



AN ALLETE COMPANY

CONSUMER GUIDE TO **SOLAR POWER**





EnergyForward



A RELIABLE PATH TO 90% RENEWABLE ENERGY AND REPLACING COAL BY 2035 WHILE MAINTAINING 24/7 RELIABLE ENERGY TO CUSTOMERS

We're adding new renewable resources and energy storage, positioning to meet increasing demand for energy, reducing carbon emissions, and ceasing coal at Boswell Energy Center for our customers.

Through this diverse combination of resources, Minnesota Power will meet the requirements of the state of Minnesota's carbon-free standard while continuing to safeguard energy security, provide reliable electric service to customers and invest in our region.



mnpower.com/energyforward

TABLE OF CONTENTS

3 HOW DOES SOLAR WORK?

4 THE PARTS OF A PV SYSTEM

6 IS SOLAR RIGHT FOR ME?

6 SOLAR RESOURCE

6 EFFICIENCY FIRST

8 SITE ASSESSMENT

9 COST OF SOLAR

10 WHERE DO I START?

11 5 STEPS TO SOLAR

14 NET ENERGY METERING

15 UNDERSTANDING YOUR BILL

16 INCENTIVES

18 GLOSSARY

20 RESOURCES

21 APPENDIX

21 INTERCONNECTION PROCESS FLOW

22 APPLICATION PROCESS

24 SAMPLE APPLICATION

40 CERTIFICATE OF COMPLETION



This guide is intended for solar PV systems 40 kW and under. Contact Minnesota Power for information regarding systems larger than 40 kW, as there may be other considerations.

ENERGY FROM THE SUN

Minnesota Power has long encouraged the adoption of renewable energy such as solar. We began offering rebates for customer-owned solar energy systems through our SolarSense program in 2004. Today, as interest in capturing energy from the sun increases and the costs associated with solar power decrease, we continue to help customers understand how they use energy and how to get the most value from their energy investments.

This guide will help you learn how you can use the sun to power your home or business and walk you through the process of installing a solar photovoltaic system.



HOW DOES SOLAR WORK?

Solar power is energy harnessed from the sun's rays. We can make use of that energy in three main ways: passive, thermal, and photovoltaic, or PV, systems.

Passive solar energy systems use building design to maximize or minimize the energy found in sunlight for heating, cooling, and lighting. Solar thermal technologies use the heat energy from the sun to heat water or air. Solar PV systems generate electricity directly from sunlight by way of solar panels. While all of these are available in our region, this guide focuses on solar PV systems.

The panels used in PV systems are made up of solar cells that convert sunlight into electrical energy in the form of direct current, or DC. That energy is then routed into an inverter

which converts the energy from DC to alternating current, or AC, that can be used to serve the electrical needs in your home or business.

There are three main types of solar PV systems: grid-tied, grid-tied with battery backup, and stand alone. Grid-tied and battery backup systems are by far the most commonly installed solar PV systems in the market today. Customers considering a stand-alone solar PV system should work with their solar installer to ensure that the system is sized and sited properly to meet their electrical needs. Costs and maintenance requirements vary among these three systems.

GRID-TIED (PV) SYSTEM

- Most common.
- Least expensive.
- Requires least maintenance.
- Connects directly to the electric distribution grid.
- Produces electricity used to power the loads in your home or business. Any excess energy is sent back into the utility grid to be used elsewhere.
- Automatically disconnects when there is an outage in order to prevent damage to equipment or personnel.

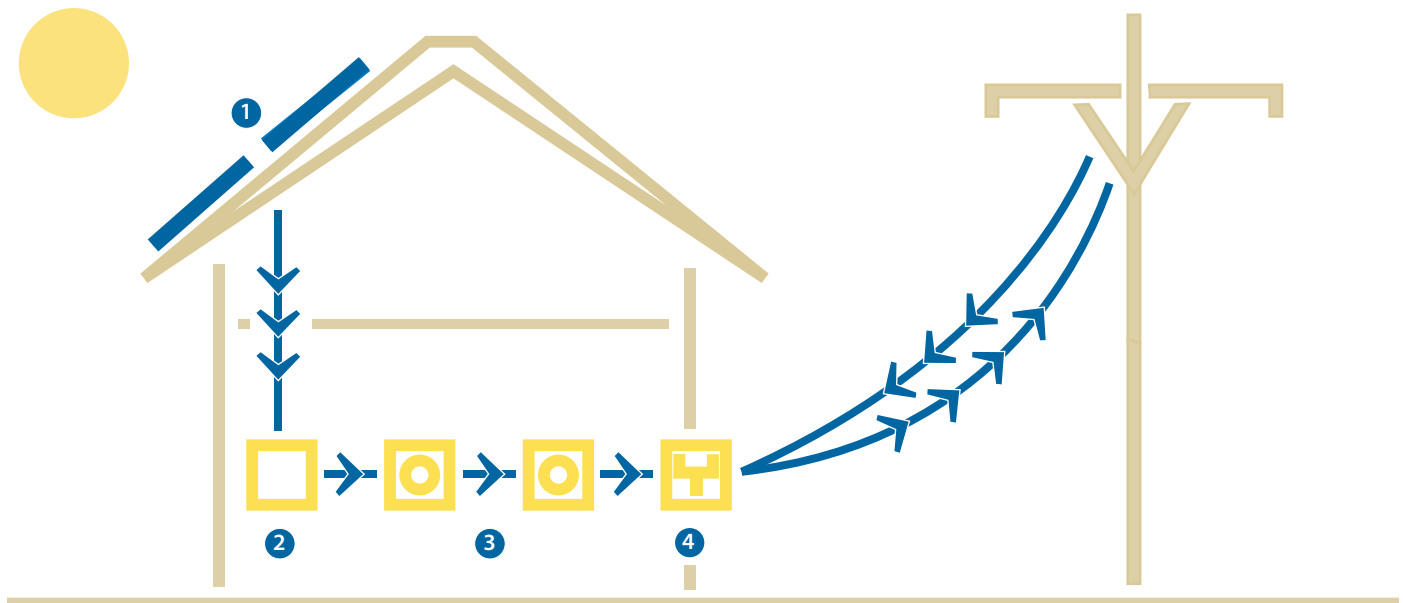
GRID-TIED WITH BATTERY BACKUP SYSTEM

- Less common than standard grid-tied systems.
- More expensive than standard grid-tied systems.
- Requires more maintenance.
- Has a battery component that allows it to continue functioning when there is a utility grid outage.
- Batteries aren't typically meant to power an entire home for a long period of time.
- Commonly installed when there is a need to back up critical loads.
- Has additional interconnection requirements.

STAND-ALONE SYSTEM

- Least common type of PV system.
- Most expensive of the three types of PV systems.
- Operates independently of the grid.
- Commonly used in remote areas where the cost of bringing utility power to a site is very high.
- Must be carefully planned to match the home's energy needs to the system's size and storage capabilities.

THE PARTS OF A SOLAR PV SYSTEM



Solar PV systems capture sunlight and convert it into electricity that can be used to power your home or business. Basic grid-tied solar systems consist of solar panels, inverters, racking, meters and disconnect switches. Optional components include monitoring systems and batteries.

1 Solar panels or modules. Individual solar cells are connected in groups called panels or modules. When the sun hits a solar panel, it allows photons, or particles of light, to knock electrons free, creating a DC flow of electricity. There are three main types of solar panels:

Monocrystalline. These panels have the highest efficiency due to the process of forming the silicon crystals. Because of their high efficiency, they are also more expensive than other solar panel technologies available today. This technology is ideal for roof-mounted systems because it is the most space efficient. You need fewer panels to produce the same amount of energy as other types of solar panels.

Polycrystalline. Polycrystalline solar panels are created using a less-intensive method of forming the silicon crystals. They tend to be slightly less efficient than monocrystalline panels but also cost less.

Amorphous or thin film: These panels are relatively inexpensive to produce but also have the lowest conversion efficiency of the solar panel technologies. Some amorphous panels are flexible and can be used in a variety of applications. This technology is suitable for large rooftops or open fields because it takes more thin-film panels to produce the same amount of electricity as traditional silicon panels.

2 Inverters. The DC electricity generated by solar panels is converted into AC by inverters. All grid-tied inverters are designed to disconnect from the utility grid when the utility experiences a disruption in power because of an unexpected outage or scheduled maintenance. Two main types of inverters are used in grid-tied solar applications:

String Inverter. String inverters are the most commonly used inverter for grid-tied PV systems. They allow the electricity output from multiple modules to be converted from DC to AC at the

same time. Although they may be built to handle Minnesota's harsh weather, they are likely to last longer and perform better in a protected environment.

Microinverter. With these inverters, the conversion from DC to AC takes place at each individual solar panel. The inverters are affixed to the back of each panel and control only that panel. Microinverters can diminish the effects of shade on a PV system's total output because each solar panel has its own microinverter. If only one section of the solar array is shaded, it won't affect the rest of the system's output. Since these inverters are connected to the solar panel, easy access to the panels needs to be maintained.

- 3 Meters.** Installing a solar PV system requires exchanging your current meter for a bidirectional meter and installing a second meter for measuring the production from your solar PV system.

Bidirectional meters record the energy that you consume from Minnesota Power and the energy that you send to Minnesota Power. Every monthly bill subtract backfed energy from consumed energy. The net usage could be a positive number, meaning you used more energy than your solar system generated. Or, the net usage could be a negative number, meaning your system generated more energy than you used and the excess was sold to Minnesota Power. Information from this meter is used for billing and allows Minnesota Power to credit your account for excess generation that your system produces during the billing cycle.

Production meters track the actual amount of electricity produced by your solar PV system. It is not used for billing purposes. Minnesota Power will provide the production meter and meter socket to customers installing a grid-tied solar PV system. However, ownership of the meter socket will be transferred to the customer and any future meter socket maintenance will be the customer's responsibility. The production meter must be installed within 10' of the bidirectional meter.

- 4 Disconnect Switches.** These switches are required on all grid-tied solar systems. One disconnect switch is located on the DC side of the inverter and is often

integrated into the inverter. Another disconnect is required on the AC side of the inverter. The disconnect switches allow utility and fire safety personnel to verify that the system is safely disconnected from the utility grid while performing maintenance or responding to an emergency. Minnesota Power requires that a disconnect switch on the AC side of the inverter be a visible open, lockable disconnect located within 10 feet of the utility meter. This allows the disconnect switch to be readily accessible at all times.

Other Parts of a PV System

Racking. PV modules are attached to the roof of a building or to a ground-mounted structure with racking. Consider wind and snow loads when choosing the racking method for your system. Ground-mounted "tracking" systems also are available. They use motors to track the sun throughout the day and move the solar array for optimal sun exposure. While trackers do increase the production, they also increase the cost of the system and are more susceptible to malfunctioning parts.

Balance of System. Many small parts are needed to complete a PV system. This can include wires, conduit, junction boxes, and wire management. Costs for these components can range significantly and depend on the unique circumstances of each installation.

Monitoring Systems. An optional component, monitoring systems can usually be added to your solar PV system for a fee. These can typically be purchased through the inverter manufacturer, your installer, or a third-party vendor and allow you to see performance metrics of your system. Some of this information may also be available on your inverter's display screen. Many inverter manufacturers include monitoring as a part of the inverter purchase.

