

# Solar Energy Guide for Morris and Stevens County Residents

Over the last several years, more and more residents in Morris and Stevens County have been interested in having solar panels installed on their homes to help off-set their home's electrical use and to future proof their homes against volatile energy prices and, in some cases, to be fully grid independent one day. However, the process to install solar energy can be long, arduous, and confusing, especially for the average citizen with little to no prior knowledge of electrical systems and renewable energy production. By publishing this guide, we at the City of Morris hope to make solar energy a more accessible option for members of our community from all backgrounds. Solar is not just a long term investment in the climate and environment, but also for the value of your home, the value of homes in your neighborhood and the value of homes across the City of Morris and Stevens County. The city, UMN Morris, and the WCROC have all made enormous investments in clean energy and we hope the families living in Morris will follow suit to make our community more resilient and more climate friendly. We hope that this guide can provide information to make the process less daunting and more attainable for more people.

## So, what is Solar Energy?

At the most basic level, a solar panel is made up of layers of glass and solar cells. The solar cells themselves are made of layers of silica, phosphorous, and boron. The solar cells produce electricity when light photons from the sun hit the solar cells. The light photons interact with the layers of silica, phosphorous, and boron producing an electric current which is then routed out of the panels before going to an inverter. Solar panels, or rather the solar cells that produce the electricity, were first invented in the late 1800s. These solar cells were made by coating sheets selenium with thin layers of gold. The modern solar panels that we use today were first made in 1941 by Russel Ohl. Over the years, solar cells found their way onboard space bound satellites and in some of the first handheld calculators. As technology has improved, solar panels quickly became a viable option for generating electricity to be used on the electrical grid.

## Important Terminology

There are many different terms that you may encounter when working through the process of installing solar energy. Below is a list that includes different terms and their definitions

**Solar Panel:** This refers to the individual solar energy production unit. Usually a group of photovoltaic cells placed into a single framed unit.

**Solar Array:** A set of many solar panels that are interconnected to make a singular solar system.



**Roof mounted:** The most common mounting type for residential installations. There are many different types of roof mounts that each have their own advantages and disadvantages.

**Railed Mounting:** A system where a set of rails are screwed into the existing roof structure. Panels are fixed to the arrays using a variety of methods including clips and additional screws/bolts. This system is best for shingle roofs.

Figure 1 Example of Railed Mounting



Figure 2 Example of Ballasted Roof Mounting

**Rail-less Mounting:** A system where the panels are directly fixed to the roof structure using clips and bolts. This mounting type is most commonly used for metal roofs where the structure of the roof supports the solar array instead of a separate structure bolted to the roof.

**Ballasted Flat-Roof Mounting:** A system that can be mounted on flat roofs or roofs with less than a 7-degree slope. Instead of bolting into the existing roof, the system is bolted into racks with concrete blocks that sit on top of the roof. The weight of the panels and added concrete blocks is enough to keep the array firmly on top of the roof, even during extreme weather.

**Ground Mounted:** This is the most common type of mounting for larger arrays and arrays on properties without proper roofs, like farms or manufacturing facilities. These systems are similar to roof mounted systems with steel beams being driven into the ground and solar racks being attached on top of the beams. These types of systems can also be elevated higher off of the ground to allow for other ground uses. Types include car ports, where vehicles can be parked under solar arrays, or Agri-voltaics where solar panels are elevated off the ground to allow for planting of shade tolerant crops beneath them. Arrays can also be mounted in such a way to allow for cows to graze the land in and around the array.

**Ballasted Ground Mounting:** Similar to ballasted roof systems, a ballasted ground system is attached to large concrete blocks that hold the panels to the ground under their sheer weight. This system is best for areas where ground conditions are not conducive to large metal beams or screws penetrating the ground. These systems are most commonly used on closed landfills or brownfields where the ground cannot be punctured due to contamination risks.

**Single Axis Ground Mounting:** A system like this mounts the panels on a steel array that is fixed to the ground using steel beams or massive screws. The main difference from typical ground mounted systems is that this array will be able to move to follow the sun in one axis of direction e.g. from east to west.

**Dual Axis Ground Mounting:** A dual axis ground mounting normally consists of 5-10 solar panels arranged into an array that is attached to a pole that elevated the system off of the ground by 3-10 ft. Then the array tracks the sun using a dual axis system. These systems allow the panels to follow the sun as it rises and sets and moves across the sky from east to west. By moving the arrays in sync with the sun, this system can produce energy more efficiently and take advantage of more hours of sunlight each day. These systems work best in large open spaces. Such as un-used lawn space.



