400 would limit the Project to use of no more than approximately 31 acres of prime farmland unless there is no feasible and prudent alternative.

Construction of the Project has the potential to damage agricultural soils through compaction or erosion if best management practices (BMPs) are not implemented to minimize damage.

Construction may damage drainage tile that has been installed to enhance crop production. Damage to drainage tile may result in slower drainage or standing water at the site itself. A disruption of the drainage system at the site may also result in a change in the flow of discharge of water into the drainage ditches that collect the discharge from the tiling.

Disruptions to the drainage system at the site would be expected to be isolated and would result in localized wet areas or possibly standing water.

### ***Mitigative Measures***

As part of the voluntary agreement between Marshall Solar and landowners, Marshall Solar will compensate the owners of the parcels used for the Project through the negotiated purchase of the land.

Marshall Solar will implement erosion control BMPs.

Marshall Solar will not install equipment near areas where the site drains to the county ditch system.<sup>100</sup>

Marshall Solar has engaged a drainage tile company to locate all drainage tiles on the site after completion of the 2015 harvest. Following mapping of the existing sub-surface drainage system, Marshall Solar will refine the site layout to avoid impacts to the existing drainage system.<sup>101</sup>

Section 4.2.7 of the *Site Permit Template* requires reasonable measures to minimize erosion during construction. Other permits have also included requirements to implement measures to protect and segregate topsoil and measures to minimize soil compaction.

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<sup>100</sup> Appendix C, response to Question 14 dated September 17, 2015

<sup>101</sup> Ibid.

Section 4.2.21 of the *Site Permit Template* would require Marshall Solar to promptly repair or compensate landowners for damage to drain tile unless otherwise negotiated with the affected landowner.

Development of an Agricultural Mitigation Plan detailing methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation would help to ensure that the Project is designed, constructed, operated and ultimately restored in a manner that would allow the land to be returned to its original agricultural use in the future.

#### **5.4.2 Forestry**

Although the additional parcel includes a forested area serving as a buffer around the existing home located to the east of the Otter Tail Power substation, these trees are not managed as for economic purposes. No economically significant forestry resources will be affected by the Project.

##### *Mitigative Measures*

No impacts to forestry resources are anticipated and therefore no mitigative measures are proposed.

#### **5.4.3 Tourism**

Tourism in the Project Area is largely associated with the recreational activities discussed in Section 5.2.9.

Impacts to tourism would be expected if the Project affected the overall experience of visitors to tourism sites, either through aesthetic impacts, noise or degradation of the natural resources such as air or water quality. No impacts to tourism are anticipated from the Project.

##### *Mitigative Measures*

No impacts to tourism are anticipated and therefore no mitigative measures are proposed.

#### **5.4.4 Mining**

There are no metallic mineral resources actively mined in Lyon County. There are currently no active aggregate mine operations within one mile of the Project. A review of historic maps shows an area in Section 28 adjacent to the Project that appears to have been used for aggregate mining operation in the late 1980s. Aerial photographs show the area as being re-vegetated by 1991.

Construction or operation of the proposed facilities would not impact any mining or mineral extraction activities.

### *Mitigative Measures*

As no impacts to mining or mineral extraction are anticipated, no mitigative measures are proposed.

## **5.5 Archaeological and Historic Resources**

At the direction of Marshall Solar, HDR Engineering, Inc. performed a search of Minnesota State Historic Preservation Office (SHPO) records was performed in November 2014 for the Project Area (within one mile of the proposed site). In addition to a search of SHPO records, historic maps and aerial photographs of the Project Area were also examined.<sup>102</sup>

The SHPO records search did not identify any previously recorded archaeological sites or architectural properties within the Project Area. A review of historic maps identified a number of wetlands and sloughs in the Project area that may have offered hunting opportunities and a wagon road running through the northern half of Section 33.

The Phase Ia literature search concluded that any cultural material found in the Project Area would most likely be related to the historic agricultural period. After reviewing the results of the Phase Ia literature search, the Minnesota State Historic Preservation Office (SHPO) concluded that there are no properties listed in the national or state register of historic places and no known or suspected archaeological properties in the Project Area.<sup>103</sup>

### *Potential Impacts*

Archaeological and historic resources can be impacted by soil disturbance during construction of the Project.

### *Mitigative Measures*

Avoidance of archaeological and historic architectural properties is the preferred mitigative policy for construction of infrastructure projects.

Given the relatively low probability of impacts to archaeological properties from construction of the Project, the SHPO did not recommend a preconstruction survey.

Section 4.2.16 of the Site Permit Template requires Marshall Solar to coordinate with SHPO in the event that new unrecorded sites are discovered during construction.