Batteries. In grid-tied systems, batteries may be used as optional backup power. During a power outage, basic grid-tied systems are designed to automatically disconnect from the grid, meaning the customer would be out of power. Battery backup systems allow the solar PV system to disconnect itself from the utility grid but continue to operate using energy stored in the batteries. Battery-based systems are more expensive and require more maintenance than basic grid-tied systems.

IS SOLAR RIGHT FOR ME?

Reasons for investing in solar energy are as individual as each customer. But whatever your motivation, you'll want to consider how much sun is available at your site and how much a solar installation will cost.

SOLAR RESOURCE

Solar resource refers to the amount of solar energy available in a given area and is measured in two ways: irradiance and insolation. Solar irradiance is the amount of instantaneous power that falls on a given area at a single point in time while solar insolation measures the irradiance over a defined period of time. Installers use solar insolation to help predict the output of a PV system.

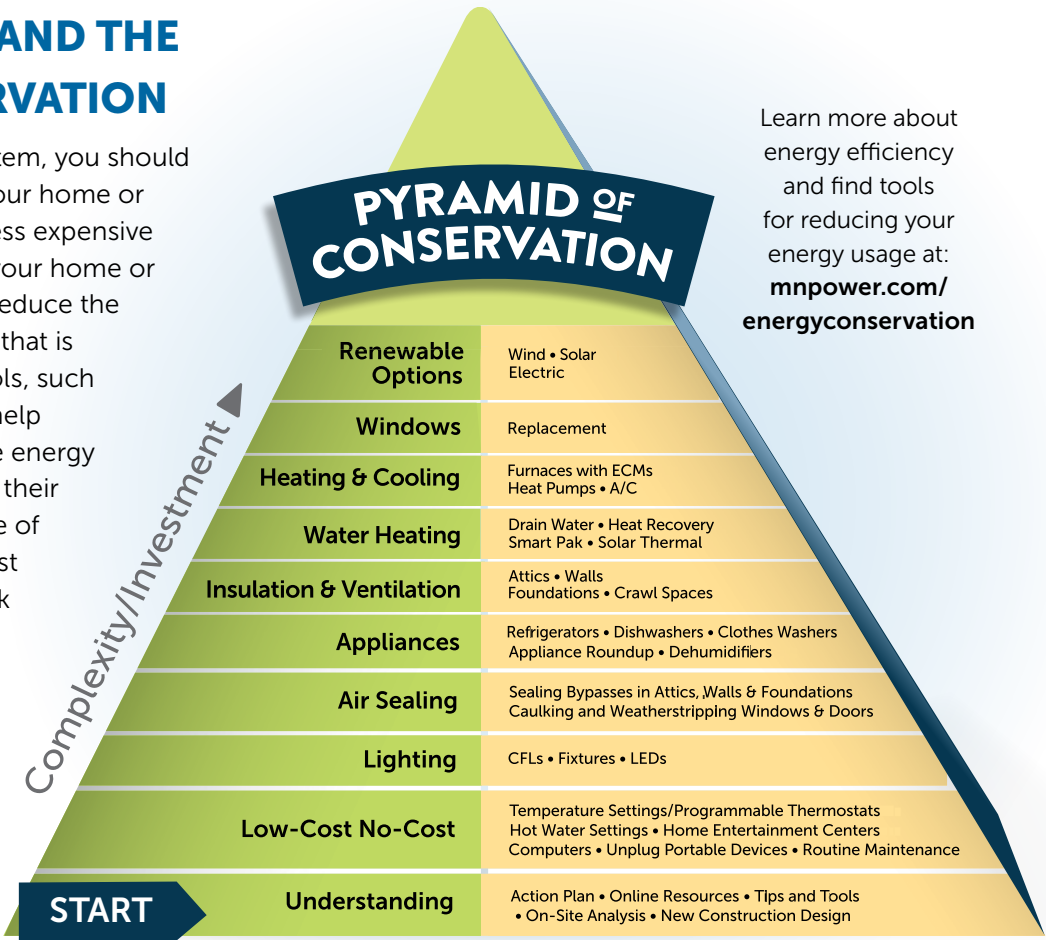
Many tools are available to help customers calculate how much electricity a PV system is expected to produce. PVWatts, for example, is an online tool developed by the National Renewable Energy

Laboratory that allows customers to enter their location and the size of their proposed PV system. It then uses local weather data and information about the proposed system to determine estimated production and energy value. Find the calculator at pvwatts.nrel.gov

While it is true that Minnesota does not have the best solar resource in the country, you may be surprised to learn that we do have a solar resource similar to some areas in Texas and Florida. It is also important to note that solar PV systems can actually perform better in cooler climates like Minnesota.

ENERGY EFFICIENCY AND THE PYRAMID OF CONSERVATION

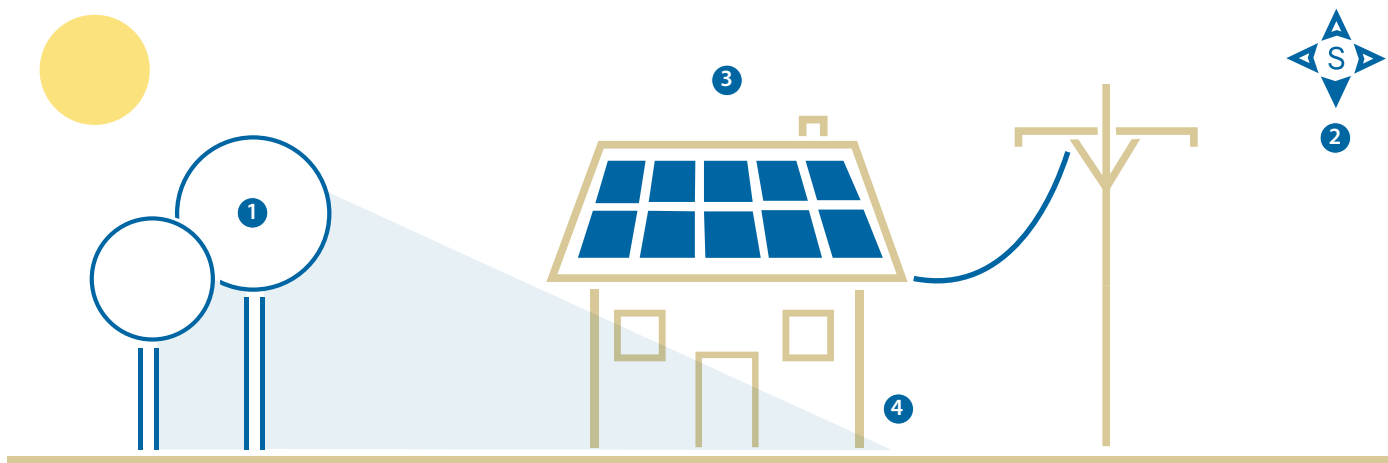
Before deciding to install a solar system, you should first reduce the amount of energy your home or business uses. Energy efficiency is less expensive than energy production so making your home or business more energy efficient will reduce the size and cost of the solar PV system that is needed. Minnesota Power offers tools, such as the Pyramid of Conservation, to help customers understand how they use energy and make informed decisions about their energy investments. Start at the base of the pyramid with low-cost or no-cost energy efficiency upgrades and work your way up to more expensive or more complex energy investments, such as renewable energy options like solar.



While it may seem logical that more sunshine means more solar power, this is not always the case. In some areas, such as the Southwest, the sun's intensity actually hinders the operation of rooftop solar panels. In fact, with the same amount of sunlight, solar panels in cooler areas generally produce more electricity than those in locations with intense heat.

Edison Electric Institute, www.eei.org





SITE ASSESSMENT

When planning the location and design of your solar PV system, it is important to conduct a site assessment to identify specific conditions that can affect energy production and overall system design. Shade, orientation, roof characteristics, utility interconnection, aesthetics and accessibility all play a role in the design and cost of the system and should be identified by your installer upfront.

1 Shade

Shade can make a big difference in how much energy a PV system produces. The shade cast by trees, nearby houses or buildings, chimneys and even power lines should all be considered when deciding where to locate your solar system. Tools such as the Solmetric SunEye and Solar Pathfinder can identify where shade will occur at different times throughout the year and are used by installers during a site assessment to develop a shade analysis. In addition to existing obstructions, it's important to think about the possibility of developments or structures that could shade your PV system in the future. Generally, an ideal site for producing solar power should be free of almost all shade from 9 a.m. to 3 p.m.

2 Orientation

Whether your system is roof or ground mounted, you will need to consider the orientation of your solar PV system. Orientation refers to the azimuth, or direction that the modules face, and the tilt, or angle of the modules. In our region, the ideal orientation for maximum output is when the array faces south, or at a 180 degree azimuth, with a tilt angle of 45 degrees.

3 Roof Condition

For roof-mounted systems, you will want to consider your roof's condition and structural integrity before installation. Solar PV systems will add a variety of stresses to your roof, including additional weight. Any necessary roof maintenance should be done before or in conjunction with the installation to avoid having to remove the system later to make repairs.

4 Accessibility

Locate your PV system in such a way that it is easily accessible for routine maintenance such as removing snow or cleaning modules, troubleshooting performance issues or replacing worn or damaged parts. Roof installations also must meet all clearance requirements in order to avoid potential hazards.



SOLAR ENERGY ANALYSIS PROGRAM

A Solar Energy Analysis (SEA), free for Minnesota Power customers, is a great way to get more information about whether solar power is a good fit for you. During an SEA, a representative from Minnesota Power will visit with you about your home or business, analyze your site, help you understand the interconnection process and point out site-specific conditions that could affect an installation.

Contact Minnesota Power at 218-355-3720 or renewableprograms@mnpower.com to schedule a Solar Energy Analysis.

UTILITY INTERCONNECTION

In a grid-tied system, you must apply for connection to the utility's distribution grid. The application should be submitted early in the process to ensure that utility requirements are incorporated into the system design. In addition, your interconnection application must be approved by Minnesota Power before the system is installed. Systems installed prior to obtaining approval from Minnesota Power are done at the risk of the customer.

COST

The costs of solar PV systems vary depending on technology, system type, and size, and are typically referred to as hard costs and soft costs. Hard costs are the actual PV system components such as solar modules, inverters, disconnect switches, wires, conduit

and meters. The soft costs refer to the customer acquisition costs, installation time and labor, travel and local permitting or application fees. These two figures together represent the total installed cost of the system which is typically expressed as \$/watt.

The cost to install solar has dropped dramatically over the last decade, making solar more cost effective than ever. According to the Lawrence Berkeley National Laboratory, the cost of a solar PV system in Minnesota has dropped from more than \$9/watt to an average of \$3.20/watt today.

Despite the declining costs, solar PV systems remain a large investment and usually require a sizeable upfront payment. We encourage you to consult multiple installers and explore different manufacturers and products in order to ensure that you are getting the most competitive price for your system.



WHERE DO I START?

Installing a solar PV system is a collaborative process. The customer, installer, electrician, local inspector and Minnesota Power should work together to ensure that the PV system operates safely and reliably. Involving Minnesota Power early in the process will help you understand the interconnection process, as well as the standards and requirements for installing a solar PV system connected to Minnesota Power's electric grid. Ensuring that these requirements are incorporated into the design of the system before construction will help you save time and money on your investment.

INTERCONNECTION REQUIREMENTS

To ensure safe installations, all grid-tied PV systems must meet relevant provisions of the National Electrical Code (NEC), the Institute of Electrical and Electronics Engineers (IEEE 1547), Minnesota Statute 216B.164, Minnesota Rules Chapter 7835 and electric utility requirements. Installations must also comply with all local permitting and zoning codes, fire codes, building codes, safety codes and local and federal laws, rules and requirements. The customer is responsible for ensuring that the installer follows all applicable rules and codes, including Minnesota Power's interconnection process and requirements.