Figure 3 Example of Dual axis pole ground mount with Solar Tracking

**Kilowatt or kW:** A kilowatt is a measurement of the energy a given solar array or panel can produce at any one point. Equal to 1000 watts. If an array is rated as a 5 kW array, when exposed to direct sunlight it will put out 5 kW of power. One hour of direct light exposure will produce 5 kWh.

**Kilowatt Hour of kWh:** A kilowatt hour is the measurement used to measure energy consumption over time. One kWh is equal to 10 100-watt light bulbs running for an hour. Alt: One kWh is equal to a 1,000-watt microwave running for one hour. Alt: One kWh is equal to a 10-watt phone charger charging a phone for 100 hours. The average US family home uses around 800 kWh each month.

**DC Power:** DC or Direct current is a form of electricity that is most often produced by solar panels. It provides power at a constant voltage in a constant direction. DC power is also used in batteries as they discharge their energy to a given device or system



single line fails and cascades to overload the entire system with too much electricity. Examples of this include 2003 Northeast blackout that was caused by a couple of tree branches touching power lines in Ohio knocking out power for more than 55 million people across the Northeast US and Canada.

**Interconnection:** Interconnection refers to connecting your solar array, known as a distributed energy resource by utilities, to the grid through your home. Interconnection is an important aspect of installing a solar array if you will continue to pull energy from the grid when conditions for producing solar energy are poor like on cloudy days and at night.

Interconnection will also allow you to 'sell' excess energy you produce to your utility to be used elsewhere on the grid.

The reason that interconnection and the associated agreements are important is because if you connect an electricity generating resource to the grid without permission it could cause major power outages and other disruptions to your local and regional energy system. This is because if your array produces energy that the grid cannot route to another use, it can cause the grid to become overloaded and fail.

## System Types

**Grid-Tied Solar:** A grid-tied solar system sounds exactly like what it is. The solar system is tied to the grid just as your house is. This is the simpler of the two types of solar installations and requires less equipment. However, when your solar array is tied to the grid and when there is a power outage on the grid, the solar array will not be able to provide power to your home independently of the grid.

To make this easier to understand I will provide an example. If you have a 5 kW solar array that produces 4.5 kW after the inverter. Your house needs 3.5 kW to operate. If your array is producing 4.5 kW and your house uses 3.5 kW there is still 1 kW of power that is produced that needs to go somewhere. In a grid tied system this extra kW of power flows out to the grid. However, if the grid is experiencing a power outage then this extra 1 kW of power has nowhere to 'flow' to. If it were pushed onto the system during a power outage it may cause additional damage to the grid or to your home.

Alternatively, if your 5 kW array produces 4.5 kW after the inverter and your home consumes 5.5 kW, then an additional 1 kW of power is

required from the grid to power your home. If the grid is experiencing a power outage then this additional 1 kW of power is not available and your homes power system will not operate.



Figure 6 Example of Emily Bruce's Solar Array installed on a detached garage- 4.8 kW

**Off-Grid Solar:** An off grid solar system is not connected to the grid in any way. It is connected to your home and the power systems within your home, but not to the grid. In this type of system, energy storage in the form of batteries is used to supplement the solar panels production. When excess energy is produced, the batteries are charged. Then when solar energy isn't available (e.g. at night) energy stored in the batteries can be used to power your home. The main drawback of this type of system is that additional energy generation will likely be needed to supplement the power produced by the solar array. This additional energy generation could take the form of a small wind turbine, which could provide energy even when conditions for producing solar are poor (like at night or during winter months when there is less sunlight at higher latitudes). However, most people opt for a generator that runs on fossil fuels that can provide reliable energy whenever demanded.

**Hybrid Solar:** This type of system incorporates aspects of Grid tied and off grid systems. The system itself is tied to the grid, but battery storage capacity is added to the house ‘behind the meter.’ In this type of system solar energy flows through the inverter then to electrical loads in the house. Once all electrical loads in the house are met, then excess energy is used to charge batteries to provide energy at a later time. Finally, when batteries are fully charged and all electrical demands of the house is met, additional energy can flow onto the grid where you can receive credits from the electric utility. In this system, when the sun isn’t shining, the batteries will power the house as long as they have stored electricity in them. When the batteries run out of charge the house will begin to draw energy from the grid. In the event of a power outage on the grid, the house will have the ability to island or disconnect itself from the grid and power the home using only the Solar panels and energy stored in the batteries. Depending on the size of the solar array and the capacity of the batteries being used, and your home’s energy demand, this system could continue to operate your home independently of the grid during extended outages.