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<sup>102</sup> Application at Appendix D

<sup>103</sup> Appendix C, response to Question 15 and Attachments 1 and 2, dated September 17, 2015

## 5.6 Natural Environment

The consideration of the impacts of an electric generation project on the natural environment, including air quality, water resources and vegetation and wildlife is required as part of the environmental review. The range of potential impacts for a PV facility depends upon the characteristics of the facility site, facility design, construction techniques and the ongoing maintenance activities during the facility's operation.

### 5.6.1 Air Quality

Air quality in Minnesota is generally good, and the trend has been improving for most pollutants. The enactment of the Clean Air Act in 1970 dramatically reduced air emissions from large facilities.<sup>104</sup>

Temporary localized short-term air quality impacts would occur during the construction phase of the Project with no effect on the larger area. Once operational, the Project would not generate criteria pollutants or carbon dioxide.

#### *Potential Impacts*

During construction of the Project temporary short-term air emissions are expected as a result of vehicle exhaust from the construction equipment and from vehicles traveling to and from facility locations. The magnitude of the construction emissions is influenced heavily by weather conditions and the specific construction activity occurring. Exhaust emissions from primarily diesel equipment would vary according to the phase of construction but would be minimal and temporary.

In addition to emissions from construction equipment, short-term air quality impacts from fugitive dust due to travel on unpaved roads, any grading or excavation activities. Fugitive dust is considered particulate matter under air quality regulations. The concentrations of fugitive dust that is fine particulate matter (P.M. less than 2.5 microns or PM2.5) is generally small, or approximately 3 percent to 10 percent of total particulate matter (USEPA's AP-42, Sections 13.2 and 11.9). Since fine particulate matter has the potential to travel further into the lungs, it is of greater concern than larger particle size ranges.

#### *Mitigative Measures*

Dust from construction traffic can be controlled using standard construction practices such as watering of exposed surfaces, covering of disturbed areas, and reduced speed limits on site.

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<sup>104</sup> MPCA, *Air Quality in Minnesota: Emerging Trends*. 2009. <http://www.pca.state.mn.us/index.php/view-document.html?gid=5658>

Emissions from construction vehicles can be minimized by keeping construction equipment in good working order

## 5.6.2 Topography, Geology, Soils

Topography at the site is relatively flat, with minor undulations. Elevations at the site range from 1,090 to 1,120 feet above mean sea level.<sup>105</sup>

Bedrock at the site is comprised of Cretaceous-age undifferentiated shale and sandstone underlain by Precambrian-age gneissic rocks. Based on construction logs for wells within one mile of the site, topsoil depths are approximately one to two feet, with glacial deposits extending approximately 30 to 40 feet below ground surface. No earthquakes have been recorded in Lyon County.<sup>106</sup>

Soils within the site represent twelve different types characteristic of cultivated fields in the region. As shown in **Table 13**, the majority, approximately 57 percent, of the soils are characterized as poorly or very poorly drained.

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<sup>105</sup> Application, at p. 57

<sup>106</sup> Application, at p. 59

**Table 13: Soils Series within the Site<sup>107</sup>**

Soil Type	Description	Percent of Site
Amiret loam	Very deep, well drained soils typically associated with cultivated fields.	13.0
Amiret-Swanlake loams	Very deep, well drained soils typically associated with cultivated fields.	14.7
Arvilla sandy loam	Very deep, somewhat excessively drained soils typically found on an east-facing slope of cultivated fields.	0.7
Arvilla-Storden-Ves complex	Very deep, well drained soils typically found on convex slopes in cultivated fields.	1.2
Canisteo clay loam	Very deep, poorly / very poorly drained soils typically found on rims of depressions in cultivated fields.	36.6
Fordville loam	Very deep, well drained soils typically associated with slightly convex slopes in cultivated fields.	1.5
Glencoe silty clay loam	Very deep, very poorly drained soils typically associated with depressions in cultivated fields.	2.6
Marysland loam	Very deep, very poorly drained soils associated with stream channels or outwashes in drained cultivated fields.	13.5
Oldham silty clay loam	Very deep, very poorly drained soils in cultivated fields.	4.2
Seaforth loam	Deep, moderately well drained soils typically in low relief areas in cultivated fields.	7.3
Storden-Ves loams	Very deep, well drained soils typically found on convex slopes in cultivated fields.	3.7
Sverdrup sandy loam	Very deep, well drained soils typically associated with cultivated fields.	1.0

***Potential Impacts***

Construction of the facilities will disturb approximately 364 acres within the 515 acre site. As with any ground disturbance, construction of the Project has the potential for soil compaction, erosion and sedimentation as a result of construction activities. Given the predominance of poorly drained soils at the site, soil compaction during construction would be a concern.

Additionally, the soil cover and management of the developed areas will change from cultivated cropland dominated by corn and soybeans to a mixture of solar panels underlain by groundcover plantings and impermeable surfaces at the locations of the roads, inverter and transformer pads, and Project Substation.