For more information about specific interconnection requirements, visit www.mnpower.com/distributedgeneration

5 STEPS TO SOLAR

Contact Minnesota Power as soon as possible after you decide to go solar. We'll help you start the important interconnection process and identify some key factors to keep in mind as your installation gets underway. Follow these steps to install and connect your system and you'll be on your way to generating your own clean energy!

1

Select an installer

Hiring a qualified solar installer is key to getting an efficient system and the most value from your investment.

Installing a solar system should be treated the same as any major construction project: get multiple bids to ensure a competitive price, request references from past customers and review systems already installed to gauge the installer's experience. In addition, review your energy consumption and talk with your installer about your usage. Understanding trends in your energy consumption may affect the design of the system you choose to install.

Solar installers typically conduct a site assessment that includes a visit to your home to analyze potential shade issues, orientation of the system, size and pitch of your roof and other factors. The assessment may be offered as a free service or you may be charged a fee. Installers may provide other services, such as facilitating the application process and securing permits, as part of their offer. Some installers may also include a warranty on their workmanship. Be sure to ask what types of warranties are available when comparing installers and what post-installation factors may affect the warranty.

QUESTIONS TO ASK YOUR INSTALLER:

- » *Are you certified with the North American Board of Certified Energy Practitioners (NABCEP) or do you hold any other nationally recognized solar installer certifications?*
Minnesota Power requires a NABCEP or UL certified installer to qualify for rebates under its SolarSense program.
- » *Do you have any experience working with local building officials and utility representatives?*
- » *Can you provide references from previous customers?*
- » *Do you offer a warranty on the installation?*
- » *What is the expected output of the system and who is responsible if the expectations are not met?*
- » *What is the cost per watt on this proposal?*
Be sure to get quotes from multiple installers to compare.
- » *What is the warranty period of the equipment and the installation?* There are equipment warranty requirements to participate in Minnesota Power's SolarSense program but you should also be sure that your installer has a warranty on the installation of the system.
- » *What type of down payment or deposit is required and under what terms (refundable, non-refundable)?*

2

Submit an Interconnection Application

Once you have selected a solar installer and designed a system that meets your needs, the next step is to submit an application to Minnesota Power for connecting your system to the distribution grid.

Make sure your application is complete, including a one-line diagram of the planned system, site drawing, equipment specification sheets, and any other required information in order to ensure a timely review. Installers often will complete the interconnection application for you but because the interconnection agreement is between you and Minnesota Power, it's important that you understand the requirements and what is being submitted. You must submit a MnDIP application for all interconnections. If you are applying for SolarSense rebates, a supplemental application is also required. A \$150 application fee applies for each application for systems under 20kW. This includes a \$50 surcharge that is directed to the MnPUC. Fees may be submitted to Minnesota Power by check to: Renewable Programs 30 W Superior Street, Duluth, MN 55802. It is also possible to have the fee added to a customer account, or installer account for online payment.

3

Preliminary Review

Once you have submitted a complete interconnection application, Minnesota Power will conduct a preliminary review.

A Minnesota Power representative will come to your site to assess the planned system and your current service to identify site-specific conditions that may affect the installation. During the preliminary review, equipment from the utility transformer to the customer's service equipment will be evaluated. This evaluation includes, but is not limited to, meter sockets, transformers, weather heads and clearance issues. If any hazards are identified, you will be notified at this time. Minnesota Power will work with you to understand the hazards, evaluate ownership and cost details of the issues in question, and identify possible solutions.

The preliminary review process allows Minnesota Power to ensure that all distributed generation systems are installed in a safe, consistent and reliable manner. It is important that you do not begin construction of your system until the preliminary review is completed and approved.

4

Installation

You can begin building your PV system after receiving approval from Minnesota Power.

All solar PV systems must be inspected by a state or local inspector after they are completed and before being energized. After the system has passed an electrical inspection, contact Minnesota Power to schedule the final commissioning test. This test allows Minnesota Power to verify that the system was installed as planned and that there are no safety concerns relative to the interconnection.

If there are any changes to the system components or design during the installation process, notify Minnesota Power prior to installation. Changes may require you to submit a new interconnection application and restart the process. It is important for changes to be approved to ensure the system passes the commissioning test and timely interconnection can occur.

5

Connect to Minnesota Power

The final step is to connect your system to Minnesota Power's distribution grid.

Once your system meets all commissioning requirements, your existing meter will be exchanged with a bidirectional meter, a production meter will be installed, and your rate will be changed, generally to a net energy metering rate. The bidirectional and production meters will not be installed until all commissioning requirements are met.

We encourage customers to be cautious about installing solar systems in the fall and winter because snow and frost can complicate the process and even increase installation costs. Be sure to give yourself plenty of time in order to avoid weather-related issues.

A typical solar module will be rated to produce 350-450 watts, weighs 45-55 pounds, and is about 18-22 square feet in size.

The United States has officially exceeded five million solar installations, marking a significant achievement in the nation's clean energy transition. This milestone comes just eight years after the U.S. reached one million installations in 2016, a milestone that took 40 years to achieve following the first grid-connected solar installation in 1973.

Solar Energy Industries Association (SEIA)

NET ENERGY METERING

Depending on the size of the system that you choose to install, you may be eligible for net energy metering, also called NEM. NEM is a rate offered to Minnesota Power customers that credits the customer's account for any excess electricity that the PV system generates.

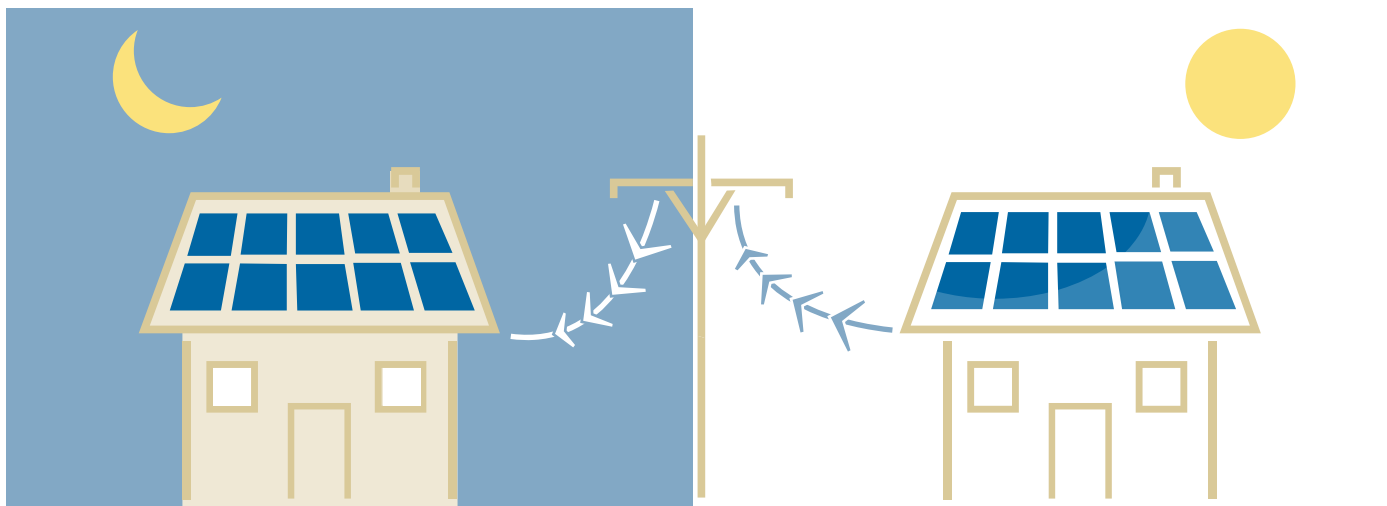
A solar PV system may produce more or less electricity than is needed in your own home or business at any given time during the month. When your system produces electricity, it first will flow to loads in the home or business. When the system produces more than you need to meet your own needs, the excess energy is sent to Minnesota Power. If you produce more than you use in a billing month, you receive a credit for the excess production. Likewise, if your system does not produce enough electricity to serve your needs, you will be able to take energy from the grid at the current rate.

Because you could be taking electricity from the grid and sending electricity to the grid, you will need a special meter that can track energy forward and backward. This bidirectional meter must be installed by Minnesota Power before your solar PV system is energized so your system's production can be properly credited.

WHY IS THE GRID IMPORTANT?

The grid refers to the poles and wires that deliver electricity to your home or business. All customers must pay to build, operate and maintain the grid infrastructure to ensure a safe and reliable energy supply.

Customers with grid-tied solar PV systems use the grid 24 hours per day, whether they are using it to purchase electricity or using it to sell excess electricity through net energy metering.



Production from a PV system rises and falls with the sun. During the night when solar panels aren't generating, you're meeting your power needs by drawing electricity from the grid. During the day, as electricity production increases, there may be times when your system produces more than enough electricity to meet your needs and excess power is sent onto the grid. Either way, a grid-tied solar system uses the grid 24 hours per day.

INCENTIVES

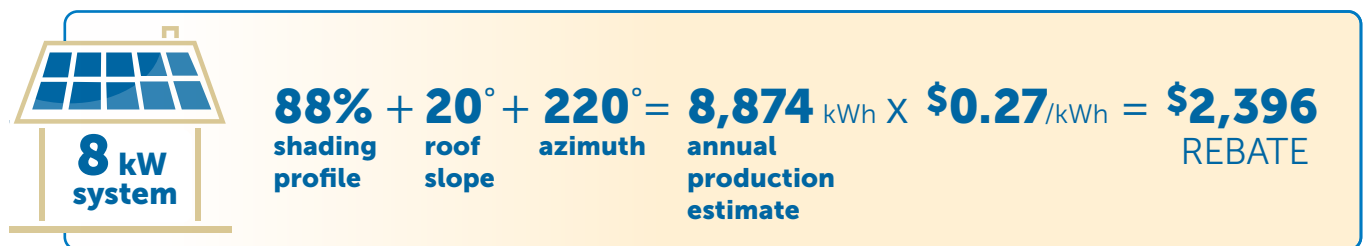
The cost to install solar at homes and businesses has dropped significantly, but many customers still rely on financial incentives to make going solar affordable. Talk with Minnesota Power, your solar installer, or your tax professional to learn more about how you can qualify for rebates or tax credits.

SOLARSENSE

Minnesota Power's SolarSense program provides rebates to income-qualified customers who install solar at their home. The rebates reduce the upfront costs of installing a solar PV system, making solar a more affordable option for more people.

SolarSense rebates are awarded on a lottery basis. Customers will receive a rebate status notice once the funds have been allocated. Applications will be accepted for three business days starting March 1 each year. If more applications are received than funds available, customer projects will be placed on a waitlist. Annual budgets for the SolarSense program are approved through 2027. Please refer to our website for up-to-date information about how much funding is available.

The SolarSense rebate is based on how much energy a customer's PV system is expected to produce. Calculating the rebate depends on the design of the solar system—including tilt, orientation and shading profile. These parameters are used to create an estimate of annual energy production from PV Watts, a publicly available tool developed by the National Renewable Energy Laboratories (NREL) to estimate energy output from PV systems. To calculate the SolarSense rebate for 2023, a PV system's estimated energy output is multiplied by \$0.27/kWh.



