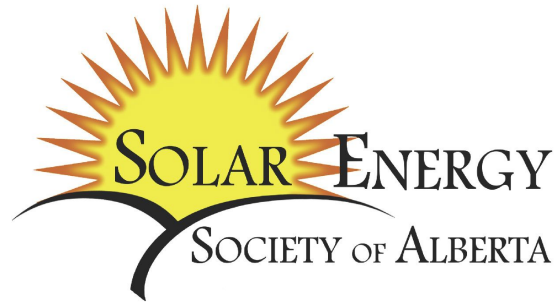




Photo courtesy of Effect Home Builders

# Going Solar in Alberta

*A Solar Consumer's Guide*



### About the Solar Energy Society of Alberta

The Solar Energy Society of Alberta (SESA) was formed in 1976 to advance the awareness, understanding and use of solar energy as well as other renewable energy and conservation technologies.

The Solar Energy Society of Alberta is a non-profit, educational organization, which serves as a resource for government, educational institutions and the public at large.

**Our organization could not exist without the support of our members. If you are interested in becoming a member, please [click here](#) to learn more about the benefits of supporting SESA.**

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This guide has been prepared with the assistance of the Canadian Solar Industry Association, and SAIT Green Building Technology.



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## Introduction

Congratulations, on taking the first steps in becoming more energy independent! Using solar energy is one of the most natural ways of powering your home and is a fantastic sustainable lifestyle choice. A solar system can generate significant benefits for you, helps reduce greenhouse gas emissions and makes you an active participant in the expanding green energy sector.

This document, adapted from the Canadian Solar Industries Association (CanSIA) Solar Consumer Guide, will help you navigate various solar options and help identify the right solution for you. The Solar Energy Society of Alberta (SESA) is here to assist you in making an informed choice. Whether you're buying a solar system outright or entering a long term agreement with a solar company, we aim to help you understand the basics of solar energy, help you go solar and identify what questions to ask your solar professionals.

It is important to remember that going solar is a major investment decision, similar in financial scope to buying a car. As with any major investment, you should thoroughly research and evaluate your options before choosing the company that will sell and install your solar system. The purpose of this document is to ensure that homeowners are informed of the major steps and considerations when buying a solar system. The more informed you are, the more likely you are to be a satisfied customer.

If you have questions concerning the information in this document, we invite you to reach out to us at [office@solaralberta.ca](mailto:office@solaralberta.ca). We will endeavour to answer your questions and get you the information you need. SESA will be updating this document periodically in order to make it as effective as possible for consumers. If there is a piece of information you think would be helpful to include, please let us know!

## How does solar work?

Solar energy is energy from the sun in the form of radiated light and heat. The sun's radiant energy can be used to provide lighting and heat for buildings and to produce electricity. Historically, solar energy has been harnessed through passive solar technologies. Typically, these involve the strategic location of buildings and various elements of these buildings, such as windows, overhangs and thermal masses. Such practices take advantage of the sun for lighting and space heating to significantly reduce the use of electrical or mechanical equipment. Solar energy can be harnessed only during the day and only if the sunlight is not blocked by clouds, buildings or other obstacles.



*Photo of solar PV modules and solar thermal collectors*

Today, two active solar technologies that involve electrical or mechanical equipment are becoming more common for homeowners:

- Solar photovoltaic (PV) technology uses solar cells to convert sunlight directly into electricity.

- Solar thermal collectors or panels are used for water, space and pool heating in buildings.

### Solar Photovoltaic

Solar PV systems convert sunlight into electricity, which can be used to meet your home's electrical demands. Grid-connected PV systems feed electricity directly into your home electrical system, reducing the amount of electricity you purchase from the electrical utility. When the solar PV system is generating more electricity than is being used in your home, the surplus is exported to the grid. The import-export process between the grid and the solar PV system is automatic. Grid-connected solar PV systems do not require batteries; when the sun is not shining, or the electricity demand is higher than the solar PV system is generating, electricity is drawn from the grid. The addition of batteries is quite expensive, so most grid-connected Albertans choose to install grid-tie PV systems without battery back-up. Solar PV systems with batteries can be installed where there is no connection to the electrical grid or when back-up power is required in the event the grid is down.

### Solar Thermal

Another type of solar energy is Solar Thermal or Solar Heating. These solar systems convert sunlight to thermal energy, which can be used to heat domestic water, or for space heating, pool heating or other heating applications. Solar heated water is stored in a hot water tank so it can be used at night or the next morning. In some space heating applications, a solar heated fluid is run through pipes within the home to provide radiant heating. There is no grid for residential heating so the thermal energy must be stored on site or dissipated.