## Installers

There are many solar installers in Minnesota and across the Midwest. However, the biggest hurdle we have found that residents wanting to install solar encounter in Morris and Stevens county is finding an installer that will drive to Morris to install solar. While there are many different companies in Minnesota, the majority of them are located in the Twin Cities metro area, Duluth, or Rochester. And many of the companies located in these more densely populated areas only serve those areas. This leaves much of rural Minnesota out of range of service of some of the more prominent installers.

I reached out to installers that have worked with residents in Morris in the past and they are listed here.

**Real Solar-** Backus, MN. [Real Solar Website](#) Real solar is a great resource, especially for rural communities wanting to install solar. They are a part of the RREAL- Rural Renewable Energy Alliance and have committed to making solar power an accessible and feasible option for rural communities across the upper Midwest.

**Solar Farm-** St. Paul, MN. [Solar Farm Website](#) Solar Farm, though located in St. Paul, has completed solar projects across MN. The owner is passionate about renewable energy and how it can be incorporated into agriculture. They are a part of the MN SFA (Minnesota Sustainable Farming Association).

**Talk Solar-** Sauk Centre, MN. [Talk Solar Website](#) Talk Solar is a smaller solar installer that is located near Morris in Sauk Centre. They provide solar consultation and installation services.



*Figure 7 Solar on Morris Public Library, another ballasted roof mount.*

When reaching out to solar installers, we recommend reaching out to at least 3 different companies to get separate quotes. Each company will likely offer a different type of system along with different costs etc. Although the companies mentioned above said they install solar in Morris, we encourage you to reach out to other installers for additional quotes.

## Process (permitting quotes install working with grid and city timelines)

1. Seek quotes for solar arrays for your home from a variety of installers. This will let you compare companies and find the best option for you and your family.
2. Permitting. In Morris and Stevens county, we have worked to make it easier than ever to install solar on your property by streamlining the permitting process.
  - a. In Morris proper you have to follow instructions provided in the Morris Solar Permit Checklist which is pasted below. Your solar installer can also help with applying and getting all of the correct permits.
  - b. In Stevens County you must follow the Standards for Solar Energy Systems, Accessory. Solar energy systems are a permitted accessory use in all zoning districts. These standards can be found on pg 131 of the Stevens County Zoning Ordinance. You must also submit a land use application to the county



Figure 8 Ground Mounted Solar

government and a Conditional Use Permit if the array you want will be mounted on the ground. All of this information can be found [here](#). Your solar installer can also help with applying and getting all of the correct permits.

c. **NOTE:** *Swan Lake TWSP and Hodges TWSP- Check with your township as they have different requirements.*

3. Working with the grid and seeking approval from Utility. The next step in the process will be to work with your utility to connect your solar array to your house and the wider grid. As discussed earlier, a grid tied system is the most common for homeowners. You and your chosen solar installer will work with the utility to create an interconnection agreement where the utility will agree to buy excess solar energy you produce at reduced

rate, in return you will have access to the grid when your solar array isn't producing enough energy to power your home on its own. If you live in the City of Morris, City of Alberta, City of Donnelley, City of Hancock, or City of Chokio and are served by Ottertail information and applications can be found [here](#). If you live in greater Stevens county and are served by Agralite, interconnection applications can be found [here](#).

4. Timelines. As most people have experienced in one way or another, timelines for projects of all types are getting longer as supply chain bottlenecks remaining from the pandemic continue to disrupt shipping and deliveries of different components etc. Most solar installers are now quoting homeowners anywhere from 12-18 months to get a solar array installed and operable and producing energy for you home. During this time, you may be asked to pay a down-payment. This could be large amount of money depending on the size of your array. Getting solar for your home is not an overnight process oftentimes people will spend 2 years researching, getting quotes, and working with their utilities before they install solar. However, the benefits of being able to produce your own energy are infinite.

