

# **SOLAR REBATE PROGRAM**

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## **RESIDENTIAL CUSTOMER GUIDE**

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# WHO WE ARE

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Efficiency Manitoba is a Crown corporation committed to achieving energy savings targets in Manitoba. We do this by offering programs and rebates to make energy efficiency upgrades around your home easy and affordable. We're here to help you save energy and money today and for years into the future.

Visit our [website](#) to learn more about our programs and rebates.



# HOW SOLAR ENERGY WORKS

All solar systems capture light from the sun and convert it into forms of energy, like electricity and heat, that we can use in our homes. Two methods of energy generation are commonly seen in homes and commercial buildings: solar photovoltaics (PV) and solar thermal. Both methods use the sun's energy to create usable energy. The difference is, solar PV systems use the energy to generate electricity, whereas solar thermal systems use the energy to heat air or water. This guide is focused on solar PV systems for generating electricity.

## Solar photovoltaics (PV)

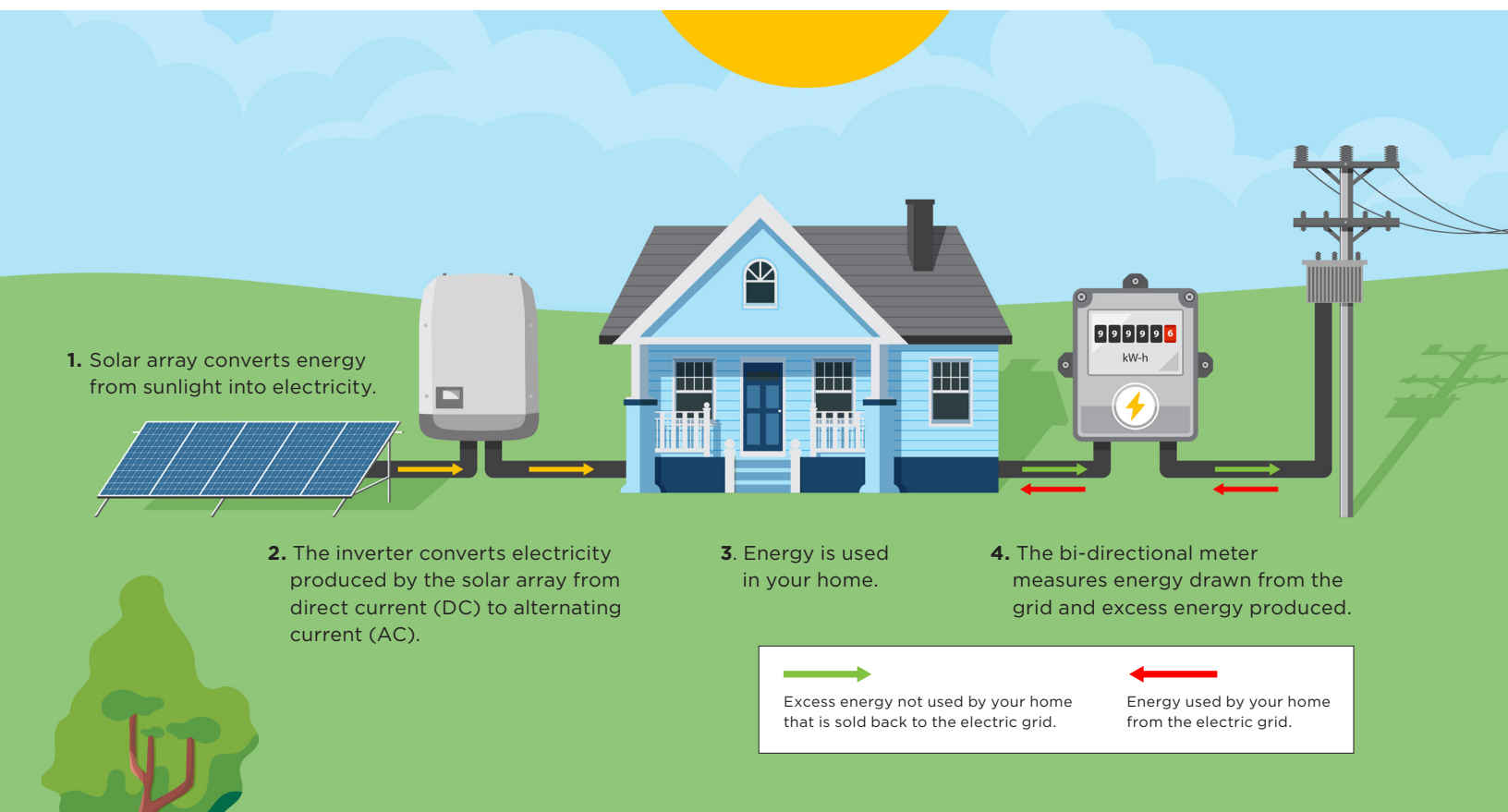
Solar PV systems are the most common solar technology. Solar panels are often affixed to rooftops using racking equipment or installed directly on the ground with a ground mount. During the day, solar PV panels produce direct current (DC) power, which is fed through an inverter to create alternating current (AC) power. AC is the most common type of electrical current used in our homes.

## Grid-connected solar PV

Most solar PV systems currently installed are grid-connected. These systems export any surplus electricity not used in the home back to the electrical grid (see Figure 1. Grid-connected solar PV system). Connection to the grid also ensures you have a reliable supply of electricity when your solar PV system isn't generating enough for your needs. Grid-connected solar PV systems can significantly reduce the amount of electricity you buy during daylight hours. We'll talk about connecting and selling to the grid later in the guide.

A typical grid-connected solar PV system is made up of solar panels, mounting hardware, one or more inverters to convert the electricity into its more usable AC form, and any other electrical equipment necessary to connect the system to the home and/or the grid. These other "balance of system" components include things like appropriately sized wiring, disconnection devices, junction boxes and breakers, a bi-directional utility meter, and optional system monitoring equipment.

**FIGURE 1. Grid-connected solar PV system**





## Inverters

After the panels themselves, inverters are the most important equipment in your solar PV system. When considering a solar PV system for your home, one of the key decisions you'll have to make is which type of inverter to install.