Here's an example: An 8 kW system is installed on a rooftop in Duluth, Minnesota. The roof has a slope of 20 degrees and the modules face southwest at an azimuth of 220 degrees. The Solar Pathfinder shade analysis performed by the installation company and confirmed by Minnesota Power determined the site has a yearly shading profile of 88 percent. According to PV Watts, the average annual production estimate is 8,874 kWh. This estimate is multiplied by \$0.27/kWh, resulting in a total rebate of \$2,396.

Solar PV systems must be installed by a certified solar installer to qualify for SolarSense rebates. A sample interconnection application in the Appendix includes a full list of eligibility requirements for the SolarSense program. More information is available on at: mnpower.com/Environment/SolarSense/

FEDERAL TAX CREDIT

Customers who install a solar PV system on their home or business may be eligible for a federal investment tax credit, or ITC, which helps to reduce the installed cost of the system. Eligible equipment includes solar panels, solar water heaters, small wind systems, and fuel cells. The ITC is available through December 2032. Contact your tax professional to determine if you qualify for this credit or any other credits that might be available. For more information, visit: energy.gov/articles/clean-energy-tax-credits

Based on whether you're using more energy than you're producing or vice versa, your bill may look slightly different. The sample bill below depicts how your bill will look if you are using more energy than you are producing during the month. Please contact Minnesota Power with any questions about your bill at **218-355-3720**.

16



- 1 Your personal **10-digit account number**.
- 2 The **graph** depicts a two-year record of your electric power (kilowatt-hour) use, as available.
- 3 The **Residential Service Rate** code identifies your classification of service. This example is of a residential home generating solar power.
- 4 **Total Usage** (kWh) provided by Minnesota Power during a billing period
- 5 **Subtractive Metering** shows the amount of energy that you used from Minnesota Power minus the amount of energy that you sent to Minnesota Power to get your monthly net usage. The net usage is the energy that your Minnesota Power bill is based on.
- 6 **Service Charge** is the minimum monthly fee intended to cover the cost of connection to our system.
- 7 The amount you are **charged per kWh**. This is currently **\$0.10818**.
- 8 The **Fuel and Purchased Energy** charge includes the cost of fuel used in our generation stations and power purchased from other energy providers when needed. Due to the varying costs of fuel, this line item will vary from month to month.
- 9 The **Interim Rate Adjustment** is a mechanism to account for capacity revenues and expenses based on MISO regional generation forecasts and actual generation capacity. This line item will vary from month to month.
- 10 The **Low-Income Affordability Program Surcharge** recovers the costs of an affordability discount program for income-qualified residential customers.
- 11 The **Minnesota Policy Adjustment** includes policy-related costs such as conservation programs and system or resource investments. Items included in this adjustment are:
 - **Conservation Improvement Program** – Our programs and services that promote Minnesota's energy conservation and optimization policy.
 - **Renewable Resources** – Additional renewable energy and transmission to deliver this energy to our system.
 - **Transmission Cost Recovery** – New transmission facilities that are necessary for reliable delivery of the electricity to customers.
 - **Solar Energy Adjustment** – Includes the cost and benefits of solar energy purchased to meet the state's Solar Energy Standard. Because solar energy production will differ from month to month, this portion of the line item will vary.
 - **Solar Renewable Resources** – Includes the costs associated with building and providing solar renewable energy on our system in addition to the solar energy we purchase. These costs are generally updated each year.

UNDERSTANDING YOUR BILL WHEN YOU USE LESS ENERGY THAN YOU PRODUCE

Based on whether you're using more energy than you're producing or vice versa, your bill may look slightly different. The sample bill below depicts how your bill will look if you are using less energy than you are producing during the month. Please contact Minnesota Power with any questions about your bill at **218-355-3720**.

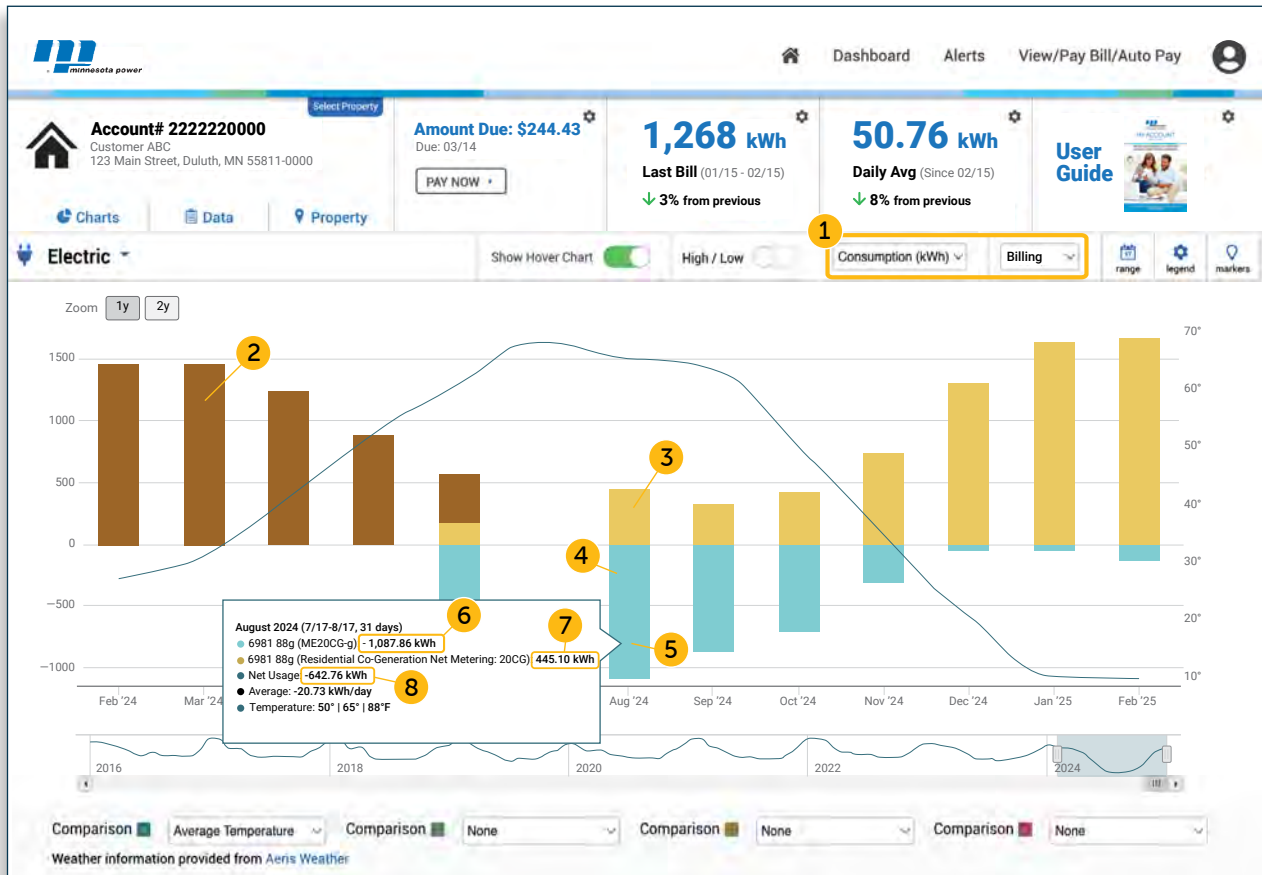
Name: Customer ABC Account: 222220000		Bill Number: 000123456789 Bill Date: May 01, 2025					
123 MAIN ST WRENSHALL MN		3 Residential Co-Generation Net Metering: 20CG 29 Days	Next Scheduled Meter Read: 05/01/2025				
Meter # 000000	Start Date 3/21/25	Start Read 57579.6	Read Code Regular	End Date 04/29/25	End Read 58500.52	Read Code Regular	4 Total Usage 920.92 kWh used
2		Billed for the Last 24 Months		6 Service Charge 9.00 7 CI-Generation Energy Credit -3,718.81 kWh @ \$0.122 -453.69 8 Low-Income Affordability Program Surcharge 2.41 Total charge this period -442.28			
		The average KWH per day for this service is -128.234828 For the same period last year, it was -138 The average daily cost for this service is -\$15.25		5 Subtractive Metering: 9,20.92 - 4,639.73 = -3,718.81			

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- 6 **Service Charge** is the minimum monthly fee intended to cover the cost of connection to our system.
- 7 The amount you are **credited per kWh**. This is currently **\$0.122**.
- 8 The **Low-Income Affordability Program Surcharge** recovers the costs of an affordability discount program for income-qualified residential customers.

SEE HOW MUCH SOLAR ENERGY YOU'RE SENDING TO THE GRID

Use MyAccount, our online energy tracking and account management tool, to see how much energy you consume from Minnesota Power and how much excess solar energy you're sending to Minnesota Power from your own solar system.

Here's a sample dashboard chart from a bidirectional, or billing, meter. The bars show a monthly record of energy sent to Minnesota Power and energy received from Minnesota Power during the same period. Hover over a bar to see more details.



- 1 Set the chart to display "Consumption" and "Billing."
- 2 This bar shows how much energy you used before your solar system was connected to the grid.
- 3 Energy the customer received from Minnesota Power as recorded by the bidirectional meter.
- 4 The amount of energy sent to Minnesota Power through the bidirectional meter.
- 5 Hover over a bar to see more information.
- 6 The amount of energy your solar system sent to Minnesota Power during the month.
- 7 How much energy from Minnesota Power you consumed during the billing period.
- 8 The net amount of energy billed or credited for the billing period.