Marshall Solar anticipates that grading will be required in isolated areas of the site (e.g., Project substation and PCS units) in order to meet the final design requirements. Grading at

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<sup>107</sup> Source: SSURGO Soil Data for Lyon County, Minnesota. USDA NRCS (2014).

the site will consist of cutting, filling, and compaction of earth in targeted areas around the site to provide a level and stable base for the equipment. Although the preliminary design does not anticipate grading of larger areas, if future design modifications require the grading of larger areas a disc and roll technique would be used to reduce the impacts associated with cut and fill grading over large areas. The disc and roll technique is a two-step process that first passes over the targeted area with tractors to till the soil and level out low spots, and then passes again with drum rollers to compact the soil. Marshall Solar anticipates that most of soils from the site will be suitable for use as fill for general site needs and filling the trenches used for cables. In some cases engineered fill may be brought to the site and used to ensure a stable base for inverter and substation pad locations and, in some areas, the collection system trenches.<sup>108</sup>

### ***Mitigative Measures***

The use of BMPs (including, but not limited to containment of excavated material, protection of exposed soil, stabilization of restored material, and treating stockpiles to control fugitive dust) would protect topsoil and minimize the potential for soil erosion.

Section 4.2.7 of the Site Permit Template would require Marshall Solar to implement BMPs identified by the MPCA Construction Stormwater Program. Because the Project will disturb more than an acre, the Project will require a National Pollutant Discharge Elimination System (NPDES) permit from the MPCA. As part of the NPDES application, Marshall Solar will be required to develop a Storm Water Pollution Protection Plan (SWPPP), which will require identification of management practices implemented during construction to minimize the potential for soil erosion.

Development of an Agricultural Mitigation Plan detailing methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation would help to ensure that impacts to soils are minimized.

### **5.6.3 Groundwater**

Groundwater in the Project Area flows north, northwest to the Redwood River. A review of DNR monitoring wells shows the water table in the Project Area ranges from about six to ten feet below ground surface. Water table wells are uncommon in the Project Area, most wells access the Cretaceous bedrock at depths of 30 to 350 feet. There are no mapped wells in the site, although the homestead in the center of the site does have a well.

### ***Potential Impacts***

Marshall Solar anticipates that project foundations (direct-embedded posts supporting the PV arrays, concrete slab foundations for PCS and Project Substation Equipment) will be

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<sup>108</sup> Application, at p. 17

installed at a depth of approximately 6 to 10 feet.<sup>109</sup> Although there is a potential that subsurface activity may disturb some of the shallow groundwater resources, the disturbance area would be above the minimum 30-foot depth to aquifers used for potable water.<sup>110</sup>

### *Mitigative Measures*

Section 4.2.7 of the Site Permit Template would require Marshall Solar to implement BMPs identified by the MPCA Construction Stormwater Program. Because the Project will disturb more than an acre, the Project will require a NPDES permit from the MPCA. As part of the NPDES application, Marshall Solar will be required to develop a SWPPP. The SWPPP requires preparation of a Spill Prevention, Control and Countermeasure (SPCC) Plan to minimize the potential for spills of hazardous materials and their transport to groundwater resources.

### **5.6.4 Surface Water**

Public waters are wetlands, water basins and watercourses of significant recreational or natural resource value in Minnesota, as defined in Minn. Statutes Section 103G.005; the DNR has regulatory jurisdiction over these waters. The DNR Public Waters Inventory (PWI) identifies lakes, wetlands, and watercourses over which the DNR has regulatory jurisdiction. There are no water courses or water basins identified on the DNR PWI within the site. Two watercourses adjacent to the site are identified on the PWI:

- the drainage ditch on the north of the site becomes a PWI on the east side of 320<sup>th</sup> Avenue, and
- The drainage ditch on the south of the Project drains into a PWI that flows near the southeastern corner of the site.

Minnesota law (Minnesota Statutes Section 84.415 administered through Minnesota Rules Chapter 6135) requires that a license be obtained from the DNR Division of Lands & Minerals for the passage of any utility over, under or across any state land or public waters.

Recognizing the importance of shoreland, the Minnesota Legislature has provided guidance to development around public waters in Minnesota through the Shoreland Management Act. The Shoreland Management Act directs the DNR to adopt model standards and criteria for development in shoreland areas. Counties and municipalities with shoreland areas are directed to develop and implement standards for shoreland areas.<sup>111</sup> Lyon County's Shoreland Standards are found in Article 17 of its zoning ordinance.<sup>112</sup>

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<sup>109</sup> Application, at p. 13

<sup>110</sup> Application, at p. 60

<sup>111</sup> Minnesota Rule, part 6120.2800

<sup>112</sup> Lyon County Zoning Ordinance,

<http://www.lyonco.org/attachments/article/170/LyonCountyPZOrdinancev2015.pdf>

### ***Potential Impacts***

The Project will not directly impact any surface water resource.