*Figure : Building-Integrated Solar PV and Thermal*

Both solar PV and solar thermal systems can be designed to integrate into the building construction. Building-integrated solar design incorporates solar modules or collectors on windows, exterior walls, roofs, or even contained within banisters and railings. Given Alberta's relatively large heating demands, homes with solar heating systems also have other methods of heating especially during short winter days. Solar shingles are another form of building-integrated solar that have received considerable attention, however they are typically a more expensive option.

### Other forms of Solar Energy

There are two other forms of solar energy: Solar Air Heating and Concentrated Solar Power systems. These solar systems are not used in residential applications and therefore outside the scope of this guide.

## Equipment required for a solar PV system

The major components of solar PV systems are:

- **Modules** (aka solar panels) that convert sunlight to electricity (see Figure 2);
- **Synchronous Inverters** that convert the direct current (DC) electricity generated by the modules into alternating current (AC) for use in your home or for export to the grid. These can be micro-inverters that are mounted under the modules or string inverters that are mounted near the distribution panel; and
- **Racking** that either fastens your panels to the roof of a building (rooftop), or to the ground (ground-mount).



Figure 2: Solar PV Modules



Figure 3: Solar PV Equipment

## Equipment required for a solar thermal system

The major components of solar thermal systems are:

- **Collectors** (aka solar panels) that convert sunlight to heat (see Figure 4);
- **Solar Tank** that receives the heat from the collector and transfers it to domestic water; and
- **Solar pump station** that circulates the heat transfer fluid, usually non-toxic glycol, between the collector and solar tank (see Figure 5).



Figure 4: Solar Thermal Collectors



Figure 5: Solar Thermal Flow Diagram

## Understanding the terminology

Below you will find some common terms used in the electrical utility/solar industry. Understanding these terms will help you in your discussions with solar vendors.

- **Direct Current (DC) Electricity:** Electricity with a constant positive polarity; the type of electricity used in a common household battery or in automotive systems. ☒
- **Alternating Current (AC) Electricity:** Electricity with an alternating polarity; the type of electricity used in the electrical utility grid system, including everything energized from the grid such as homes and businesses.
- **Kilowatt (kW):** The measurement of instantaneous power; a product of multiplying the voltage and current component of a system.
- **Kilowatt peak (kWp):** Describes the instantaneous energy output capability of a solar electric system under ideal solar energy conditions. This would be during peak times in the middle of the day. ☒
- **Kilowatt hour (kWh):** The amount of power delivered over a period of one hour; the universal quantity for electrical utility billing.
- **Voltage/Volts (V):** Measurement of the pressure of an electrical system – the greater the pressure the more power can be transported in an electrical wire.
- **Ampere/Amps (A):** Measure of the quantity of electrical energy that is flowing in an electrical conducting wire.
- **Feed-In-Tariff (FIT):** An agreement where the utility company buys all the power generated from your solar electric system at a set price for a set period of years. ☒
- **Net-metering:** An agreement where the utility company buys the surplus power that is not consumed in your home at a rate equal to the rate you are charged. ☒
- **Grid-tie:** Refers to a PV system that is connected to the electrical network. This connection type allows excess power to be exported in return for money/credits from your utility company.
- **Off-grid:** Refers to independent solar generation and consumption of electricity associated with remote cabins or properties; typically requires batteries and/or a generator.
- **Local Distribution Company:** Term used for your power/electric utility (hydro) company.

### Measuring Energy

Electricity is measured in kilowatts (kW). Electrical energy is the amount of electricity used in an hour and is measured in kilowatt-hours (kWh). The average Alberta home uses 600 to 800 kWh per month as is shown on the monthly electric utility bill.

Thermal energy is typically measured in Giga-Joules (GJ) for natural gas although several other measures of thermal energy are also used. The average Alberta home uses about 2 GJ of natural gas in the summer increasing to 20 or more GJ in winter months. All thermal energy measures can be converted to kWh to develop your combined energy profile. For example, one GJ is equivalent to 278 kWh.



## How can I own a solar PV system?

There are two options to go solar in Alberta:

1. **Purchase:** Outright ownership of the system from the initial installation. This requires greater initial capital investment and the owner assumes the ongoing operating and maintenance costs.
2. **Lease-to-own:** Allows the homeowner to eventually own the system by paying it off over a set period. Typically, solar companies allow consumers to buy-out the rest of the cost of the system at any time.