Login to MyAccount or Sign up at mnpower.com/myaccount

HOW TO VIEW YOUR PRODUCTION METER IN MYACCOUNT

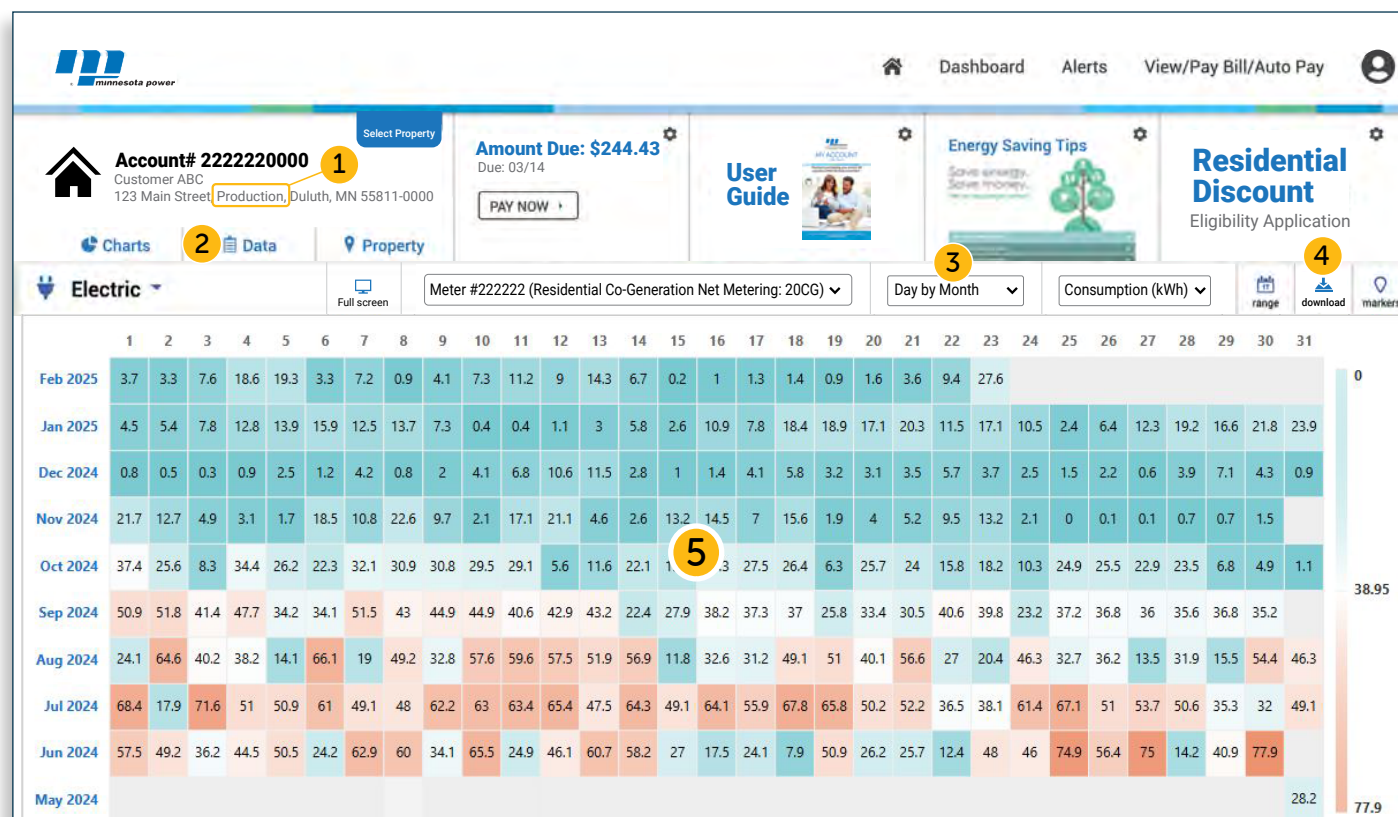
It’s Minnesota Power’s standard practice to install two meters—a bidirectional meter to measure energy you take from and send to the grid to calculate your monthly bill and a separate meter to measure how much solar energy your system produces. The production meter allows you and Minnesota Power to track overall performance of your solar system. Use the “Select Property” tab in the upper left corner to toggle between the production and billing meters.



- 1 After hovering over and clicking on the “Select Property” tab, a dropdown will show the meters available to you.
- 2 The production meter is labeled in the address line. Click on the account box to navigate to the production meter.

SEE HOW MUCH ENERGY YOUR SOLAR SYSTEM PRODUCES

Here's a sample MyAccount dashboard from a production meter. This meter tracks how much electricity is produced by your solar system and is not used for billing purposes. You can see how many kilowatt-hours of electricity your solar system is producing by day, month and hour. It's a great tool for troubleshooting and comparing system performance. Plus, it's simply fun to track your own solar generation.



- 1 The address line shows you are looking at the "Production" meter.
- 2 Choose the data display tab.
- 3 Choose the day by month and kilowatt-hour consumption.
- 4 You can download data for further analysis.
- 5 Data shows the daily production in kilowatt-hours.

GLOSSARY OF COMMONLY USED TERMS

Alternating Current (AC) - AC is the form of electricity that is delivered to your home or business by an electric utility. Solar systems produce DC, which must be converted to AC by an inverter.

Array - A group of connected solar PV modules or panels providing a single electrical output.

Azimuth - Azimuth is the direction measured in degrees from North that the solar installation is oriented.

Bidirectional Meter - The bidirectional or net meter is a specific meter that measures the energy used from Minnesota Power minus the energy sent to Minnesota Power. A bidirectional meter must be installed before the solar system is energized.

Direct Current (DC) - DC is the type of electricity produced by a solar PV system and must be converted to AC prior to being used in a home or business.

Grid - A network of power stations, transmission circuits, substations and power lines that conduct electricity and provide it to homes and businesses for their use.

Grid-tied PV System - A PV system connected to the electric grid. It produces electricity to power your home and any excess energy is sent back to the utility grid. These systems are designed to automatically disconnect from the grid when Minnesota Power is experiencing an outage.

Grid-tied with Battery Backup - A PV system connected to the grid with energy storage capability. These systems have the ability to operate when the utility is experiencing an outage. However, they are not typically designed to power all of your electric needs for a long period of time.

Interconnection Application - An interconnection application must be completed to notify Minnesota Power of your intent to install a solar PV system connected to Minnesota Power's electric grid.

Interconnection Process - The steps that customers must follow in order to connect their system to the electric grid. Minnesota Power's interconnection process is in place to ensure safety, consistency and reliability.

Inverter - A device that converts DC electricity produced by a solar system into AC electricity that can be used in a home or business.

Investment Tax Credit (ITC) - Federal investment tax credit available through December 2032 at 30%.

Kilowatt or kW - A unit of electrical power equal to 1,000 watts, which constitutes the basic unit of electrical demand.

Kilowatt Hour or kWh - A unit of electrical energy equivalent to the use of one kW of electricity for one full hour. Minnesota Power measures customers' electric energy usage based on kWh, and electricity rates are expressed in cents per kWh.

Megawatt or MW - A unit of electrical power equal to 1,000 kW or 1 million watts.

Modules or panels - Groups of solar cells that convert sunlight into electrical energy in the form of direct current, or DC.

North American Board of Certified Energy Practitioners (NABCEP) - A certification available to solar professionals for PV sales, PV installers or solar heating installers. While Minnesota Power does not require that customers use a NABCEP certified installer, we strongly encourage it.

Net Energy Metering (NEM) - NEM is a rate offered to Minnesota Power customers that tracks and credits production from the solar system. This rate is also known as the Rider for Parallel Generation and can be found in the rate book on the Minnesota Power website.

Orientation - A term used to describe the direction that the modules face.

Passive Solar - A form of solar energy that uses building design to maximize or minimize the energy found in sunlight for heating, cooling, and lighting.

Photovoltaic (PV) - A technology that uses a semiconductor (such as silicon) to convert sunlight directly into electricity.

Preliminary Review - An integral step in the interconnection process where a Minnesota Power representative visits your home or business to identify site-specific conditions that may affect your proposed installation. Solar PV systems may not be installed until you have received preliminary review approval from Minnesota Power.

Production Meter - A production meter is used to record the production of your solar system and is not used for billing purposes.

Renewable Energy Credit (REC) - RECs represent the environmental attributes of the power produced from renewable energy projects. As the generator, you are the owner of the RECs associated with your system unless otherwise agreed to in a contract or rate. SolarSense and MiM customers must reassign REC ownership to Minnesota Power.

SolarSense - A solar rebate program available to Minnesota Power customers installing a solar PV system.

Solar Energy Analysis (SEA) - Minnesota Power pilot program available to help customers determine if solar is right for them.

Solar Thermal - Solar technology that uses the heat energy from the sun to heat water or air.

Stand-alone system - Solar PV system that operates completely independently from the electric grid using energy storage technology.

System Size - The nameplate capacity of the solar PV system.

Watt - A unit of measurement of electric power.

RESOURCES

GENERAL RESOURCES

Minnesota Power

mnpower.com/Environment/Solar

PV Watts Calculator

pvwatts.nrel.gov

EPA Building Solar Ready Guide

energystar.gov/products/rooftop_solar

Minnesota Power Interconnection Guidelines

mnpower.com/Company/DistributedGeneration

INSTALLERS

Hiring a Renewable Energy Contractor

mn.gov/commerce-stat/pdfs/going-solar.pdf

North American Board of Certified Energy Practitioners (NABCEP)

www.nabcep.org

CERTS Clean Energy Builder Database

cleanenergyresourceteams.org/questions-ask-companies

mn.gov/commerce-stat/pdfs/solar-directory.pdf

INCENTIVES

Database of State Incentives for Renewables & Efficiency

dsireusa.org

Minnesota Power's SolarSense

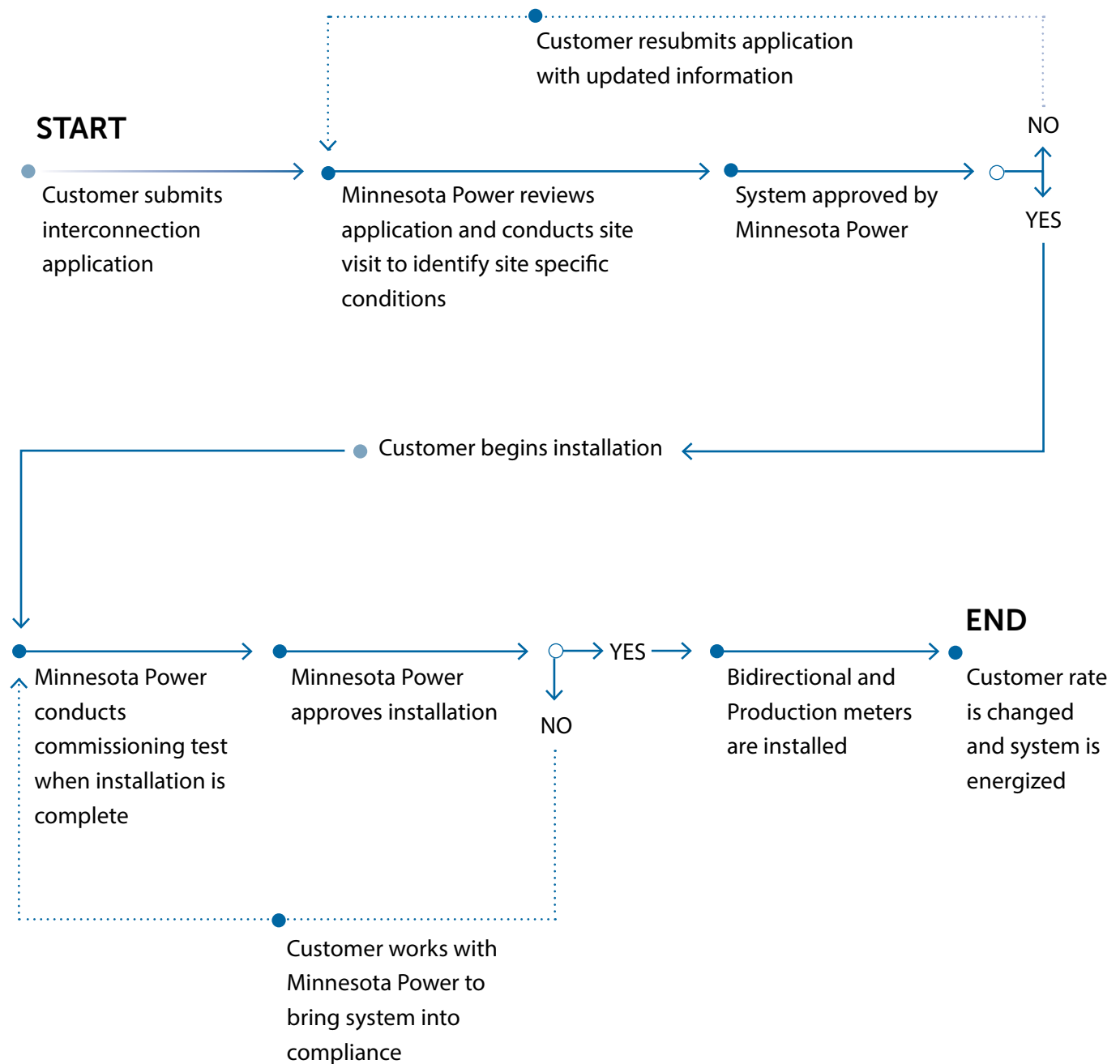
www.mnpower.com/environment/SolarSense

Federal Investment Tax Credit

energy.gov/eere/solar/homeowners-guide-federal-tax-credit-solar-photovoltaics

APPENDIX

MINNESOTA POWER INTERCONNECTION PROCESS – 40 KW AND UNDER



INTERCONNECTION PROCESS – 20 KW AND UNDER

Application

- 1 Applicants should submit a complete interconnection application to Minnesota Power's Renewable Programs via the online application form: https://mnpower.formstack.com/forms/interconnection_simplified_application. A \$150 application fee applies for each application and may be submitted to Minnesota Power by check to: Renewable Programs 30 W Superior Street, Duluth, MN 55802.