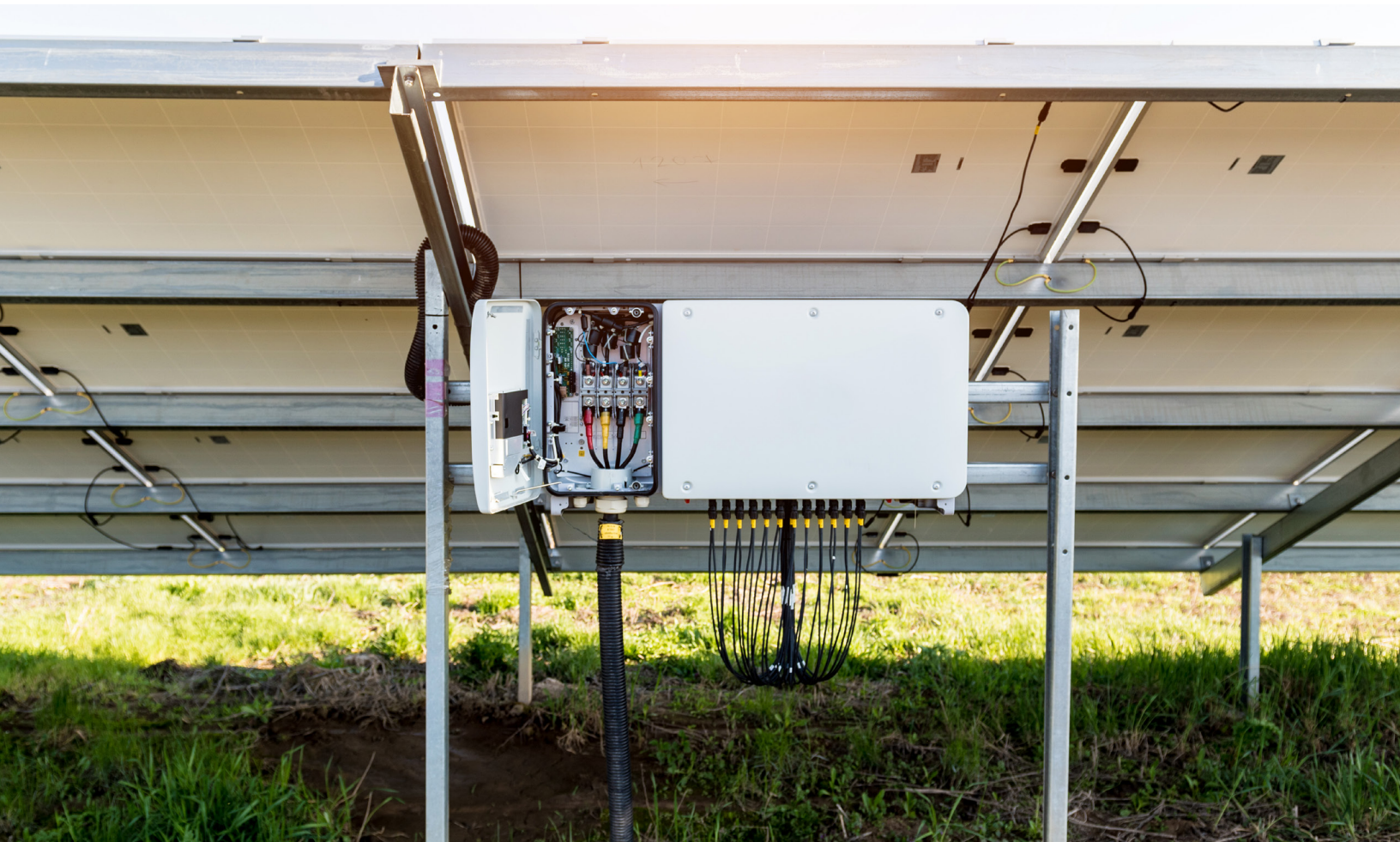
There are three main types of inverters currently available for your grid-connected solar PV system: string inverters, microinverters, and power optimizers (also known as string inverters with power optimizers or DC optimizers).

String inverters provide power conversion for multiple panels and are typically less expensive than other types of inverters. A string inverter's performance is limited by the worst performing panel and therefore shouldn't be used if your panels are shaded at any point during the day and are facing multiple directions. The production of the entire string of panels connected to the string

inverter is reduced if one panel is shaded. For example, if one panel is shaded and the energy output is reduced by 50%, all of the other panels will also be reduced by 50% even if they are receiving full sunlight.

Microinverters and power optimizers allow you to monitor and maximize the power production of each individual panel. They're best for installations where one or more panels may be shaded at any point during the day or where panels are facing different directions. Microinverters convert power at each panel, whereas power optimizers are paired with central inverters where the power is converted.

Although power optimizers offer many of the same benefits as microinverters, they tend to be slightly less expensive. However, microinverters are more flexible in terms of future expandability.



# GETTING STARTED WITH SOLAR

Deciding if a solar system is right for you takes a trained eye. How much usable roof area is available? What is your sun exposure? How much electricity do you use? What size system can your electrical panel support? The best way to answer these questions is to speak with a registered Efficiency Manitoba solar contractor.

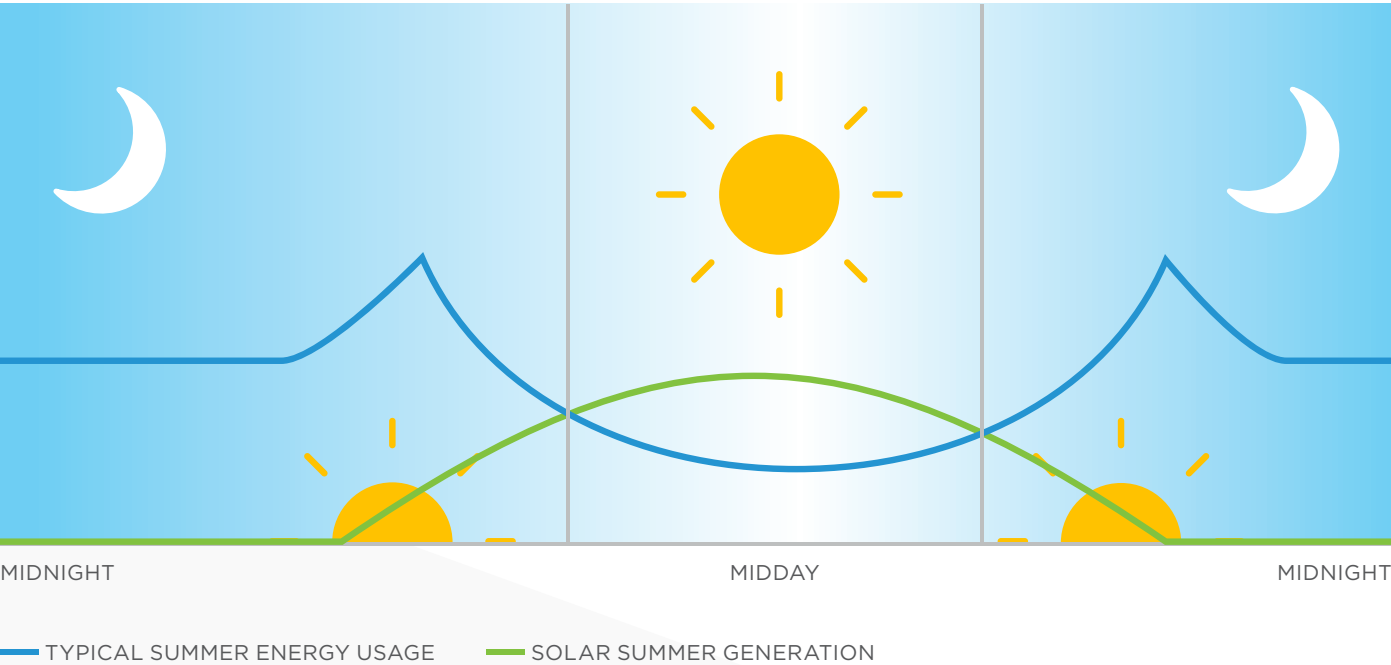
A registered Efficiency Manitoba contractor should guide you through these questions and provide an honest assessment of your property’s potential, but it’s helpful to understand the main factors that influence the decision. This section provides an overview of important things to consider when selecting a solar PV system.