During construction, there is the possibility of sediment reaching nearby surface waters and wetlands as the ground is disturbed by excavation, grading and construction traffic.

Maintenance and operation activities for the Project are not expected to have an adverse impact on surface water quality.

### ***Mitigative Measures***

The use of BMPs (including, but not limited to containment of excavated material, protection of exposed soil, stabilization of restored material, and treating stockpiles to control fugitive dust) would minimize the potential for soil erosion

Section 4.2.7 of the Site Permit Template would require Marshall Solar to implement BMPs identified by the MPCA Construction Stormwater Program. Because the Project will disturb more than an acre, the Project will require a NPDES permit from the MPCA. As part of the NPDES application, Marshall Solar will be required to develop a SWPPP. The SWPPP requires preparation of a Spill Prevention, Control and Countermeasure (SPCC) Plan to minimize the potential for spills of hazardous materials and their transport to surface waters. As part of the SWPPP preparation, Marshall Solar will identify BMPs to minimize the potential for soil erosion.

Section 4.2.9 of the Site Permit template requires that the Project components (PV panels, roads, substation, etc.) be located in compliance with the standards for development of shorelands of public waters as implemented in Minnesota Rule.

## **5.6.5 Wetlands and Floodplains**

Wetlands are important resources for flood abatement, wildlife habitat and water quality.

Marshall Solar commissioned a wetland delineation of the site in the summer of 2014. With the exception of the two county drainage ditches located on the north and south sides of the site, no jurisdictional wetlands occur within the site.

Wetlands that are hydrologically connected to the nation's navigable rivers are protected federally under Section 404 of the Clean Water Act. Under the Clean Water Act, Section 401 water quality certification is also required for activities that may result in a discharge to waters of the United States. The MPCA administers Section 401 water quality certification on non-tribal lands in Minnesota. If the USACE authorizes the project under its General Permit/Letter of Permission permitting program, the MPCA waives its Section 401 Water Quality Certification authority. In Minnesota, wetlands are also protected under the Wetland

Conservation Act, which is administered by the Board of Water and Soil Resources (BWSR) and the identified Local Government Unit.

Floodplains are low-lying areas that are subject to periodic inundation due to heavy rains or snowmelt. Floodplain areas are generally found adjacent to lakes, rivers and stream. In their natural state, floodplains provide for temporary water storage during flooding events. There are no mapped floodplains within one mile of the site.<sup>113</sup>

### ***Potential Impacts***

Because there are no wetlands within the site, the Project will not directly impact any wetlands.

During construction, there is also the possibility for indirect impacts to wetlands from sediment as the ground is disturbed by excavation, grading and construction traffic.

The project will not impact any floodplains.

### ***Mitigative Measures***

The preferred method for minimizing impacts to wetlands is to avoid disturbance of the wetland. Section 4.2.9 of the *Site Permit Template* requires that solar panels and associated facilities not be placed in public waters wetlands, as defined in Minnesota Statutes section 103G.005, subdivision 15(a). The anticipated layout avoids directly impacting any wetlands.

Although the layout anticipates avoiding the wetland areas bordering the existing drainage ditches, indirect impacts to wetlands could result from runoff into the wetland areas that border the drainage ditches.

Section 4.2.7 of the *Site Permit Template* would require Marshall Solar to implement BMPs identified by the MPCA Construction Stormwater Program to minimize erosion and sedimentation.

Because the Project will disturb more than an acre, the Project will require a NPDES permit from the MPCA. As part of the NPDES application, Marshall Solar will be required to develop a SWPPP, which will require identification of specific BMPs to minimize the potential for soil erosion.

## **5.6.6 Vegetation**

As summarized in Table 6, land cover at the site is dominated by cultivated agriculture (96.8 percent), consistent with the current agricultural use of the site. In addition to the cultivated

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<sup>113</sup> Application, at p. 63

fields, the remainder of the site consists of a small woodlot surrounding the home on the parcel in the center of the site. There are no identified native plant communities within one mile of the site.<sup>114</sup>

Non-native invasive species cover is also quite limited due to the intensive weed management associated with agriculture. Section 5.2 provides additional information about land cover at the site and in the project area. Marshall Solar has not identified any Reinvest in Minnesota or United States Fish and Wildlife Service (USFWS) easements at the site.<sup>115</sup>

### *Potential Impacts*

The small woodlot surrounding the home located east of the Otter Tail Power substation would be removed prior to construction of the Project.