Minnesota Power offers two interconnection applications: a simplified application for solar interconnections 20 kW and under, and an interconnection application for solar systems larger than 20 kW and above (See Attachment 3 "Interconnection Application Form").

- 2 Customers seeking rebates through SolarSense must submit applications to Minnesota Power only during the open application period starting March 1 for three business days. Verify that your system meets all of the requirements of Minnesota Power's SolarSense program (if applicable). Rebates are awarded on a lottery basis. If there aren't enough applications received during the open application period, the remaining funds will be available first come, first served.

Preliminary Review

- 3 During the preliminary site visit, equipment from the utility transformer to the customer's service equipment will be evaluated including but not limited to meter sockets, transformers, weather heads, and clearance issues.

If any safety hazards are identified at a customer's site, they will need to be addressed by either Minnesota Power or the customer, with details dependent on the specific hazard. If unsafe conditions exist, customers will be notified after the preliminary review and options will be discussed.

- 4 Minnesota Power will conduct a review of complete interconnection applications within 15 business days of an application that is deemed complete. This includes an engineering review of the application, one-line diagram and site drawing and a preliminary site visit. If additional information is requested, the 15 business day review period will restart once Minnesota Power has received all requested information.
- 5 Some installations may require a detailed engineering study. If an engineering study is required, the customer will be notified at this time. The customer will need to confirm that they would like Minnesota Power to complete the study and agree to pay any costs identified during the study, including the study itself.
- 6 Upon review completion and approval, Minnesota Power will send the customer an approval packet consisting of a formal approval letter, including a SolarSense rebate reservation, if applicable. Customers will also have MN interconnection agreement (MnDIA) or the Uniform Statewide Contract that must be signed and returned to Minnesota Power as well as other important documents. All required documentation must be signed and returned to Minnesota Power prior to system installation.

System Installation

- 7 Once all required documentation has been received and approvals made, the system installation may begin.
- 8 The applicant must notify Minnesota Power when the installation is complete and submit any final documentation including an invoice of the actual installed costs, certificate of completion, M-RETs form and proof of liability insurance (if not already submitted).

Connecting the System

- 9 Upon receiving all applicable documents, Minnesota Power will schedule a commissioning test within 5 business days to verify that the system is installed as was approved in the application.
- 10 If the Minnesota Power representative identifies discrepancies between the installation and the application, updated information will be requested at this time. Any additional information or updates will need to be completed before the meter exchange can occur.

If the system is approved, the net meter and production meter installation will occur at this time. Minnesota Power requires that all distributed generation customers install a production meter within 10 feet from the existing service meter to measure the solar system production (as stated in Minnesota Power construction manual, DCS 4800) unless otherwise agreed upon. Minnesota Power will supply the bidirectional meter, production meter and production meter socket at no direct cost to the customer.

Once the appropriate meters have been installed, Minnesota Power will adjust the customer's current rate to the applicable distributed generation rate. The customer will be notified at this time that the system may be energized for use.

- 11 SolarSense customers will receive their rebate check within six (6) weeks of system completion.

All communication regarding the solar interconnection process or requirements and the SolarSense program should be directed to Minnesota Power Renewable Programs at (218) 355-3720 or renewableprograms@mnpower.com.

Attachment 2: Simplified Application Form**MINNESOTA DISTRIBUTED ENERGY RESOURCES****SIMPLIFIED PROCESS APPLICATION**

The Simplified Process is available only for certified, inverter-based Distributed Energy Resources (DER) no larger than 20 kW that meet the requirements of Attachment 4 and Attachment 5.

This Application is deemed complete when it provides all applicable and correct information required below. The following additional information must be submitted with an application:

- ☐ Single Line Diagram
 ☐ Site Plan with site owner signature if different than Interconnection Customer
 ☐ Specification Sheet(s)
 ☐ Insurance Document

A DER with an energy storage component must additionally complete Exhibit B - For Energy Storage.

A non-refundable processing fee of \$100 must accompany this application.

Interconnection Customer/Owner

Name: _____

Account Number: _____ Meter Number: _____

Mailing Address: _____

Telephone: _____ Email: _____

Application Agent / Company: _____

Telephone: _____ Email: _____

Distributed Energy Resource Information

Location (if different from above): _____

The Distributed Energy Resource is a single generating unit or multiple? ☐ Single ☐ Multiple

The Distributed Energy Resource is or includes energy storage? ☐ Yes (Complete ☐ No

Type: ☐ Solar ☐ Wind Other: _____
Exhibit B - For Energy Storage)

Inverter Manufacturer: _____

Model: _____

AC Rated Nameplate Rating: _____ (kWac) _____ (kVAac) ☐ Single Phase ☐ Three Phase

Export Capability Limited (e.g., through use of a control system, power relay(s), or other similar device settings or adjustments): ☐ Yes ☐ No

If yes, describe: _____

DER capacity (as described in MN DIP 5.14.3): _____ (kWac)

Is equipment certified (i.e. UL 1741 Listed)? ☐ Yes (Certification is a Simplified Process requirement)

Installed DER System Cost (before incentives): _____

Estimated Installation Date: _____

Interconnection Customer Signature [This Section must be completed by the Customer]

The simpler Uniform Statewide Contract replaces the longer Interconnection Agreement (MN DIA) if the conditions of MN DIP 1.1.5 are met. A qualifying customer signing a Uniform Statewide Contract may elect to be additionally provided the MN DIA. Request a MN DIA?: ☐ No ☐ Yes

Disclaimer: Minnesota Power shall notify the Interconnection Customer with an opportunity to request a timeline extension (See MN DIP Section 1.8.2 and 5.2.2.) Failure by the Interconnection Customer to meet or request an extension for a timeline outlined in the MN DIP could result in a withdrawn queue position and the need to re-apply. INITIAL: _____

I designate the individual or company listed as my Application Agent to serve as my agent for the purpose of coordinating with Minnesota Power on my behalf throughout the interconnection process (see MN DIP 1.3.2.) INITIAL: _____

I hereby certify that, to the best of my knowledge, the information provided in this Application is true, and that I have appropriate Site Control in conformance with the MN DIP. I agree to abide by the Terms and Conditions for Interconnecting an Inverter-Based Distributed Energy Resource No Larger than 20 kW (Simplified Process) (see Exhibit A) and return the Certificate of Completion (see Exhibit C) when the DER has been installed.

Interconnection Customer Signature: _____

Name (print): _____ Date: _____

Send a completed and signed copy of this form with attachments to Minnesota Power at renewableprograms@mnpower.com or the address listed below. Send application fee to:

Minnesota Power
Attn: Renewable Programs
30 W. Superior St.
Duluth, MN 55802

Attachment 2: Simplified Application Form (cont'd)**Exhibit A – Terms and Conditions for Interconnecting an Inverter-Based DER No Larger than 20 kW****1.0 Construction of the Facility**

The Interconnection Customer (the “Customer”) may proceed to construct (including operational testing not to exceed two hours) the Distributed Energy Resource(s) when Minnesota Power (the “Company”) approves the Interconnection Application (the “Application”).

2.0 Interconnection and Operation

The Customer may operate Distributed Energy Resource(s) and interconnect with the Company’s electric system once all of the following have occurred:

- 2.1 Upon completing construction, the Customer will cause the Distributed Energy Resource(s) to be inspected or otherwise certified by the appropriate local electrical wiring inspector with jurisdiction, and
- 2.2 The Customer returns the Certificate of Completion to the Company, and
- 2.3 The Company:
 - 2.3.1 Shall have the opportunity to witness test as described in Minnesota Technical Requirements, but takes no liability for the results of the test. Completes its inspection of the Distributed Energy Resource(s) to ensure that all equipment has been appropriately installed and that all electrical connections have been made in accordance with applicable codes and standards. All inspections must be conducted by the Company, at its own expense, within ten Business Days after receipt of the Certificate of Completion and shall take place at a time agreeable to the Parties. The Company shall provide a written permission to operate authorization that the Distributed Energy Resource(s) has passed inspection or shall notify the Customer of what steps it must take to pass inspection within three (3) Business Days.
 - or
 - 2.3.2 Does not schedule an inspection of the Distributed Energy Resource(s) within ten business days after receiving the Certificate of Completion, in which case the witness test is deemed waived (unless the Parties agree otherwise).
 - or
 - 2.3.3 Waives the right to inspect the Distributed Energy Resource(s).
- 2.4 The Company has the right to disconnect the Distributed Energy Resource(s) in the event of: 1) improper installation or failure to return the Certificate of Completion, or 2) does not meet any of the requirements of this Agreement or, 3) if applicable, refusal to sign Uniform Statewide Contract.

- 2.5 Revenue quality metering equipment must be installed and tested in accordance with applicable Minnesota Technical Requirements.
- 2.6 If the Distributed Energy Resource(s) either: 1) does not use default IEEE 1547-2018 functions and settings; or 2) is not yet subject to a developed national standard or national certification, then at the option of the Company there needs to be in place an operating agreement to document and govern the operation of the Distributed Energy Resource(s).
- 3.0 Safe Operations and Maintenance

The Customer shall be fully responsible to operate, maintain, and repair the Distributed Energy Resource(s) as required to ensure that it complies at all times with the interconnection standards to which it has been certified.
- 4.0 Access

The Company shall have access to the disconnect switch, if required by the Company, and metering equipment of the Distributed Energy Resource(s) at all times as described in Minnesota Technical Requirements. The Company shall provide reasonable notice to the Customer when possible prior to using its right of access.
- 5.0 Disconnection

The Company may temporarily disconnect the Distributed Energy Resource(s) upon the following conditions:

 - 5.1 For scheduled outages upon reasonable notice.
 - 5.2 For unscheduled outages or emergency conditions.
 - 5.3 If the Distributed Energy Resource does not operate in the manner consistent with these Terms and Conditions.
 - 5.4 The Company shall inform the Customer in advance of any scheduled disconnection, or as is reasonable after an unscheduled disconnection.
 - 5.5 If the Customer is in Default it may be disconnected after a 60-day written notice is provided and the Default is not cured during this 60-day notice. This provision does not apply to disconnection based on outages or emergency conditions.
- 6.0 Treatment Similar to Other Retail Customers
 - 6.1 The Customer may be disconnected consistent with the rules and practices for disconnecting other retail electrical customer.
- 7.0 Indemnification
 - 7.1 This provision protects each Party from liability incurred to third parties as a result of carrying out the provisions of this Agreement.
 - 7.2 The Parties shall at all times indemnify, defend, and save the other Party harmless from, any and all damages, losses, claims, including claims and actions relating to injury to or death of any person or damage to property, demand, suits, recoveries, costs and expenses, court costs, attorney fees, and all other obligations by or to third parties, arising out of or resulting from the other Party's action or inactions

of its obligations under this agreement on behalf of the indemnifying Party, except in cases of gross negligence or intentional wrongdoing by the indemnified Party.