## Solar PV system performance factors

How much electricity you buy and sell will depend on several factors, including:

- Solar PV system size, panel mounting type, panel degradation, type of electrical service
- Weather, season, time of day, cloud cover
- Your house’s current and future electrical loads
- Site selection

FIGURE 2. Solar capacity and usage throughout the day



A surplus of electricity typically occurs when the sun is at its peak and usage is relatively low.

## System size

The size of your solar PV system will determine how much of your generated electricity will be used by your home and how much will be sold back to Manitoba Hydro. Let's say you have a home with a five kW system. On a sunny day, you'd likely be selling electricity to the grid when only your lights and refrigerator are operating. (Generally, smaller systems will sell less, and larger systems will sell more.) However, on that same sunny day when a 20 kW electric furnace or a five kW electric dryer is operating, you'd begin purchasing power until the furnace or dryer shuts off (see Figure 2. Solar capacity and usage throughout the day).

We recommend sizing your solar PV system appropriately to avoid exceeding the annual electricity usage of your home. This means that the amount of electricity your solar PV system produces should be comparable to the amount of electricity your home uses.

Assuming that your system is sized to produce as much electricity as your home consumes annually, you can estimate that between 40% and 60% of the annual solar energy you produce will be sold back to Manitoba Hydro.

## Panel mounting types

Another important factor that will impact the energy production of your solar PV system is the type of panel mounting system you decide to install: a rooftop or a ground system.

Under ideal conditions, a well-sited rooftop solar array in Manitoba produces approximately 1,020 kWh annually for every installed kW of solar capacity. Ground-mounted solar systems will yield approximately 1,200 kWh annually for every installed kW of solar capacity. There are different considerations that may affect the production for each type.

## Orientation

The angle and direction of your roof, also referred to as the azimuth angle, is the primary factor determining how much direct sunlight will hit your solar panels. The optimal orientation for solar in Manitoba is facing due south with a slope of around 40° to 50° inclination (see Figure 3. Sun's path during summer and winter). This is easiest to do by using a ground system. A rooftop system is often limited to the direction the roof faces (which is often not due south) and the roof slope (which is usually lower than the ideal inclination)

Solar panels oriented directly east or west will produce about 20% less electricity than if they were facing south. That said, most roofs that face anywhere from W-SW-SSE-E and have roof slopes anywhere from 0° to 45° will still produce a desirable amount of electricity. While it's technically possible to install solar panels on the north side of your roof, it's not recommended for any roofs with a significant slope. It costs more to install panels on steep roofs, meaning you'll end up paying more for a solar PV system that generates less electricity. A knowledgeable contractor will be aware of this and should recommend a system that produces at least 70% of what a system with optimal orientation would produce.

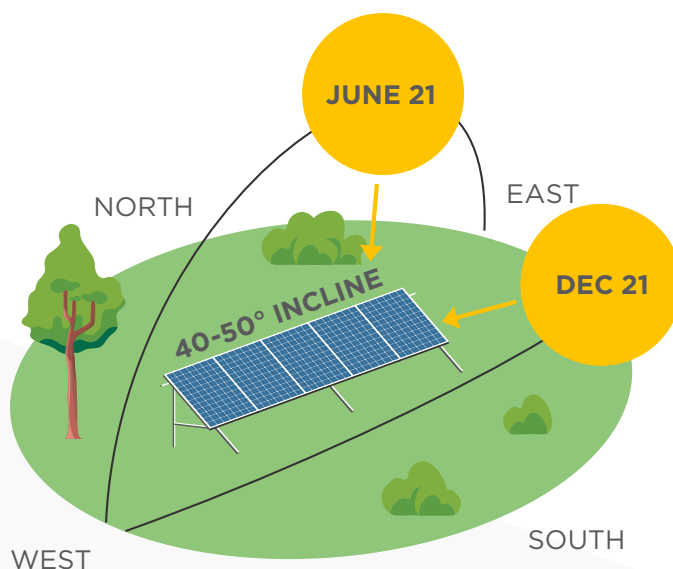
## Shading

Shading can greatly impact the suitability of solar at any given location. Shading can be caused by existing and future obstructions, such as trees, neighbouring buildings, or nearby new construction.

## Roof size and condition

If you're considering a rooftop system, the size of your roof will dictate how many panels can fit and how big of a system can be accommodated. The condition of your roof is important in deciding whether it makes more financial sense to redo your roof before committing to a solar install. If the roof needs to be replaced within the life of the solar PV system, the cost of removal should be included within the overall cost to ensure the financial analysis is accurate.

**FIGURE 3.**  
**Sun's path during summer and winter**



### Solar tracker racks

Solar tracker racks are automated systems that move to track the sun. They can produce up to 25% more energy but cost much more to install and may result in ongoing maintenance expenses due to the moving parts. Snow and ice getting into the drive mechanisms can present challenges.

### Maintenance

Because they're more accessible, fixed ground systems are generally easier to maintain and keep clean and clear of snow compared to rooftop systems. Solar panels that are well maintained and kept clear of debris will perform optimally.