Construction and operation of the Project would change the vegetative cover of up to 515 acres for at least the 25 year expected lifespan of the Project. With the exception of the Project Substation location and access roads (approximately 15 acres in total), areas developed for the Project would be re-seeded with a mixture of native prairie grasses and wildflowers to provide permanent groundcover during the operation of the Project. Once operational, Marshall Solar anticipates that vegetation at the site will be primarily be maintained with mowers and string trimmers to control weeds and avoid impact to the PV panels. Once the vegetation is established, more selective or intensive maintenance measures (e.g. spot herbicide application, herbicide wicking or hand weeding) may be required to ensure successful establishment of the vegetation.<sup>116</sup>

Construction activities may introduce invasive species. The Minnesota Noxious Weed Law defines a noxious weed as an annual, biennial or perennial plant that the Commissioner of Agriculture designates to be injurious to the public health, the environment, public roads, crops, livestock or other property.<sup>117</sup> The Minnesota Department of Agriculture's Noxious & Invasive Weed Program assists local governments and landowners with resources for managing noxious and invasive weeds throughout Minnesota.

### *Mitigative Measures*

Marshall Solar has committed to revegetating the site (areas between solar panels, between the arrays and fencing and the former laydown areas) with native prairie vegetation. Procedures for establishment of the prairie habitat will be identified in an *Agricultural Mitigation Plan* currently under development.<sup>118</sup>

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<sup>114</sup> Application, at p. 66

<sup>115</sup> Appendix C, response to Question 24, dated September 28, 2015

<sup>116</sup> Application, at p. 66; Appendix C, response to Question 16 dated September 23, 2015

<sup>117</sup> Minnesota Statutes Section 18.75 – 18.91, <https://www.revisor.mn.gov/statutes/?id=18>

<sup>118</sup> Appendix C, response to Question 16 dated September 23, 2015

Section 4.2.11 of the *Site Permit Template* requires Marshall Solar to clear the site only to the extent necessary to assure suitable access for construction, safe operation and maintenance of the project. The condition also requires Marshall Solar to work with MNDNR to establish and manage vegetation that will benefit pollinators and other wildlife, to the extent that the vegetation will not interfere with the operation of the facility.

Section 4.2.12 of the *Site Permit Template* addresses the use of herbicides.

Sections 4.2.13 and 4.2.14 of the *Site Permit Template* include restrictions to manage for noxious weeds and invasive species.

A vegetation management plan can be developed to formalize measures to minimize the disturbance and removal of vegetation for the Project, prevent the introduction of noxious weeds and invasive species and re-vegetate disturbed areas consistent with the safe and reliable operation of the Project. MNDNR communication to Marshall Solar encouraged use of native seed to establish a restored short-grass prairie at the site to:

- improve water quality by reducing soil erosion;
- increase soil water retention;
- improve soil composition and structure with the extensive root system;
- reduce applications of fertilizer and herbicides; and
- provide habitat for pollinators and other wildlife.<sup>119</sup>

## 5.6.7 Wildlife

As discussed in Section 5.5.6, vegetative cover at the proposed site is dominated by cultivated agriculture with a small homestead comprised of a home, outbuildings, and a woodlot. The non-native cover types that dominate the site are typically used by common wildlife species that are accustomed to agricultural habitats. Examples of such species would include whitetail deer, raccoons, mice, voles, songbirds, waterfowl and gamebirds such as pheasant. It is anticipated that these species' use of the proposed site is largely limited to occasional foraging in the fields and shelter within the small woodlot.

Although there are no surface waters within the proposed site, the drainage ditches to the north and south of the site may provide habitat for fish or other aquatic species.

### *Potential Impacts*

Wildlife that resides within the construction zone will be temporarily displaced to adjacent habitats during the construction process. The wildlife species in the Project Area do not generally require specialized habitats and are able to find generally suitable habitat nearby.

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<sup>119</sup> Application, at Appendix F.

Once restoration of the site is established after construction, the current non-native habitats that are used by habitat generalists will be replaced by a native prairie habitat that may be attractive to some species and less attractive to species that use the open farm and pasturelands.

Once construction begins, access to facilities will be limited by perimeter fences around the separate sections of the Project. Although a variety of birds and small mammals, are likely to still be able to gain access to the developed area of the site to use the habitats under and around the solar arrays, access will be limited for larger wildlife. Fencing around facilities may also disturb wildlife movement corridors.

Plastic erosion control netting is frequently used for erosion control during construction and landscape projects and can negatively impact terrestrial and aquatic wildlife populations as well as snag in maintenance machinery, resulting in costly repairs and delays. Wildlife entanglement in and death from plastic netting and other man-made plastic materials has been documented in birds, fish, mammals and reptiles.<sup>120</sup>

A National Fish and Wildlife Forensics Laboratory report has identified some avian risks associated with PV facilities.<sup>121</sup> Some birds in the study suffered impact trauma, and related predation. Preliminary findings, based on limited data, suspect the danger is the possible appearance of the facility as a large body of water. Migrating birds may attempt to land, consequently incurring the trauma.

### *Mitigative Measures*

The anticipated design of the Marshall Solar Project would be broken into blocks by the existing transmission lines, 290<sup>th</sup> Street, and the access roads inside the Project footprint, minimizing the appearance of an unbroken water-like expanse and providing for corridors for wildlife movement between fenced areas.