Which option you choose will depend on a number of factors, some are listed below. These certainly are not the only factors when choosing solar power, but they are the main ones:

1. How much you can initially afford to spend on your system.
2. How much ongoing operation and maintenance work/risk you want to assume.
3. How you are compensated for the electricity generated by your solar PV system.

### Purchase

The option to purchase your solar system has higher up-front costs, but allows you to own the system and have full access to all savings and revenues that are generated. Ownership of your solar electric system is very much like owning your home and owning your own solar system to power that home, rather than purchasing electricity from a utility indefinitely.

Purchasing will require a solar vendor to both sell you the solar system and usually to install the system. Once the system has been installed you may be responsible for ongoing operation and maintenance of the system, however some solar companies will sign an agreement with you to provide those services. This will increase the cost of the system, but ensures that your system is being maintained by a qualified professional who will keep it performing optimally which will help to increase its useful life.



Figure 6: Roof-mounted Solar PV

This type of ownership option is available in Alberta regardless of the way that you will be compensated for the energy generated by your system. We will cover the main ways customers are compensated for their generated electricity in the section below.

### Lease to Own

Leased systems are not very common in Alberta yet, but they are coming. This type of ownership option is most common in jurisdictions that have long-term contracts for solar. Some companies offer, “no (or low) money down,” solar PV systems to customers. In this type of an arrangement there are either no, or low, upfront costs to the customer in order to install the solar system. Generally under this type of arrangement, the customer will pay off the cost of the system slowly over time using the revenues from the electricity that is generated. Some solar vendors will also pay you an agreed upon annual sum for as long as you are paying off the cost of the system.

In most cases, solar vendors will allow customers to pay off the solar system early in one lump sum payment, which allows customers to take immediate ownership of the equipment, should they wish. Ask your solar vendor if this is an option when you are doing your research.

## Can I be compensated for the electricity I generate?

Alberta has a 'net billing' regulation that provides value to homeowners in two ways:

1. The homeowner first consumes the electricity produced by the solar system at their home, therefore lowering their electricity bill; and
2. When they are generating more electricity than they are using, the excess electricity is exported to the local distribution grid. This exported electricity is credited towards the homeowner's electricity bill, giving them credits to apply against their electricity charges or roll over month to month.

## How is solar energy regulated in Alberta?

Grid-connected solar energy systems are regulated in Alberta depending on the size and grid connection method as discussed below.

### Alberta Micro-Generation Regulation

Alberta Energy defines micro-generation as, "production of electricity on a small scale, using renewable and alternative energy sources, typically solar and wind, by individual homeowners and small businesses, as well as municipal and community buildings to meet their electricity needs." A micro-generation regulation was established by Alberta Energy in 2008 and is overseen by the Alberta Utilities Commission (AUC). Under this regulation, micro-generators receive credits for electricity produced but not consumed. The credits are applied to the utility bill; hence the Alberta regulation is described as a 'net billing' system. Micro-generation systems are intended to allow Albertans to offset all or a portion of their electricity needs through using renewable energy, such as solar. Micro-generators can be small (sized under 150 kilowatts) or large (sized 150 kilowatts and up to 5 megawatts). Small micro-generators receive credits for sending electricity to the grid on a monthly basis at retail rates. Large micro-generators receive credits for sending electricity to the grid at an hourly wholesale market price. Once electricity is sold to earn a revenue, the generator is considered a commercial generator and is not recognized as a micro-generator, nor provided the micro-generator benefits. See the Government of Alberta [micro-generation webpage](#) for more information.

### Community Power Generation

Micro-generators provide their electricity behind the connection to a grid electrical meter. Community solar generation provides energy to multiple meters, such as in a condominium complex or to members of a Solar Co-op or similar organization. At this time the regulatory framework in Alberta is not conducive to Community Solar.

The Government of Alberta is currently in the process of determining ways to make community-owned electricity generation from green sources, such as solar, feasible for Albertans. The AUC is conducting a formal study of community-owned generation to help shape future policy development that meets the demand for local, sustainable electricity generation.<sup>1</sup>

### Utility Solar/Solar Farm

A utility-scale solar farm produces electricity from thousands of ground-mount solar panels and supplies this electricity into the transmission grid. As part of its Climate Leadership Plan, Alberta has embarked on utility-scale solar PV farms, large wind turbines and potentially other forms of renewable energy.<sup>2</sup> The objective is to achieve 30% of the grid electricity from renewable sources by 2030. The Alberta Electric Systems Operator oversees the installation and operation of utility-scale solar.