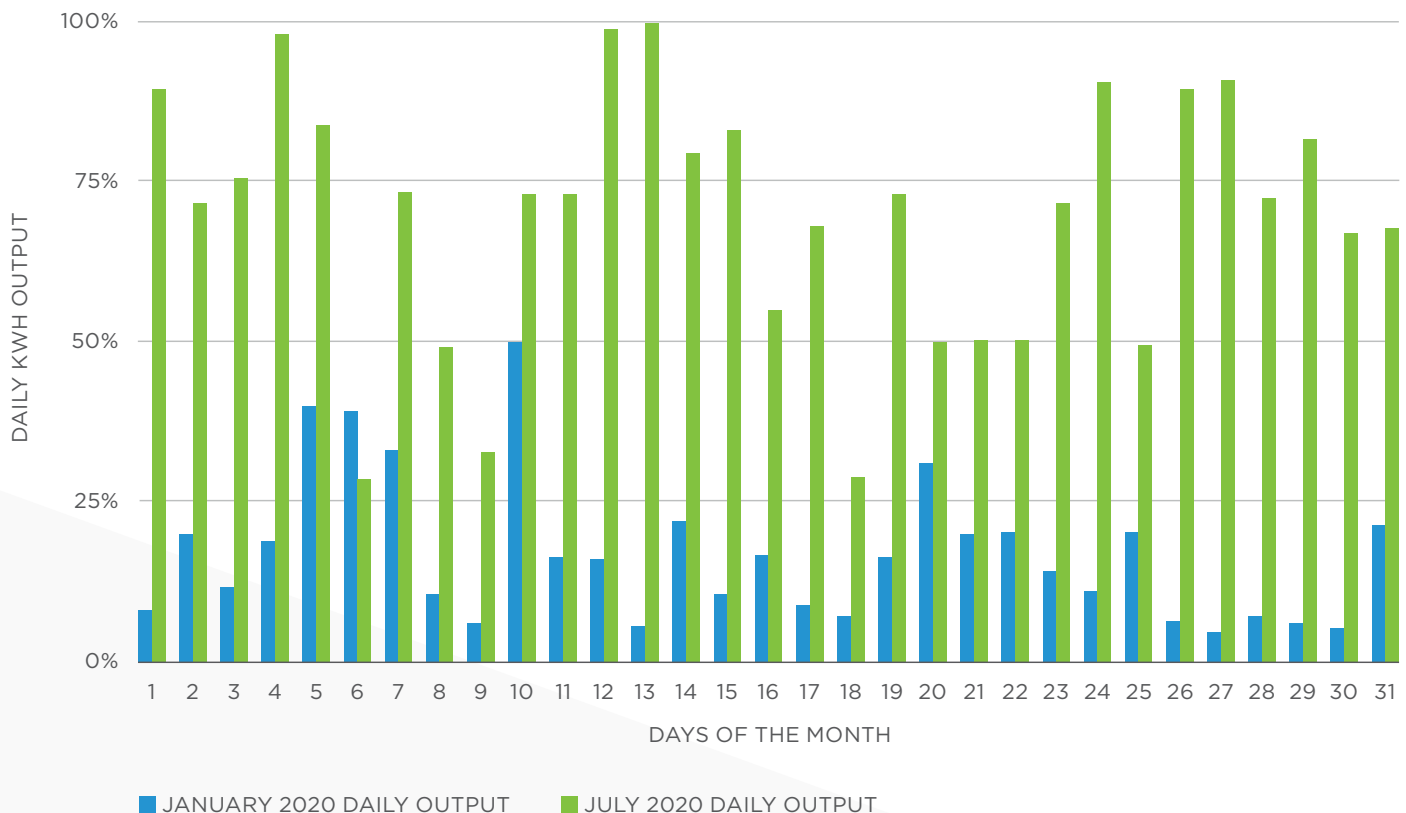
### Panel degradation

Although solar panels typically last up to 25 years, their energy production will degrade over time and from panel to panel. They typically degrade at a rate of around 0.5% each year. By the end of their lifespan, they may produce around only 80% of what they produced in their first year.

### Electrical service

Depending on your electrical service and the bus bar rating on your electrical panel, your home may be able to accommodate only a limited amount of solar-generated electricity. Your contractor can check the rating of your main electrical panel and explain any limitations it might have on the size of solar PV system you can install.

**FIGURE 4. Daily output as a percentage of peak generation**



Historical solar output in January versus June 2020 that shows solar generation is drastically reduced in winter months.



## Weather

As the weather varies throughout the year, so will production from your solar PV system. Some months may be sunnier than average, while others may have more clouds, fog, or snow (see Figure 4. Daily output as a percentage of peak generation).

When solar production is at its highest during long summer days, your energy requirements will be much lower, resulting in more excess energy being sold to Manitoba Hydro at the **excess energy price**. Customers with electric heat need most of their energy in winter when solar PV production is at its lowest due to the short days and low angle of the winter sun. You'd be required to purchase power from the Manitoba Hydro grid on cloudy, rainy, or snowy days and during evening and night.

## Your house's current and future electrical loads

You'll also need to consider any other upgrades you plan on making to your home that may impact your electricity usage in the future. A well-designed solar system should annually produce around 1,020 kWh for rooftop installations and 1,200 kWh for ground installations for every kW of installed solar capacity. In addition, your solar system should produce electricity for at least 25 years, so you'll need to consider any future obstructions or plans that might impact your system.

It's important to think ahead so you can design a system that fits your long-term needs. Installing additional electric heat, adding air conditioning, or purchasing an electric vehicle will increase your usage. You might also

be taking measures to reduce your usage by switching to energy efficient appliances, upgrading your heating system, or adding extra insulation. We recommend undertaking any energy efficiency measures prior to installing your solar PV system. It's generally more cost-effective for you to improve your home's energy efficiency first; that way, you don't need as large of a solar PV system to meet your annual electricity usage needs.

## Site selection

The site of the solar PV system itself, including the orientation of the roof and shading, is the most significant factor that will affect how much electricity your solar PV system will generate over time.

Your contractor should undertake detailed performance modelling to determine the best location for an installation on your property. This process will include measurements and analysis to help the contractor identify structural or natural features that could impact system performance, both now and in the future.

Ideally, your system should be unshaded for the useful life of the system. As mentioned earlier, it is a good idea to speak with your neighbours about plans that could affect land use, such as the removal or addition of trees and home renovations. Some homeowners are understandably reluctant to remove trees which add beauty and value to the property. In some cases, depending on the location of the tree relative to the solar PV system, the overall impact on solar efficiency may be minimal. You should discuss this issue with your contractor to make an informed decision.



# SECURING YOUR SOLAR PV CONTRACT

To be confident in the advice and quality of work you receive, we recommend requesting quotes from at least three different contractors. This will help you understand what's needed for a successful installation and receive the best value for your investment. Sometimes a contractor will prepare a project estimate using available satellite and street imagery, but to ensure accuracy, the contractor will need to visit your home to assess the site conditions and surrounding area.

## Choosing a solar PV contractor

When evaluating potential contractors, you'll want to determine if the company you're considering has experience installing solar PV systems. The following are some questions you can ask to evaluate their capabilities, experience, and pricing:

- Do their employees or subcontractors have any specialized training in solar PV design and installation, including electrical fundamentals, solar energy principles, PV modules, inverters, and racking?
- Are they familiar with available solar rebate and financing programs?
- Do they have a portfolio of similar solar PV installations they can share?
- If their main experience is unrelated to solar, how do their skills and experience relate to the solar business?
- What do they offer for workmanship warranty, labour, and products?
- In addition to the installation of solar PV systems, what other services do they provide, and at what cost?
- What is the full cost of the total installation, including miscellaneous equipment, bi-directional meter, permit, and interconnection fees?
- What will be the payback for your investment in this project? What factors are taken into consideration when calculating the payback period of this project?

Don't be shy with your questions! You need to be able to count on the company to competently manage your installation from design and permitting, to installation, to flicking on the switch.

## Checking references

Before you choose a contractor, we recommend you seek references and reviews from past customers and obtain independent feedback whenever possible. While a reputable contractor will aim for a smooth, problem-free installation, your installation may require additional followup. Ask past customers about how the contractor addressed any issues that came up. You can also search your contractor's business name online to review comments and ratings left by customers.

After consulting with a potential contractor, ask yourself if the representative leaves you with confidence that the company will be around for the long term to deliver on warranty coverage and services that will support the optimum performance of your system. If you have any doubts, don't be afraid to ask more questions.

## Hiring a contractor through the Solar Rebate Program

If you're applying for our Solar Rebate Program, you'll need to hire a registered Efficiency Manitoba contractor. They must hold an electrical contractor's licence and offer you a workmanship warranty. They should also be able to provide you with proof of general liability insurance coverage.

You can find **[a list of registered contractors](#)** on our website.