- 7.3 This indemnification obligation shall apply notwithstanding any negligent or intentional acts, errors or omissions of the indemnified Party, but the indemnifying Party's liability to indemnify the indemnified Party shall be reduced in proportion to the percentage by which the indemnified Party's negligent or intentional acts, errors or omissions caused the damages.
- 7.4 Neither Party shall be indemnified for its damages resulting from its sole negligence, intentional acts or willful misconduct. These indemnity provisions shall not be construed to relieve any insurer of its obligation to pay claims consistent with the provisions of a valid insurance policy.
- 7.5 If an indemnified person is entitled to indemnification under this article as a result of a claim by a third party, and the indemnifying Party fails, after notice and reasonable opportunity to proceed under this article, to assume the defense of such claim, such indemnified person may at the expense of the indemnifying Party contest, settle or consent to the entry of any judgment with respect to, or pay in full, such claim.
- 7.6 If an indemnifying party is obligated to indemnify and hold any indemnified person harmless under this article, the amount owing to the indemnified person shall be the amount of such indemnified person's actual loss, net of any insurance or other recovery.

- 8.0 Promptly after receipt by an indemnified person of any claim or notice of the commencement of any action or administrative or legal proceeding or investigation as to which the indemnity provided for in this article may apply, the indemnified person shall notify the indemnifying party of such fact. Any failure of or delay in such notification shall not affect a Party's indemnification obligation unless such failure or delay is materially prejudicial to the indemnifying party.

9.0 Insurance

The Parties agree to follow all applicable insurance requirements imposed by Minnesota. All insurance policies must be maintained with insurers authorized to do business in Minnesota. See MN DIP Section 5.10.

10.0 Limitation of Liability

Each party's liability to the other party for any loss, cost, claim, injury, liability, or expense, including reasonable attorney's fees, relating to or arising from any act or omission in its performance of this Agreement, shall be limited to the amount of direct damage actually incurred. In no event shall either party be liable to the other party for any indirect, incidental, special, consequential, or punitive damages of any kind whatsoever, except as allowed under paragraph 6.0.

11.0 Termination

The agreement to operate in parallel may be terminated under the following conditions:

11.1 By the Customer

By providing written notice to the Company

11.2 By the Company

If the Distributed Energy Resource(s) fails to operate for any consecutive 12 month period or the Customer fails to remedy a violation of these Terms and Conditions.

11.3 Permanent Disconnection

In the event this Agreement is terminated, the Company shall have the right to disconnect its facilities or direct the Customer to disconnect its Distributed Energy Resource.

11.4 Survival Rights

This Agreement shall continue in effect after termination to the extent necessary to allow or require either Party to fulfill rights or obligations that arose under the Agreement.

12.0 Assignment/Transfer of Ownership of the Facility

This Agreement shall survive the transfer of ownership of the Distributed Energy Resource(s) to a new owner when the new owner agrees in writing to comply with the terms of this Agreement and so notifies the Company.

Interconnection Application

This form is for Distributed Energy Resources (DERs) that meets the eligibility of the Minnesota Interconnection Process (see 1.1) and are not eligible for consideration under the Section 2 Simplified Process.

The Interconnection Application is to be filled out completely by the applicant or as noted in each section of the application. Section that are noted with * are required to be filled out along with bolded items.

Checklist for Submission to Area EPS Operator	
<i>The items below shall be included with submittal of the Interconnection Application to the Area EPS Operator. Failure to include all items will deem the Interconnection Application incomplete.</i>	
	Included
Non-Refundable Processing Fee Fast Track <ul style="list-style-type: none"> • \$100 + \$1/kW for Certified Systems • \$100 + \$2/kW for Non-Certified Systems Study Process <ul style="list-style-type: none"> • \$1,000 + \$2/kW down payment. Additional study fees may apply. 	<input type="checkbox"/> Yes
One-line diagram <ul style="list-style-type: none"> • Please see Area EPS Operator's Technical Specification Manual for more details. 	<input type="checkbox"/> Yes
Documentation showing site control (see MN DIP Section 1.7).	<input type="checkbox"/> Yes
Site Diagram showing DER system layout (See TSM for more details)	<input type="checkbox"/> Yes
<u>Possible Additional Documentation (See TSM for more details)</u> <ul style="list-style-type: none"> • If requesting the DER export capacity to be limited, include information material explaining the limiting capabilities. • Schematic drawings for all protection and control circuits, relay current circuits, relay potential circuits, and alarm/monitoring circuits (if applicable). • Documentation that describes and details the operation of protection and control schemes (if applicable). • Inverter Specification Sheet(s) (if applicable). 	

Interconnection Customer/Owner *	
Full Name (match name of electric service account, if applicable):	
Account Number:	Meter Number:
Mailing Address:	
Email:	Phone:

Application Agent *	
Is the Customer using an Application Agent for this application? <input type="checkbox"/> Yes <input type="checkbox"/> No	
<i>If Interconnection Customer is not using an Applicant Agent, please continue to next section.</i>	
Application Agent:	
Company Name:	
Email:	Phone:

DER Location *	
Is the proposed DER system to be located at the Interconnection Customer's mailing address: <input type="checkbox"/> Yes <input type="checkbox"/> No	
<i>If Yes, please continue to the next section.</i>	
If No, will the proposed DER system be interconnected to an existing electric service? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Please provide the address or GPS coordinates:	
If not an existing service, please state the proposed service entrance size (amps):	

General *	
Select Review Process:	<input type="checkbox"/> Fast Track Process <input type="checkbox"/> Study Process
Choose one of the following and provide applicable data:	
<input type="checkbox"/> Application is for a new DER	
Aggregate DER nameplate rating of all generation and storage types (kW AC):	
<input type="checkbox"/> Application is for a Capacity Addition to an existing DER	
Capacity of existing DER (kW AC):	Capacity proposed to be added (kW AC):
<input type="checkbox"/> Application is for a Material Modification to an existing DER	
If Material Modification to existing facility, please describe:	
Distributed Energy Resource will be used for what reason? (Check all that apply):	
<input type="checkbox"/> Net Metering <input type="checkbox"/> To only supply power to Interconnection Customer <input type="checkbox"/> To only supply power to Area EPS	
Type of Generator (check all that apply):	<input type="checkbox"/> Inverter <input type="checkbox"/> Induction or Synchronous
Installed DER System Cost (before incentives): \$	

Distributed Energy Resource Information *

Phase configuration of Distributed Energy Resource(s): ☐ Single-Phase ☐ Three-Phase

DER Type (Check all that apply and list aggregate capacity of each type):

<input type="checkbox"/> Solar Photovoltaics	Size (kW AC):	<input type="checkbox"/> Wind	Size (kW AC):
<input type="checkbox"/> Storage	Size (kW AC):	<input type="checkbox"/> Diesel	Size (kW AC):
<input type="checkbox"/> Natural Gas	Size (kW AC):	<input type="checkbox"/> Fuel Oil	Size (kW AC):
<input type="checkbox"/> Hydro Type	Size (kW AC):	<input type="checkbox"/> Other	Size (kW AC):

Please specify other:

Export Capacity Limitation *

Is the Maximum Physical Export Capacity request the same as the nameplate capacity: ☐ Yes ☐ No

If Yes, please continue to the next section.

If No, what is the Maximum Physical Export Capacity Requested (kW_{ac}):

Is the Export Capacity Limited (e.g. though the use of a control system, power relay(s), or other similar devices setting of adjustment?): ☐ Yes ☐ No

If Yes, please attach detailed information describing the method of limiting export capacity.

Interconnection Facilities Information *

What type of DER Interconnection/Transfer Method is Proposed?

- ☐ None (DER is never operating parallel with the distribution system)
- ☐ Extended Parallel/Continuous (The normal state of the DER is to operate parallel with the distribution system.)
- ☐ Limited (DER operated parallel with the distribution system for a short time). Please specify what type of Limited.
- ☐ Quick Closed (100msec parallel or less) ☐ Limited Parallel (2 minutes or less)

Will a transfer switch be used with the DER? ☐ Yes ☐ No

Manufacturer:

Model:

Load Rating (in Amps):

Will a transformer, owned by the Interconnection Customer, be used between the DER and the Point of Common Coupling?

☐ Yes ☐ No

Please show proposed location of protective interface equipment on property on the submitted site diagram.

Transformer Data (For Interconnection Customer-Owned Transformer) (if applicable) <i>(Ex. Transformers used for secondary voltage conversion or primary metered interconnections)</i>			
What is the phase configuration of the transformer?			<input type="checkbox"/> Single Phase <input type="checkbox"/> Three Phase
Size (kVA):		Transformer Impedance (%):	On kVA Base:
Transformer Volts: (Primary)	Delta:	Wye:	Wye Grounded:
Transformer Volts: (Secondary)	Delta:	Wye:	Wye Grounded:
Transformer Volts: (Tertiary)	Delta:	Wye:	Wye Grounded:
Transformer Fuse Data (For Interconnection Customer-Owned Fuse)			
Manufacturer:	Type:	Size:	Speed:
Interconnecting Circuit Breaker (For Interconnection Customer-Owned Circuit Breaker) (if applicable)			
Manufacturer:		Type:	
Load Rating (in Amps):	Interrupting Rating (In Amps):	Trip Speed (Cycles):	
Interconnection Protective Relays: Please show protective relay manufacturer, model and type on the one-line diagram.			
Current and Potential Transformer Data: Please show CT ratios and CT/PT locations on one-line			

Fill out all following sections which pertain to the proposed DER installation

Inverter Interconnected System Information – non ESS (if applicable)	
Aggregate Inverter Rating (kW AC):	Number of Total Inverters:
Phase configuration of inverter(s):	<input type="checkbox"/> Single-Phase <input type="checkbox"/> Three-Phase
Voltage of Inverter(s):	
Inverter Manufacturer:	
1. Model No.	Certification <input type="checkbox"/> UL 1741 <input type="checkbox"/> UL 1741-SA <input type="checkbox"/> UL 1741-SB
Inverter Rating (kW AC):	Number of Units of this Model:
2. Model No.	Certification <input type="checkbox"/> UL 1741 <input type="checkbox"/> UL 1741-SA <input type="checkbox"/> UL 1741-SB
Inverter Rating (kW AC):	Number of Units of this Model:
3. Model No.	Certification <input type="checkbox"/> UL 1741 <input type="checkbox"/> UL 1741-SA <input type="checkbox"/> UL 1741-SB
Inverter Rating (kW AC):	Number of Units of this Model:
4. Model No.	Certification <input type="checkbox"/> UL 1741 <input type="checkbox"/> UL 1741-SA <input type="checkbox"/> UL 1741-SB
Inverter Rating (kW AC):	Number of Units of this Model:

Energy Storage System Information (if applicable)