Avoiding the use of photodegradable erosion-control materials where possible and using biodegradable materials (typically made from natural fibers) instead, preferably those that will biodegrade under a variety of conditions, can minimize the impact to wildlife. The Site Permit could include the use of these materials as a standard condition or as a special condition for facilities where there is greatest concern.

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<sup>120</sup> DNR. *Wildlife Friendly Erosion Control Fact Sheet*. 2013.

<http://files.dnr.state.mn.us/eco/nongame/wildlife-friendly-erosion-control.pdf>

<sup>121</sup> USFWS Forensics Lab, *Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis*, 2014, <http://www.ourenergypolicy.org/wp-content/uploads/2014/04/avian-mortality.pdf>

## 5.7 Rare and Unique Natural Resources

Construction and maintenance of solar facilities might destroy individual plants and animals or might alter their habitat so that it becomes unsuitable for them. For example, trees used by rare birds for nesting might be cut down, soil disturbance from construction activities may destroy rare plant species or communities, or soil erosion may degrade rivers and wetlands that provide required habitat.

Endangered species are species whose continued existence is in jeopardy. Threatened species are likely to become endangered. Species of special concern have some problems related to their abundance or distribution, although more study is required.

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

Some areas of the state have not been surveyed extensively or recently, so the NHIS database cannot be relied upon as a sole information source for rare species. Nevertheless, the NHIS database provides a starting point for anticipating potential impacts to rare and unique natural species and communities. A query of the DNR NHIS database did not identify any locations of rare and unique natural species within the Project Area (one mile of the site boundary).<sup>122</sup>

Although no instances of the northern long-eared bat (*Myotis septentrionalis*) were identified at the Project site, the species is known to occur in suitable forested habitats, including woodlots, shrubby fence lines and small copses, throughout Minnesota. The USFWS issued a final decision and interim rule as of May 4, 2015, designating the northern long-eared bat as threatened under the Endangered Species Act.<sup>123</sup>

### *Impacts*

As the Project avoids identified areas of biological significance and rare species, impacts to sensitive natural resources is not anticipated.

There is a potential that the small woodlot at the center of the site may provide some habitat for the northern long-eared bat.

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<sup>122</sup> Application, at pp. 68-69

<sup>123</sup> Interim Rule 4(d),

<http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/FRnlebFinalListing02April2015.pdf>

*Mitigative Measures*

The mitigative measures described for Vegetation and Wildlife in Sections 5.6.5 and 5.6.6 are also applicable to minimizing impacts to sensitive species.

Consistent with USFWS guidance on the northern long-eared bat, any tree removal at this location tree removal should avoid the active season (April 1-September 30) for the species. The northern long-eared bat would not be anticipated to be present in the action area between the months of October 1st and March 30th. Development of facilities consistent with USFWS guidance would minimize impacts to the northern long-eared bat. To determine the conditions and timing of tree-clearing under the rule, Marshall Solar will need to consult with the USFWS.

## 6 Application of Siting Factors

The Power Plant Siting Act requires the Commission to locate large electric power facilities “in an orderly manner compatible with environmental preservation and the efficient use of resources” and in a way that minimizes “adverse human and environmental impact while insuring” electric power reliability.<sup>124</sup> Minnesota Statute Section 216E.03, subdivision 7(b) identifies considerations that the Commission must take into account when making its final determination on siting of large electric power facilities. Minnesota Rule 7850.4100, lists 14 factors to guide Commission site and route designations, including the evaluation and minimization of adverse environmental impacts, impacts to public health and welfare, and adverse economic impacts. These factors are outlined in Section 2.5 of this document.

### 6.1 Relative Merits

Generally, an Environmental Assessment will review the Factors to help establish the relative merits of a proposed project against any alternative routes or sites that have been reviewed in the EA. Since only the proposed site is being considered in the current review, the concept of relative merits is not applicable.

### 6.2 Review of the Siting Factors

This review looked not only at the Factors, but also the Elements that make up those Factors (see subsections below). For the most part, adherence to best practices during construction and operation and the general permit conditions in the *Site Permit Template* (**Appendix B**) is anticipated to result in minimal to moderate impacts from the facilities. In some instances, however, the addition of special permit conditions could help to minimize impacts.

#### 6.2.1 Factor: Effects on Human Settlement

*Elements: Noise, cultural values, public services, recreation*

Impacts related to noise, cultural values, public services and recreation are anticipated to be minimal with the use of standard construction techniques and the general conditions in the *Site Permit Template*.

Ensuring for proper decommissioning and site restoration of the Project or any abandoned equipment that is part of the Project, as required in Sections 9.1, 9.2, and 9.3 of the *Site Permit Template*, will help to ensure that impacts on Human Settlement are minimal.