## Getting a quote

It's important to understand what products and services are included in the cost of your solar PV system. When you request a quote, ask for a written account of the costs and responsibilities that are covered in the total, including all components and installation. Make sure the estimate clearly indicates the costs, if any, for which you'll be responsible, in addition to the contractor's quote.

### During the process of getting a quote, there are a few questions you should ask the contractor:

- ☐ Will they help you with all rebate and/or Manitoba Hydro non-utility generation-related paperwork?
- ☐ Does the estimate include a complete turnkey installation including all permits, equipment, costs, and related tasks?
- ☐ Is the company able to provide you with a quote to temporarily remove the panels if your roof needs repairs or replacement?

### When you review the estimate, check to see if it includes the following items:

- ☐ The cost of labour, equipment, and materials (names, models, size, etc.);
- ☐ Permit costs and associated fees (for example, a building permit may require a stamped engineering drawing);
- ☐ The expected payment schedule, including clear holdback amounts (for example, for performance and builders' lien) and timing of release;
- ☐ The estimated work start and completion dates;
- ☐ Warranty support and maintenance after your system is installed;
- ☐ A statement that the contractor carries liability insurance for property damage and workers compensation coverage;
- ☐ A statement identifying what the contractor will clean up during the work and after completion;
- ☐ Monitoring equipment for your system that will help you track its performance; and
- ☐ A statement that the contractor will instruct you on the operation and maintenance of any equipment and provide any required operation manuals.

Make sure you fully understand the warranty coverage your system will have and who will be responsible for honouring that warranty (i.e. the manufacturer or contractor). Also ensure that any subcontractors the contractor may use have the proper qualifications and insurance needed to properly complete the work. Remember, all electrical work must be inspected. Additional inspectors may be required for building safety.

### Make sure each estimate you obtain includes the following:

- ☐ An estimate of the ongoing costs for the system, including regularly scheduled system maintenance and service;
- ☐ The approximate lifespan of the system and its expected output over this lifespan. This should align with the manufacturer's performance guarantee and equipment warranty period. Most solar panel and inverter manufacturer warranties are 10 years, while most solar panel performance warranties are 25 years;
- ☐ Any potentially significant costs for replacement parts, such as panels, inverters, and control systems;
- ☐ A reliable assessment of the energy production at the site, including an assessment of shading impacts;
- ☐ All assumptions related to the lifetime financial analysis (if this is included);
- ☐ Reasonable projections for electricity rates.
- ☐ Assumptions and calculations related to the impacts of inflation;
- ☐ Assumptions and calculations related to panel degradation (solar panel output decreases around 0.5% each year); and
- ☐ The inclusion of ongoing maintenance and operating costs (for example, if the inverter has a 10-year manufacturer warranty, it's reasonable to assume it will need to be replaced in 10 years).

Ensure payment terms are clearly explained within the terms and conditions of the agreement. If a deposit is being requested upfront, make sure payment and refund terms are included.

You should be able to have these open discussions with your contractor before signing on the dotted line. Understanding the full picture at this stage in the project will mitigate surprises and give you more confidence in your investment.



## Ask for a written contract

When you hire a contractor, ask for a written contract.

### **Before you sign the contract, follow these recommendations:**

- Read it carefully to make sure all the quote details are included.
- Review all terms and conditions and the fine print.
- Seek legal counsel when you're not sure about something.
- Initial any changes to the work or standard conditions on the contract. Your contractor must do the same.

Never sign an incomplete contract or make a verbal agreement. A contract helps resolve disputes if the work is unsatisfactory or if there are any other disagreements between you and your contractor. Because Efficiency Manitoba isn't a party to any contract you have with your contractor, we can't and won't act as a mediator in any disputes or disagreements between you and your contractor.



# REBATES & FINANCING OPTIONS

## How our Solar Rebate Program works

At Efficiency Manitoba, we're here to help you make energy-efficient choices and upgrades. That's why we offer rebates to homeowners who install eligible solar PV systems.

We provide a rebate of \$0.50 per direct current (DC) watt installed on homes connected to Manitoba Hydro's grid, up to a maximum of \$5,000 per home. Rebates are available for system sizes of up to 10 kW per home. You can install a solar system larger than 10 kW; however, your rebate will be capped at 10 kW and \$5,000. If the equipment cost of your new solar PV system is less than the calculated rebate amount, your rebate will be capped at the lesser of the two amounts.

We don't need to approve your project in advance to be eligible for a rebate. However, you do need to follow all applicable municipal codes, provincial and federal regulations, and installation standards. In addition, the system must be installed by a **registered Efficiency Manitoba contractor**. You can apply to receive your rebate after your system is installed and operational.

### Steps to participate

Once you've determined you want to install a solar PV system and receive a rebate, here are your next steps:

- 1 Contact at least three **registered Efficiency Manitoba contractors** for quotes. This would also be a good time to assess the condition of your roof. If your roof is at least 12 years old, you may want to contact a professional roofing company to inspect it. This is also the best time to contact your home insurance provider to see if any changes to your policy or coverage are required.
- 2 After you choose a contractor, they'll submit all necessary documentation to Manitoba Hydro to receive the interconnection approval to connect your system to their grid. Now's a good time to obtain any necessary permits and ensure your system complies with any municipal building code and electrical code requirements.
- 3 Once your interconnection application is approved by Manitoba Hydro and you obtain all required permits, you can purchase the equipment and have it installed.
- 4 Once the installation and all required inspections are completed, your bi-directional meter is installed, and your system is fully operational, you can apply for our Solar Rebate Program. You or your contractor have 90 days after the installation date to send us the application and supporting documents. Your rebate cheque will arrive in the mail six to eight weeks after we receive your completed rebate application.

Visit **our website** for more information about our Solar Rebate Program.



## Other rebate and financing options

In addition to receiving a rebate through our Solar Rebate Program, you can also apply for rebates directly through the Canada Greener Homes Initiative, further lowering the cost of your solar PV system. Financing is also available through the Canada Greener Homes Loan and Manitoba Hydro's Home Efficiency Loan.

### Canada Greener Homes Grant

The Canada Greener Homes Grant is offered by the Government of Canada as part of its Canada Greener Homes Initiative. It provides grants up to \$5,000 for eligible home energy retrofits, including solar PV systems. You'll need to apply before purchasing or installing any equipment and you must undertake both a pre- and post-retrofit EnerGuide evaluation. Eligible homeowners who install a solar PV system can receive \$1,000 per kW.

For more information, visit [the Canada Greener Homes Initiative website](#).

### Canada Greener Homes Loan

The Canada Greener Homes Loan builds on the Canada Greener Homes Grant. This is an interest-free loan that allows homeowners to finance their home's energy retrofits and improve their home's energy efficiency and resiliency. Eligible homeowners can receive between \$5,000 and \$40,000 in financing. You'll need to be eligible and apply for the Canada Greener Homes Grant to qualify for the loan, and you must have obtained a pre-retrofit evaluation of your home.

For more information, visit [the Canada Greener Homes Initiative website](#).