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<sup>1</sup> Government of Alberta. Review to explore greener community power, 2017. [alberta.ca/community-power](http://alberta.ca/community-power)

<sup>2</sup> Alberta Climate Leadership Plan: [alberta.ca/climate-leadership-plan](http://alberta.ca/climate-leadership-plan)

## How do I select a solar vendor?

Installing solar technology is about much more than getting a system at the lowest cost. It is about:

- Analyzing your unique needs;
- Coming up with the best overall solution;
- Choosing the right components that are certified and labeled for use in your jurisdiction;
- Installing them correctly; and
- Keeping the system running as expected over its lifetime.

You want to choose a vendor you look forward to working with over the period of design, installation and ongoing delivery of power.

It is also recommended that you choose a solar vendor that is a member of SESA or CanSIA. The Alberta Solar Providers Directory<sup>3</sup> lists over 150 Alberta solar businesses. It is searchable by service area, type of services, length of time in business and other details. SESA members have subscribed to the Alberta Solar Business Code of Conduct.<sup>4</sup> This code recognizes solar vendors' obligations to the public, the consumer, the industry and related professions and industries. Another useful resource on the SESA website is, "[How to Choose a Solar Provider.](#)"<sup>5</sup>

Below you will find helpful information on how to select a vendor, what to ask them and what information they should be providing you.

### Checking references

Start by determining if the prospective vendor has a record of quality work in the solar installation business by asking questions and checking references. Remember, it's not a perfect world and some installs may require additional follow-ups. Ask for history regarding how the vendor solved site-based issues in the past.

Obtain independent feedback from past customers wherever possible. You need to be able to count on the company to competently manage your installation from design to permits to safe solar power delivery. If the vendor's main experience is unrelated to solar, you may want to ask more questions about how their prior skills and experience relate to the solar business.

You can also check with groups like the Better Business Bureau to see if the solar vendor you are thinking of working with is listed on their website, history of complaints against them, and how they have worked to resolve those issues.

After your consultation, ask yourself if your vendor representative leaves you with the confidence that the company will be around for the long-term to deliver on warranty coverage and services that will assure optimum performance of your system. If there is any doubt, ask more questions. Consult multiple vendors and compare your findings.

### Reducing installation risk

Determine the installation services that your solar vendor offers in-house. Some providers subcontract these services to reduce labour costs. There are a number of pieces of information that you should be getting from your solar vendor.

- A licensed electrician or plumber may be required to take out a permit and be responsible for all electrical or plumbing connections on site. If your vendor contracts out work, find out who they use and whether 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 give preference to certain vendors

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<sup>3</sup> SESA Alberta Solar Providers Directory: <https://solaralberta.ca/directory/alberta-solar-providers>

<sup>4</sup> SESA Solar Business Code of Conduct: <https://solaralberta.ca/alberta-solar-business-code-conduct>

<sup>5</sup> SESA How to Choose a Solar Provider: <https://solaralberta.ca/how-choose-solar-provider>

based on the degree to which their installers are trained in solar technologies. Anyone working on site must also be insured by the Workers' Compensation Board of Alberta.

- Other related solar certification organizations like North American Board of Certified Energy Practitioners (NABCEP) and Canadian Standards Association Solar PV System Certification for Construction Electricians provide optional certification for Canadian contractors choosing to dedicate their efforts to improving solar development and applicable standards.

### Assessing the cost of your solar system

It is important to understand what goes into the cost of the solar system you are purchasing, and what products and services are included in the cost. There are a number of pieces of information that you should be getting from your solar vendor.

1. Ask for a written accounting of the costs and responsibilities covered in the total cost estimate.
2. Look for the costs of stamped engineering drawings, building permits, warranty support and maintenance support going forward.
3. Will the vendor help you with an incentive application?
4. Does the total cost estimate include a complete installation including all materials, labour, permits, grid connection and related tasks?
5. Who will bear the costs for temporarily removing and reinstalling the system if your roof needs to be renovated?
6. Will the installation of a solar system have implications for your home insurance, income taxes or property taxes?