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<sup>124</sup> Minnesota Statute 216E.02, <https://www.revisor.mn.gov/statutes/?id=216E.02>

***Element: Displacement***

Construction of the Project as proposed would result in the removal of one home at the site. The removal of the home is part of a voluntary agreement between Marshall Solar and the landowner.

***Element: Aesthetics***

Impacts are anticipated to be minimal with the use of the anticipated location, design and the general conditions identified in the *Site Permit Template*.

Aesthetics impacts from the gen-tie line are anticipated to be minimal, as the line would be a similar use to the existing transmission lines and substations.

***Element: Consistency with Local Land Use and Planning***

The Project is not anticipated to have an impact on growth patterns in the greater Marshall area and is not located in an area where extension of water, sewer, or other urban services is planned. The proposed layout of the Project is consistent with setbacks identified for Large Solar Energy Systems in the *Lyon County Zoning Ordinance*.

**6.2.2 Factor: Effects on Public Health and Safety**

Impacts to public health and safety from the Project are anticipated to be minimal with use of standard construction techniques and the general conditions identified in the *Site Permit Template*. Impacts to public health and safety are anticipated to be limited to the construction phase of the Project and similar to other large construction projects. Operation of the facility is not anticipated to be a public health or safety concern.

**6.2.3 Factor: Effects on Land-Based Economies**

***Elements: Forestry, Tourism and Mining***

Project impacts to forestry, tourism and mining are anticipated to be minimal with the use of standard construction techniques and the general conditions in the *Site Permit Template*.

***Element: Agriculture***

Impacts to agriculture in Lyon County are anticipated to be minimal with use of standard construction techniques and the general conditions identified in the *Site Permit Template*. The Project would remove approximately 0.1 percent of the nearly 367,000 acres of cultivated cropland in Lyon County. At the end of the Project's useful life, a minimum of 25 years, the Project may be decommissioned and the land could be restored to agricultural use.

Although the impacts to agriculture in the county are anticipated to be minimal, a permit condition requiring development of an Agricultural Mitigation Plan would help to ensure that

the Project is designed, constructed, operated and ultimately restored in a manner that would allow the land to be returned to its original agricultural use in the future.

Minnesota Rule 7850.4400, Subpart 4, allows for the use of up to 0.5 acres of prime farmland per MW in most areas unless there is no feasible and prudent alternative. Approximately 93 percent of the site (478 acres) is considered to be prime farmland or prime farmland if drained. In comparison, approximately 92 percent (5,000 acres) of the Project Area and 79.3 percent (366,368 acres) in Lyon County are considered to be prime farmland or prime farmland if drained. The site comprises approximately 0.1 percent of prime farmland in Lyon County. Marshall Solar anticipates that up to 364 acres would be used for the proposed Large Electric Power Generating Power Plant. Application of Minnesota Rule 7850.4400 would limit the Project to use of no more than approximately 31 acres of prime farmland unless there is no feasible and prudent alternative.

#### **6.2.4 Factor: Effects on Archaeological and Historic Resources**

Project impacts to archaeological and historic resources are anticipated to be minimal with use of standard construction techniques and the general conditions identified in the *Site Permit Template*.

The procedures outlined in Section 4.2.16 of the *Site Permit Template* provide an outline of the process for resolution should any previously unknown archaeological resource or human remains be encountered.

#### **6.2.5 Factor: Effects on Natural Environment**

##### ***Element: Air***

Project impacts to air quality are anticipated to be minimal with the use of standard construction techniques and the general conditions in the *Site Permit Template*.

##### ***Element: Surface Water***

Project impacts to surface waters from are anticipated to be minimal with the use of standard construction techniques and the general conditions identified in the *Site Permit Template*.

##### ***Element: Wetlands***

Project impacts to wetlands are anticipated to be minimal with the use of standard construction techniques and the general conditions in the *Site Permit Template*.

***Element: Soils***

Project impacts to soils are anticipated to be moderate with the use of standard construction techniques and the general conditions in the *Site Permit Template*.

A permit condition, perhaps incorporated in an *Agricultural Mitigation Plan*, to preserve topsoil, establish and maintain a ground cover that minimizes the potential for erosion, and minimize soil compaction would help to ensure that the Project is designed, constructed, operated and ultimately restored in a manner that would allow the land to be returned to its original state in the future.

***Element: Groundwater***

Project impacts to groundwater are anticipated to be minimal with the use of standard construction techniques and the general conditions in the *Site Permit Template*.

***Element: Vegetation***

Impacts to vegetation are anticipated to be moderate with the use of standard construction techniques and the general conditions in the *Site Permit Template*.

In addition to the general conditions in the *Site Permit Template*, a vegetation management plan, such as required in Commission permits for High Voltage Transmission Lines, should be developed. The plan should formalize measures to minimize the disturbance and removal of vegetation for the Project, prevent the introduction of noxious weeds and invasive species and re-vegetate disturbed areas consistent with the safe and reliable operation of the Project and maintain the ground cover to minimize erosion and stormwater runoff.