## FAQ (breakeven/roi and who should I contact with questions)

- How long will it take to pay off the money I have invested in my solar array?
  - How long it takes for you to see a net positive return on your initial investment will depend on a variety of factors including how big your array is, how much energy your home uses, how much energy you sell back to the grid, and more. The average return on investment for homeowner who install solar on their homes in the US is between 10 to 14 years. Most arrays last 25-30 years which translates to 15-20 years of 'making money' off of the initial investment. And as energy prices continue to rise, the price of grid energy will outpace the degradation of initial generation capacity.
- Who should I talk to?
  - City:
    - Mike Jacobson- Building Inspector. E: [jacobsonjl@juno.com](mailto:jacobsonjl@juno.com) P: (320)-808-3457
    - Griffin Peck- Sustainability Coordinator. E: [griffin@ci.morris.mn.us](mailto:griffin@ci.morris.mn.us) P: City Hall
  - County:
    - Bill Kleindl- Environmental Services/Planning and Zoning Director. E: [billkleindl@co.stevens.mn.us](mailto:billkleindl@co.stevens.mn.us) P: (320)-208-6558
  - Ottertail Power Company:
    - [DPawlowski@otpc.com](mailto:DPawlowski@otpc.com)
  - Agralite Power Cooperative:
    - [dercoordinator@agralite.com](mailto:dercoordinator@agralite.com)

## Getting Started

1. Research, learn more about different types of solar systems and the benefits of each system. Learn the terminology associated with installing a solar array to better communicate with future solar installers, city government employees and electric utility representatives. By reading this document you have already started this process! Continue your research on sites like Solar United Neighbors and state government reports. Explore possible incentives you may qualify for when installing solar.
2. Solicit quotes from at least 3 installers. 3 installers have been provided in this summary and we encourage you to reach out to other area installers and solicit quotes for a variety of opinions and options. Choose the quote that makes the most sense for your home and family.
3. Work with your chosen installer to complete all required paperwork and permits for the City/County government and for the utility that you will interconnect the system to. Submit necessary paperwork and permit applications and get approval.
4. Continue working with your chosen installer to figure out where your array will be located, how much energy it will produce, what the return on investment will look like, and work out a timeline for installation and interconnection.
5. Install the array.
6. Connect the array to your home and to the grid and start seeing the benefits!



Figure 9 Bob Culbertson's finished array- 10 kW

# Morris Solar Permitting Checklist

## Solar Photovoltaic (PV) System Permitting Checklist

The pre-submittal checklist below contains the minimum information and project plan details required to be submitted to the city of Morris (hereafter, “the city”) when applying for a permit to install a residential and commercial/non-residential solar photovoltaic (PV) system. The intent of using the checklist is to provide transparent and well-defined information to minimize the number of required revisions, improve permit application quality, and accelerate the application and review process.

### Codes and Design Criteria

For information pertaining to requirements for solar systems installed within city limits, please reference the Morris City Code, Chapter 11, Section 11.70, Subd. 26.

All electric solar energy system components must have a UL or equivalent listing, and must be installed in compliance with the Minnesota State Electric Code. Racking, frames, or other devices that allow the mounting of a solar collector onto a roof surface or the ground must be installed in compliance with the Minnesota Building Code and manufacturer’s recommendations.

### Required Permits

A permit must be obtained prior to the start of any work. Complete the following permit application form(s) and submit any additional required documents.

Residential Solar PV System:

- Electrical Permit – Obtained via MN Dept of Labor and Industry [here](#)
- Building Permit - The building permit can be found [Posted Below](#), simply check “Solar Rooftop PV” under the Type of Improvement section.
- Conditional-Use Permit – NOTE: Only required if installing ground-mounted solar arrays in Single and Family Residence and Multiple Family Residence Districts.

Commercial/non-residential Solar PV System

- Electrical Permit – Obtained via MN Dept of Labor and Industry [here](#)
- Building Permit - A building permit can be found [pasted below](#), simply check “Solar Rooftop PV” under the Type of Improvement section.
- Conditional-Use Permit – NOTE: Only required if installing ground-mounted solar arrays in Neighborhood Commercial District

### Additional Required Documents

- [Site Plan](#)
- Site plan should show the location of major components on the property. The site plan drawing need not be exactly to scale, but it should represent relative location of components at site (see supplied example site plan).
- PV arrays in compliance with [IRC fire setback requirements](#) need no separate fire service review.
- [Electrical Diagram](#)
- Electrical diagram/worksheets should show PV system configuration, wiring system, overcurrent protection, inverter, disconnects, required signs, and AC connection to the building.
- [Specification sheets and installation manuals \(if available\)](#)
- Provide spec sheets and manuals for all manufactured components including, but no limited to, PV modules, inverter(s), combiner box, disconnects, and mounting system

### Contractor Requirements

Electrical contractor must have all applicable state licenses for performing general electrical work in good standing.