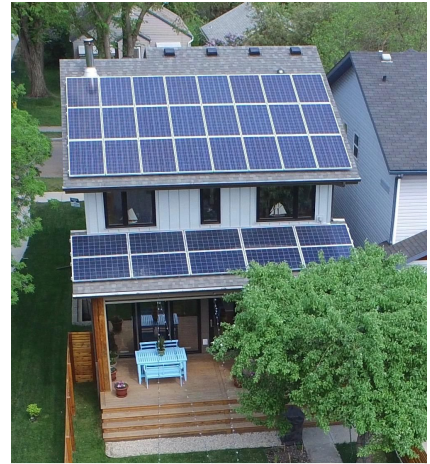


Figure 7: Horseman Net Zero Energy Home

### Selecting your site

One of the most significant factors that will affect how much energy your solar PV system will generate are the conditions of the site on which it is constructed.

- When determining the best location for your installation, a competent solar company will provide detailed performance modelling.
- With the use of appropriate devices and/or analytical skills, the representative can identify obstructions such as structural or natural features that could affect system performance because of shading, both now and in the future.
- Ensure the system will be unshaded for the life of the contract. At this point, it is well worth speaking to neighbours to discuss plans that could affect one another's use of the land (for example removal or addition of trees, home renovations, etc.).
- The orientation of the planned system is also important. The angle/pitch and compass direction of the roof will impact how much sunlight in your area hits the panels.

### Examining performance projections

A number of factors are used to calculate the projected performance for your solar installation. Ensure each quote you obtain documents the following:

- Estimates the total costs of the solar equipment, including regular system maintenance and service. Sets out the approximate life of the panels, aligning with the manufacturer's warranty period. Indicates the potentially significant costs for replacement parts such as inverters or tracker motors and control systems.
- Accurately assesses the solar exposure and energy production, considering statistical highs and lows caused by fluctuations in weather. Also, consider including monitoring equipment with your system to track its performance and to ensure its optimal performance. These types of

services generally come with a cost, so be sure to ask your solar professional about how much these services will cost.

### Other considerations

- A grid-connected solar PV system in Alberta will be net-metered therefore the energy savings of the system will be directly linked to how much electricity you consume in your home/building. Remember, a net-metered system only saves you money on your electricity bill; there aren't direct payments for your generation like under a Feed-In-Tariff contract. Your utility bill will show your electricity usage in kilowatt-hours (kWh) and the amount you pay for that electricity.
- Are you planning any changes that will affect your electricity use, such as buying an electric vehicle, planning an addition to your home, or improving your home's energy efficiency? Discuss your usage with the solar vendors you interview to get a system sized for your needs.
- Check with your insurance provider and real estate agent to determine if installing a solar system on your home will impact your home insurance or your ability to sell your home.

### How can I resolve issues with a solar vendor?

SESA's members are dedicated to providing quality products and customer service and endeavour to ensure their customers are satisfied. If you are having an issue with a solar vendor that is a SESA member, you can utilize the following methods to seek resolution:

- The first step should be to try to seek resolution with your solar vendor. Consider exercising your rights under your contract or lease, which may include a dispute resolution process.
- You can contact private consumer organizations (e.g. your local Better Business Bureau) about your issue.
- SESA may also be able to assist you in resolving your issue. Note that SESA member companies are bound by the Code of Ethics and Solar Business Code of Conduct. If you believe a company has violated either of these documents, you may submit a complaint to SESA. SESA will consider the issue under our Complaint Resolution and Disciplinary Process. SESA's Solar Business Code of Conduct and Complaint Resolution and Disciplinary Process are available on the SESA website ([www.solaralberta.ca](http://www.solaralberta.ca)).
- Completed complaint forms are to be submitted to [office@solaralberta.ca](mailto:office@solaralberta.ca)



Figure 8: Nu Energy Solar System

### Additional Resources

- SESA Consumer Protection: [solaralberta.ca/alberta-solar-business-code-conduct](http://solaralberta.ca/alberta-solar-business-code-conduct)
- Municipal Climate Change Action Centre: [mccac.ca/resources/solar-friendly-municipalities](http://mccac.ca/resources/solar-friendly-municipalities)
- CanSIA: [cansia.ca/market-intelligence](http://cansia.ca/market-intelligence)
- Natural Resources Canada: [nrcan.gc.ca/energy/renewable-electricity](http://nrcan.gc.ca/energy/renewable-electricity)
- International Energy Agency: [iea.org/topics/renewables/subtopics/solar](http://iea.org/topics/renewables/subtopics/solar)
- Better Business Bureau: [bbb.org](http://bbb.org)

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*Figure 9: City of Leduc Recreation Centre*



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