ESS Inverter Energy Rating (kWh AC):		ESS Inverter Capacity Rating (kW AC):	
How will the ESS be used? Select all Use Cases that apply. <input type="checkbox"/> Outage Protection/Backup Power <input type="checkbox"/> Demand Reduction <input type="checkbox"/> No Export <input type="checkbox"/> Time-of-Use Energy Management <input type="checkbox"/> Increased Self-Consumption <input type="checkbox"/> Other			
Please specify other:			
What Operating Modes will be used? Select only one Operating Mode. <input type="checkbox"/> Import Only <input type="checkbox"/> Export Only <input type="checkbox"/> No Exchange <input type="checkbox"/> Unrestricted Exchanged			
If Export Only is Checked, select all that apply.			
<input type="checkbox"/> ESS Export is Allowed <input type="checkbox"/> Solar Export is Allowed <input type="checkbox"/> Limited Export is Allowed (please specify export limit amount in kW):			
Is the ESS recharging limited to certain times of the day and/or after a power outage? <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, please explain:			
<i>If the ESS shares an inverter that is listed in the previous section, please skip the rest of this section.</i>			
Aggregate ESS Inverter Rating (kW AC):		Number of Total ESS Inverters:	
Phase configuration of ESS inverter(s):		<input type="checkbox"/> Single-Phase <input type="checkbox"/> Three-Phase	
Voltage of ESS Inverter(s):			
ESS Inverter Manufacturer:			
1. Model No.		Certification <input type="checkbox"/> UL 1741 <input type="checkbox"/> UL 1741-SA <input type="checkbox"/> UL 1741-SB	
Inverter Rating (kW AC):		Number of Units of this Model:	
2. Model No.		Certification <input type="checkbox"/> UL 1741 <input type="checkbox"/> UL 1741-SA <input type="checkbox"/> UL 1741-SB	
Inverter Rating (kW AC):		Number of Units of this Model:	
3. Model No.		Certification <input type="checkbox"/> UL 1741 <input type="checkbox"/> UL 1741-SA <input type="checkbox"/> UL 1741-SB	
Inverter Rating (kW AC):		Number of Units of this Model:	
4. Model No.		Certification <input type="checkbox"/> UL 1741 <input type="checkbox"/> UL 1741-SA <input type="checkbox"/> UL 1741-SB	
Inverter Rating (kW AC):		Number of Units of this Model:	

Rotating Generation System Information (if applicable)**Prime Mover Information**

Please indicate the prime mover:

☐ Microturbine ☐ Reciprocating Engine ☐ Hydro ☐ Wind ☐ Other (please specify)
Generator type ☐ Induction ☐ Synchronous

Manufacturer:

Model Name & Number:

Version:

Summer Name Plate Rating: kW_{ac} Summer Name Plate Rating: kW_{ac} Winter Name Plate Rating: kVA_{ac} Winter Name Plate Rating: kVA_{ac}

Rated Power Factor:

Leading:

Lagging:

Distributed Energy Resource Characteristic Data (for Synchronous machines)

RPM Frequency:

Neutral Grounding Resistor:

Direct Axis Synchronous Reactance, X_d :Zero Sequence Reactance, X_0 :Direct Axis Transient Reactance, X'_d :

KVA Base:

Direct Axis Subtransient Reactance, X''_d :

Field Volts:

Negative Sequence Reactance, X_2 :

Field Amperes:

For Synchronous Generators 1 MW or larger, please provide the appropriate IEEE model block diagram of excitation system, governing system and power system stabilizer (PSS) in accordance with the regional reliability council criteria. A PSS may be determined to be required by applicable studies. A copy of the manufacturer's block diagram may not be submitted.

Distributed Energy Resource Characteristic Data (for Induction machines)	
RPM Frequency:	Neutral Grounding Resistor:
Motoring Power (kW):	Exciting Current:
Heating Time Constant:	Temperature Rise:
Rotor Resistance, R_r :	Frame Size:
Stator Resistance, R_s :	Design Letter:
Stator Reactance, X_s :	Reactive Power Required In Vars (No Load):
Rotor Reactance, X_r :	Reactive Power Required In Vars (Full Load):
Magnetizing Reactance, X_m :	Total Rotating Inertia, H:
Short Circuit Reactance, X_d'' :	

Additional Documentation

On the one-line please show the interconnection transformer and provide the transformer winding configuration, primary and secondary transformer voltage, transformer protection information and expected impedance. Please also show how the transformer will be protected to meet the NEC requirements.

Please see the Area EPS Operator's Technical Specification Manual (TSM) for requirements that need to be on the one-line and site diagram and for example application documentation.

Please see the Interconnection Process (MN DIP) for additional requirements related to Site Control and insurance documentation.

Acknowledgements – Must be completed by Interconnection Customer *

	Initials
The Interconnection Customer has opportunities to request a timeline extension during the interconnection process (See MN DIP Section 1.8.2 and 5.2.3). Failure by the Interconnection Customer to meet or request an extension as described in MN DIP Section 5.2.3 for a timeline outlined in the Interconnection Process could result in a withdrawn queue position and the need to re-apply.	
Propose DER interconnection to the Utility's distribution submitted under the Fast Track Process may be moved into the Study Process if engineering screens are failed during the Interconnection Application review. Interconnection Customer will be contacted to approve being moved into the Study Process.	

Application Signature – Must be completed by Interconnection Customer *

I designate the individual or company listed as my Application Agent to serve as my agent for the purpose of coordinating with the Area EPS Operator on my behalf throughout the interconnection process.

Initials

I hereby certify that, to the best of my knowledge, the information provided in this Interconnection Application is true and correct.

Applicant Signature:

Date:

*****Please print clearly or type and return completed along with any additional documentation*****

Exhibit C – Certificate of Completion

Distributed Energy Resource Certificate of Completion

MN DIP Simplified Process Interconnection

Customer: _____

Account Number: _____ Meter Number: _____

Application ID number: _____

Address of Distributed Energy Resource (DER):

City: _____ State: MN Zip: _____

Is the DER owner-installed? Yes No If no: Install

Company: _____

Contact: _____

Phone: _____ Email: _____

Electrician Name / License#: _____

The DER has been installed and inspected in compliance with the local electrical permitting authority as verified by the signature below or the additionally attached document.

Inspector Signature: _____

Print Name: _____ Date: _____

Authority Having Jurisdiction (city/county): _____

As a condition of interconnection, email a completed copy of this form to

_____ at _____.

Electronic submission of this form through email to Minnesota Power's

renewableprograms@mnpower.com email address shall be an alternative means to satisfy the

Certificate of Completion submission requirements.

If you prefer to mail the form, please mail to: Minnesota Power
Attn: Renewable Programs
30 W. Superior St.
Duluth, MN 55802

SolarSense Rebate Application

40 kW and under



APPLICATION PERIOD:

The program funds are awarded to customers on a lottery basis each spring and only available while funds last. If the company receives enough qualified applications to exceed its annual budget, projects located in disadvantaged communities or on Tribal lands will be prioritized for approval. Remaining eligible projects will be placed on a wait list.

WHO SHOULD FILE THIS APPLICATION:

Minnesota Power's SolarSense rebate program is open to retail customers that meet income guidelines as approved by the Minnesota Public Utilities Commission. Only customers that are below 150% of the Area Median Income (AMI) for their household size are eligible. See SolarSense Eligibility Requirements section on the next page for a full list of rebate program conditions. Either customers or their solar installer can submit the rebate application.

INFORMATION:

This application is used by Minnesota Power to determine eligibility in the SolarSense program. Applicants will receive a confirmation email when their rebate application is submitted. The applicant will be contacted if additional information is required. Please allow up to 15 business days after receipt of all the required information before inquiring about the status of the application.

For further details regarding Minnesota Power's interconnection processes and standards, refer to the "State of Minnesota Distributed Energy Resources Interconnection Process for Minnesota Power," the "State of Minnesota Distributed Generation Interconnection Requirements for Minnesota Power," the terms and conditions outlined in this application and other interconnection information. These documents can be found on Minnesota Power's website at: www.mnpower.com/DistributedGeneration

SOLARSENSE PROGRAM:

The SolarSense rebate is based on the expected performance of the PV array. The annual average energy production is calculated using several variables including tilt, azimuth and shading profile in the PV Watts tool provided by the National Renewable Energy Laboratory (NREL): <https://pvwatts.nrel.gov/>

APPLICATION TIMELINE:

- Submit application during open application period.
- After a two-week review period, notifications sent to approved rebate applicants.
- If they haven't already, approved applicants must submit an interconnection application within three weeks of receiving approval.
- Once interconnection agreement is signed, construction may begin and must be completed within six months.
- Once system is commissioned, Minnesota Power sends final rebate award documentation for signature.
- When all documentation is signed and returned, SolarSense rebate check is issued.

SolarSense Rebate Application

40 kW and under



SOLARSENSE ELIGIBILITY REQUIREMENTS:

To qualify for Minnesota Power's SolarSense solar electric rebate, projects must meet the following criteria:

Customer Criteria:

- Be a Minnesota Power retail customer with an account in good standing installing a grid-tied solar system.
- Must meet income qualification of household income less than 150% AMI (area median income).
 - For more information on county income AMI thresholds visit mn.gov and search for 2024 median income.
- Own the PV system and the property/building where the system will be installed.
- Customers exempt from the Solar Energy Standard are not eligible to apply.
- Customers that installed a solar PV system within the past 12 months are not eligible to apply.
- Customer that has received a SolarSense rebate within the past 12 months are not eligible to apply.

Installer and System Criteria:

- Installer must be certified (NABCEP or UL).
- Installed equipment must be new, including all major system components.
- System must have a nameplate capacity of 40 kW (ac) or less.
- Estimated annual kWh generation capacity shall not be more than 120% of the premise's previous 12 months energy consumption.
- PV modules must come with a 20-year or more manufacturer's performance warranty. All inverters must come with a minimum 10-year manufacturer's performance warranty. Installers must offer a two-year workmanship warranty.
- All energy production must be measured by a production meter before going through any other device.
- You must submit the final installation costs to Minnesota Power.

Application/Project Requirements:

- Complete the installation within six months of receiving rebate approval and a signed uniform statewide contract.
- The installer must submit system design specifications for system size and shading to Minnesota Power to calculate the incentive estimate.
- Get pre-approval of the project prior to installation of equipment.
- SolarSense Renewable Energy Credit (REC) and MRETS Schedule A contracts must be completed and submitted once the installation is complete.
- Final installation costs must be submitted to Minnesota Power.

If you are unsure whether you are eligible to participate in the SolarSense program, please contact Minnesota Power's Renewable Programs directly at 218-355-3720.

SolarSense Rebate Application

40 kW and under



Please complete the information below and submit the following documents via email to be considered for the SolarSense rebate program:

- Shade analysis from an industry standard tool such as Solar Pathfinder, Solmetric SunEye, Aurora, Helioscope, or others.
- Current photos of the site (Optional, but helpful)

Complete the following information:			
Customer Name:			
Complete Address:			
County:			
Phone:			
Email:			
Installer Name:			
Representative:			
Phone:			
Email:			
System Data			
Size kW AC:		Size kW DC:	
Azimuth:		Tilt:	
Placement (Roof/Ground):		Shade (% unshaded):	
Family Size / Household Size (1-8):			

If submitting application via email or mail, Minnesota Power will follow up once application is received to collect income threshold information to verify rebate eligibility.

Please return this application to: renewableprograms@mnpower.com

If you prefer to mail the application, return the form (prior to March 5th, 2025) to:
 Minnesota Power Attn. Renewable Programs
 30 W Superior St. Duluth, MN 55802



AN ALLETE COMPANY

mnpower.com/solar | renewableprograms@mnpower.com | 218-355-3720

Minnesota Power | Renewable Programs | 30 W. Superior St. | Duluth MN 55802