### Manitoba Hydro's Home Energy Efficiency Loan

Manitoba Hydro's Home Energy Efficiency Loan offers eligible homeowners up to \$20,000 in financing for their solar PV system to a maximum of 15 years. The monthly payment is added to your energy bill and no down payment is required.

For more information, visit [Manitoba Hydro's Home Energy Efficiency Loan web page](#).



# MANITOBA HYDRO'S NON-UTILITY GENERATION PROCESS

When you install a solar PV system, you can use the electricity your system produces to reduce the amount of electricity you buy from Manitoba Hydro. However, you'll still need to be connected to Manitoba Hydro's grid because your system won't be able to produce electricity 24 hours a day, and there may be periods when the amount of electricity your system generates won't be enough for your needs.

There may also be times when your system generates more electricity than your home needs. When this happens, you can sell your excess electricity to Manitoba Hydro for other customers to use. Figure 5 illustrates how the solar PV system is expected to perform throughout the day.

## Connecting to Manitoba Hydro's grid

To install your solar PV system and sell your electricity to Manitoba Hydro, you'll need to follow Manitoba Hydro's non-utility generation process. As part of the process, you must meet Manitoba Hydro's interconnection requirements, enter into an engineering study agreement (for large and complex interconnections), use a CSA-approved grid-tied inverter(s), and pay for a bi-directional meter and any other upgrades to facilitate the interconnection. Your contractor will typically complete these forms on your behalf before the system is installed.

For more information about Manitoba Hydro's non-utility generation process, including how to apply, go to [\*\*Manitoba Hydro's website\*\*](#).

## Selling excess electricity

If your solar PV system is connected to Manitoba Hydro's power grid, you can sell your excess electricity back to Manitoba Hydro. The purchase price and the required agreement to sell your excess electricity will depend on the size and type of your system. There are

two types of electricity agreements currently available for Manitoba Hydro customers: non-utility generation less than 100 kW and non-utility generation 100 kW or greater. Most residential solar PV installations will fall under the first category.

For non-utility generation less than 100 kW, Manitoba Hydro may purchase your excess electricity using **net billing** at the **excess energy price**. This price is updated annually to reflect the current market value of excess energy. You'll notice that the excess energy price isn't equal to electricity rates. That's because the rate must recover the cost of additional services that Manitoba Hydro provides you, such as transmission, distribution, customer service, safety, and emergency restoration. The excess energy price will change from year to year and can vary significantly depending on the market value of excess energy.

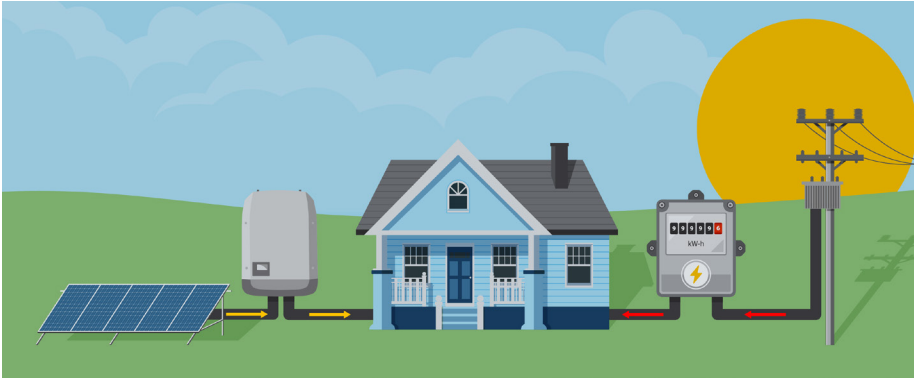
## How net billing works

Net billing allows homeowners to benefit from generating their own electricity while still being connected to Manitoba Hydro's grid. If your solar PV system generates more electricity than your home is using at any given time, the extra electricity flows into the grid for others to use. If your system isn't producing as much as your home needs, it draws electricity from the grid to power your home just like it did before you installed your solar PV system.

Manitoba Hydro will install a bi-directional electricity meter to record the flow of electricity to and from your home. If the value of the electricity that you sell to Manitoba Hydro is greater than the value of the energy you buy from them, a credit is applied to your account. The credit is carried forward to your next bill and applied to your new charges.

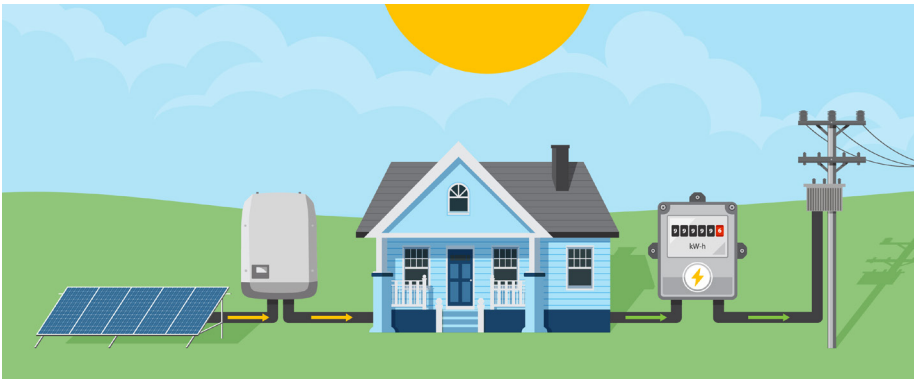
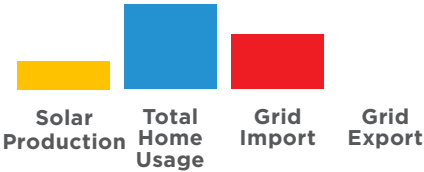
For more information about non-utility generation interconnection, email Manitoba Hydro's **Energy Services Advisor**.

FIGURE 5. Solar PV system performance throughout the day



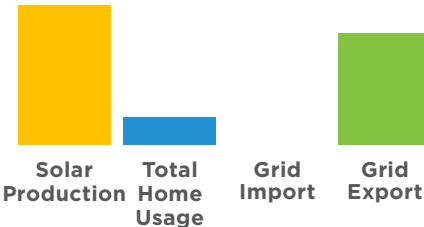
### Morning

Your solar PV system starts generating electricity but not enough to meet your home's electric needs so you continue to import from the grid



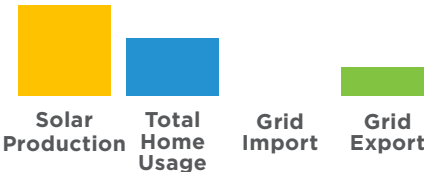
### Midday

Solar production ramps up as usage drops — lots of power is exported to the grid



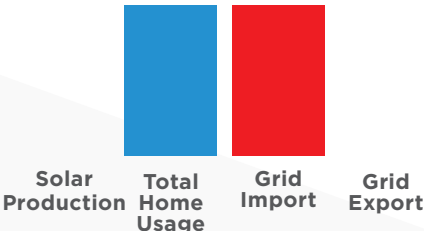
### Afternoon

Solar output stays high but exports decrease due to higher usage



### Evening

Solar production drops off but usage goes up, so you import fully from the grid



# FINANCIAL ANALYSIS OF A SOLAR PV SYSTEM

Purchasing a solar PV system is a big investment, and you'll need to determine if the decision is financially viable for you.