### Permit Fees

The cost for a rooftop solar PV installation permit is \$36.

**Submit Permit Application** Completed permit applications should be emailed to [cityhall@ci.morris.mn.us](mailto:cityhall@ci.morris.mn.us).

### **Review Process Timeline**

The city is committed to providing a timely review of solar PV permit applications. Best efforts are made to review completed residential solar permit applications within 14 days and commercial/non-residential solar permit applications within 14 days. These turnaround times are typical, not guaranteed. The city has a staff of dedicated individuals, however workloads, vacations, and sick leave can cause unforeseen delays that may impact turnaround time.

Certain circumstances can prolong the permit turnaround time including:

- Applicant does not submit all required information
  
- Contractor applying for permit is not a licensed contractor
  
- Equipment is not listed

### **Permit Status**

To check your permit status please contact the city Building Inspector, Mike Jacobsen, at the phone number or email address listed at the end of this checklist.

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### **Permit Expiration**

All permits expire six (6) months after date of issue. Failure to start the work authorized by a permit within this six-month period renders the permit invalid and a new permit must be obtained. Once work begins, noticeable progress must continue until completion. All work must be complete within twelve (12) months of a permit issue date.

### **Scheduling an Inspection and the Inspection Process**

To schedule an inspection please contact the city Building Inspector at the phone number or email listed below.

Typically, inspections are completed within two days.

A residential solar PV system requires two inspections:

- Final electrical inspection
  
- Final building/installation inspection

### **Contact Information**

If you have any questions, please contact us at:

- Morris Building Inspector: Mike Jacobsen
- Office Email: [cityhall@ci.morris.mn.us](mailto:cityhall@ci.morris.mn.us)
- Phone Number: (320) 808-3457

### **Address:**

610 Oregon Avenue  
Morris, MN 56267

### **Hours of Operation**

Office: Monday – Friday, 8am – 4:30pm

**CITY OF MORRIS**  
P.O. Box 438, 610 Oregon Avenue, 320-589-1341  
**BUILDING PERMIT APPLICATION**  
*(Incomplete applications will not be accepted)*

Address of Site: \_\_\_\_\_

Legal Description of Property:

Block: \_\_\_\_\_ Lot: \_\_\_\_\_ Addition: \_\_\_\_\_ Parcel/Property #: \_\_\_\_\_  
*The above items can be found on your property tax statement. (Example parcel #: 20-1234-000)*

Owner Information:

Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_  
Home Telephone: \_\_\_\_\_ Business Telephone: \_\_\_\_\_

Type of Improvement:

New Construction  Addition  Alteration  Repair   
Maintenance  Raze  Move  Solar Rooftop PV

Structure to be used as: \_\_\_\_\_ Square Feet: \_\_\_\_\_ Estimated Cost: \_\_\_\_\_

Applicant is: Owner  Licensed Contractor  Architect/Engineer  Other

Applicant: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_  
Work Telephone: \_\_\_\_\_ Home Telephone: \_\_\_\_\_ Fax Number: \_\_\_\_\_

Architect or person preparing the drawing: \_\_\_\_\_ Contact: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_  
Work Telephone: \_\_\_\_\_ Home Telephone: \_\_\_\_\_ Fax Number: \_\_\_\_\_

Contractor: \_\_\_\_\_ Contact: \_\_\_\_\_  
Address: \_\_\_\_\_ License #: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_  
Work Telephone: \_\_\_\_\_ Home Telephone: \_\_\_\_\_ Fax Number: \_\_\_\_\_

Use this area for larger legal description or project description:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

The applicant by signature herewith agrees to comply with all city ordinances and state laws regulating building construction under this permit.  
\_\_\_\_\_  
**Remember to call Gopher State One Call before you dig !!! 1-800-252-1166**

Signature of Applicant or Agent: \_\_\_\_\_ Date: \_\_\_\_\_