***Element: Wildlife***

Impacts to wildlife are anticipated to be minimal to moderate with the use of standard construction techniques and the general conditions in the *Site Permit Template*.

**6.2.6 Factor: Effects on Rare and Unique Natural Resources**

The Project does not appear poised to impact any identified rare and unique natural resources. Recommendations for the northern long-eared bat can be included in the Site Permit. Otherwise, impacts should be minimal with standard construction techniques and the general conditions in the *Site Permit Template*.

## **6.2.7 Factor: Project Design**

### *Element: Design Options to Maximize Energy Efficiencies*

Marshall Solar has attempted to design the Project to maximize energy efficiency by minimizing the overall footprint of the facility and locating it close to the point of interconnection to minimize the length of transmission line.

### *Element: Design Options to Accommodate Potential Expansion*

There is insufficient information in the record to fully assess the Project's ability to expand its generating capacity. Marshall Solar has designed the proposed facility in accordance with agreements with landowners, environmental and siting constraints specific to the Project Area, its power purchase agreement with Xcel Energy, and its interconnection agreement at the Lyon County Substation. Marshall Solar's ability to expand its facility depends upon a number of criteria, including:

- interest in additional solar power from Xcel Energy or another off-taker for the energy
- availability of additional land from willing landowners;
- suitability of additional land to support a PV facility; and
- capacity at the substation to deliver the power into the grid.

If Marshall Solar could meet those criteria, and had interest in expanding the Project, they would need to seek a modification to the Site Permit from the Commission or, more likely, file a new Site Permit Application.

### *Element: Design Options to Mitigate Adverse Environmental Effects*

A description of mitigative measures that could be used to avoid and minimize impacts is included in the descriptions of impacts in Section 5. To the extent that special conditions may be appropriate for particular Elements, those mitigative measures are identified in the individual subsections.

## **6.2.8 Factor: Use of Existing Large Electric Power Generating Plant Sites**

The Marshall Solar Project does not make use of existing Large Electric Power Generating Plant sites. A solar facility's unique siting requirements, particularly the relatively large land requirements, preference for a site without large structures that may limit solar access, and the need for willing landowners, make using existing power plant sites more challenging.

## **6.2.9 Factor: Electrical System Reliability**

Electrical system reliability was addressed in a separate docket (eDocket 14-162). The Marshall Solar 62.25 MW Solar Project was determined by the Commission to be an appropriate segment of Xcel Energy's solar portfolio. Reliability was also a focus of the Project's Midwest Independent System Operator interconnection review.

### **6.2.10 Factor: Design-Dependent Costs**

This 62.25 MW Project is the second largest solar proposal to date in Minnesota. The centralization of that energy production in one location creates efficiencies for construction, infrastructure, transmission and interconnection costs. Marshall Solar has developed the Project using fixed solar arrays, which it believes will reduce both capital and operations costs.

### **6.2.11 Factor: Irreversible and Irretrievable Commitments of Resources**

A commitment of resources is irreversible when its primary or secondary impacts limit the future option for a resource. An irretrievable commitment refers to the use or consumption of resources that is neither renewable nor recoverable for later use by future generations. The commitment of resources refers primarily to the use of nonrenewable resources such as fossil fuels, water, and other materials (aggregate minerals, steel/metals, etc.).

Construction activities would require the use of fossil fuels for electricity and for the operation of vehicles and equipment. Use of raw building materials for construction would be an irretrievable commitment of resources from which these materials are produced. The use of water for dust abatement during construction activities would be irreversible. Commitment of labor and fiscal resources to develop and build the project is considered irretrievable.

### **6.2.12 Factor: Unavoidable Impacts**

Where feasible, the EA suggests mitigation measures to be incorporated into the planning, design, and construction of the proposed project to substantially eliminate the adverse impacts. In other areas of consideration, adverse impacts can be reduced but not eliminated and are therefore determined to be unavoidable. Most unavoidable adverse impacts would occur during the construction phase of the proposed project and would be temporary.

A review of impacts and possible mitigation measures is located in Chapter 5 of this document; the unavoidable adverse effects caused by the proposed project that would remain after applying mitigation measures are discussed in Chapter 6.

Unavoidable adverse effects related to proposed project construction would last only as long as the construction period, and would include the following:

- Soil compaction, erosion, and vegetation degradation;
- Disturbance to and displacement of some species of wildlife;
- Disturbance to nearby residents;
- Traffic delays in some areas; and
- Minor air quality impacts due to fugitive dust.

Unavoidable adverse effects related to proposed project that would last at least as long as the life of the project would include the following:

- The addition to the visual landscape of PV arrays, chain-link security fencing, and overhead gen-tie lines; and
- Changes in land use at the site.

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