If you're working with a solar professional, they might include a cash flow analysis and attempt to quantify the total financial benefits over the entire lifetime of the system. When performing a financial analysis, several factors should be considered. For example, panels are known to slowly degrade in performance each year, electricity costs will fluctuate, and the value of money will change over time.

The following sections outline the factors that influence the payback period of your solar PV system.

## Installation costs (including financing costs)

The average installed cost for grid-connected solar PV systems in Manitoba is \$3.00 per watt before taxes and rebates.

## Operating & maintenance (O&M) Costs

On average, maintaining your solar PV system costs \$28.94 per kW per year over the lifespan of the system. This will include preventative maintenance, corrective maintenance to replace components, and the replacement cost plus labour cost multiplied by the probability that a failure will occur each year.

Some solar panel manufacturers are beginning to offer 25-year manufacturer warranties and some inverter manufacturers offer extended warranties on their inverters to 25 years. In cases where both the solar panels and inverters have 25-year manufacturer warranties, this number would be significantly lower, but many systems have 10-year manufacturer warranties, on both. Most of this O&M estimate refers to the cost of replacing faulty equipment outside of the warranty period.

If your solar panel manufacturer or inverter manufacturer warranties are greater than 10 years, a reduced O&M annual cost assumption can be used in the financial modelling of your system.

## System performance

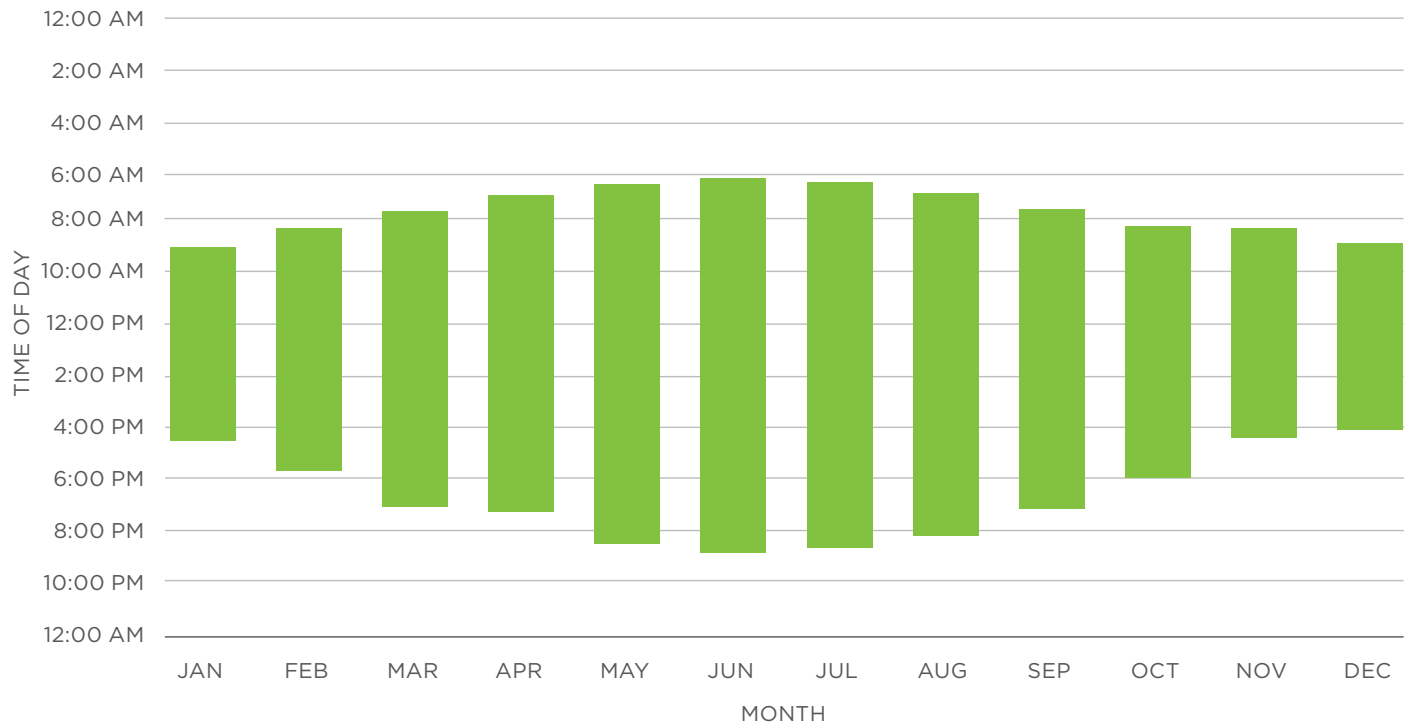
A well-designed rooftop solar system produces around 1,020 kWh each year for every installed kW of solar capacity, while a ground-mounted solar system will yield approximately 1,200 kWh per year for the same capacity. However, system performance may be impacted by many other factors such as dust, snow, dirt, and shading. We recommend using **PVWatts®**, an online solar PV production calculator, to help estimate your system's energy production. Note that using default settings in PVWatts could overstate your energy production estimates. Work with your contractor to accurately use the advanced settings within PVWatts to get the most accurate results.

## Quantity of energy used to offset load vs. excess sold to Manitoba Hydro

In Manitoba, solar generation during summer months begins at approximately 6:30 a.m., peaks at approximately 1 p.m. to 2 p.m., and ends at approximately 9 p.m. During winter months, electricity production for solar PV systems doesn't begin until approximately 9 a.m. and stops at approximately 4:30 p.m., with peak production occurring between noon and 1 p.m. (see Figure 6. Average daily solar generation period). Therefore, it's a good idea to use electricity during these peak hours to maximize solar energy use and reduce the amount of electricity you sell to Manitoba Hydro's grid.



**FIGURE 6. Average daily solar generation period**



### Annual energy needs relative to system size

If you have a grid-connected system, remember that a solar PV system should be sized to meet the annual electricity usage of your home, and not beyond it. This means that the amount of electricity your solar PV system produces should be comparable to the amount of electricity used by your home.

### Future electricity rates & the excess energy price

The cost of electricity in Manitoba has historically increased by around 3% for the last five years. However, this is just an estimate; the future cost of electricity may vary.

### Panel degradation rate

All solar panels degrade very slowly over time. The degradation rate varies between models but is generally estimated to be around 0.5% per year.

### Project lifetime

Grid-connected solar PV systems have very few moving parts and may last for a long time. However, 25 years matches what the typical performance warranty is on solar panels.

It should be noted that solar PV systems with battery storage have additional costs compared to grid-connected systems. A financial analysis can still be performed to provide information on the value of the solar PV system as a function of its upfront cost and anticipated energy production. However, this analysis won't quantify any other costs or benefits related to supplying power during outages.



## How to calculate your payback period

### STEP 1: Determine your costs

We recommend getting at least three quotes and being cautious of estimates that promise quick paybacks. Once you have a quote from your contractor, subtract the value of any federal and provincial grants and rebates from the total cost of your solar PV system. Note that the average price of installing a solar system in Manitoba is \$3.00 per watt.

### STEP 2: Determine your annual cost savings

Calculate your annual financial benefit including your avoided electricity usage at the current electricity rates and add any additional benefits including excess energy sold to Manitoba Hydro.

#### Here's some information that can help you calculate your annual savings:

- Rooftop systems will typically produce 1,020 kWh per installed kW of solar capacity per year.
- Ground systems will typically produce 1,200 kWh per installed kW of solar capacity per year.
- The current electrical residential standard rate can be found on [Manitoba Hydro's website](#).
- The price Manitoba Hydro pays for excess energy can be found on [Manitoba Hydro's website](#).
- Assuming your system is sized to produce as much electricity as your home consumes each year, you can estimate that between 40% and 60% of the annual solar energy produced will be sold back to the grid.
- We offer rebates of \$0.50 per DC watt installed on homes connected to Manitoba Hydro's grid system. We offer rebates for system sizes of 10 kW per home to a maximum of \$5,000. You can install a solar system larger than 10 kW, but your rebate will be capped at 10 kW.

#### Use this formula to calculate your annual cost savings:

*(solar energy produced x percent of energy used in home x current electricity rate) + (solar energy produced x percent of energy exported x excess energy price)*

### STEP 3: Calculate the payback period

Divide the total cost of your solar PV system by your annual financial benefits to calculate the number of years it'll take for you to achieve your payback.

## Reducing risks and solving problems

Doing all your homework will help you feel confident in your final decision as it relates to your solar PV system. That said, there are some additional steps you can take to further minimize any risks associated with your installation.

It's a good idea to determine the installation services that your contractor offers in-house. Some providers subcontract these services. For example, a licensed electrician or plumber may be required to take out a permit and be responsible for all electrical connections on site. If your contractor subcontracts that work, find out who they use and ask if that company or person is experienced with, or certified in, the installation of solar technology.

To reduce risk and protect all parties, you may decide to choose a contractor based on their training and experience in solar technologies. All contractors who are registered to offer our Solar Rebate Program will have already provided proof of insurance and signed all necessary documentation.

If a concern arises during or after the installation of your solar PV system, don't be afraid to raise the issue with your contractor. Reputable businesses will always be keen to address any problems. If you're not satisfied with the contractor's response, look into the solutions available to you under your contract or warranty.

# FINAL CHECKLIST & QUESTIONS TO ASK BEFORE SIGNING AN AGREEMENT

Congratulations on preparing to go solar! Here's a quick summary of the key points to remember before you sign on the dotted line.

## Laying the groundwork

- ☐ Have you spoken with your neighbours and insurance company to identify any potential issues (current or future) that might impact your system?
- ☐ Is your contractor taking care of your interconnection application with Manitoba Hydro on your behalf?
- ☐ Have you checked your electricity rate, and do you understand the rules for net billing?
- ☐ Have you decided if you're going to participate in our Solar Rebate Program and checked to see if you qualify?
- ☐ Have you decided if you're going to finance your solar PV system?

## Choosing a solar PV contractor

- ☐ Have you checked the qualifications and references for your chosen contractor?
- ☐ Have you checked if your contractor is registered with Efficiency Manitoba?
- ☐ Do you have a copy of the warranty or guarantee for equipment and workmanship?

## Checking the math

- ☐ Is your system sized appropriately for your average annual consumption level?
- ☐ Have you factored in any financing costs (including leasing costs) when calculating your system costs and savings?

## Preparing for installation

- ☐ Have you checked your roof condition to ensure that it will hold up for the next 25 years?
- ☐ How will the contractor access your roof? Do you need to make any special arrangements to allow access?
- ☐ Have you and your contractor assessed and addressed any potential shading issues (current or future) that may affect power production?
- ☐ Have you completed any other upgrades to your home that may impact your home's electricity usage?
- ☐ Are there any other structural or electrical conditions you need to address before installation?
- ☐ Who will take care of any necessary building or electrical inspections?

## Completing the paperwork

- ☐ Who will apply for Manitoba Hydro interconnection approval and our Solar Rebate Program?
- ☐ Are any municipal permits required? If so, will the contractor take care of these?
- ☐ Do you have a copy of a detailed invoice or a list of model and serial numbers for equipment should there be a warranty issue?
- ☐ Have you checked what your contract does and doesn't cover?

# ADDITIONAL RESOURCES

## Canada Greener Homes Initiative

The Canada Greener Homes Initiative provides grants and loans for home evaluations and retrofits. Eligible retrofits include solar PV and other renewable energy systems, home insulation, windows and doors, air sealing, and mechanical systems. Homeowners must undertake both a pre- and post-retrofit EnerGuide evaluation to be eligible.

To learn more, visit [Canada Greener Home Initiative](#).

## City of Winnipeg

The City of Winnipeg developed a guide with information about permit requirements for rooftop and ground solar PV installations in Winnipeg for both residential and commercial applications. This document addresses topics such as building and development permits, electrical permits, installation, inspections, and common defects.

To learn more, read this PDF from the [City of Winnipeg](#).

## Manitoba Hydro

To install a grid-connected solar PV system, you must follow Manitoba Hydro's policies and requirements and sign an Excess Energy Purchase Agreement that would allow you to sell your excess electricity to Manitoba Hydro.

To learn more, visit [Manitoba Hydro](#).

## PVWatts® calculator

PVWatts is a solar production calculator developed by the National Renewable Energy Laboratory (NREL) that can be used to estimate your annual energy production in a given geographical area. Advanced settings including additional system losses due to soiling, snow cover, and panel degradation can be programmed to provide a realistic estimate for your project. Note that using all the default settings in PVWatts could overstate energy production estimates.

To learn more, visit [PVWatts®](#).

# DEFINITIONS

**Alternating current (AC):** the type of electrical current commonly used in homes.

**Direct current (DC):** the type of electrical current that's created from solar photovoltaic (PV) panels.

**Grid:** a network that encompasses generation, transmission, and distribution systems to deliver electricity from generating stations to homes and businesses.

**Inverter:** a device that converts the direct current (DC) output of a photovoltaic (PV) solar panel into alternating current (AC).

**Kilowatt (kW):** a unit of power equal to 1,000 watts.

**Kilowatt-hour (kWh):** 1,000 watts of electrical energy produced in one hour.

**Photovoltaic (PV) solar:** a technology that converts sunlight into electricity at the atomic level with solar PV cells.

**Payback period:** the amount of time it takes to recover the cost of installing a solar PV system.

**Racking:** the hardware under the solar panel that secures it to a surface (roof, ground, pole).

**Solar array:** a collection of solar PV panels connected together to produce electricity.

**Solar panel:** a large, flat piece of equipment designed to absorb the sun's rays as a source of energy for generating electricity or heat.



September 2022  
Printed on recycled paper

Available in accessible  
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**Phone: 204-944-8181**  
**Toll free: 1-844-944-8181**  
**[solar@efficiencyMB.ca](mailto:solar@efficiencyMB.ca)**  
**[efficiencyMB.ca/solar](http://efficiencyMB.ca/solar)**



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This guide has been produced in partnership with CanREA.