



Generating Electricity From the Sun

March 23, 2017

RESOURCES



Alberta Farmers Solar Energy Resources and Websites

1 Growing Forward 2 Solar Grant Program

http://www.growingforward.alberta.ca/Programs/index.htm?contentId=ON_FARM_SOLAR_PRG&useSecondary=true

2 Solar Energy Society of Alberta

Lots of resources.

www.solaralberta.ca

3 Alberta Solar Providers Directory

Solar installers must be listed here.

<http://www.solaralberta.ca/company-directory>

4 Solar Systems Gallery

A gallery of 130 Alberta solar systems. Lots of system information and “lessons learned”.

<http://www.solaralberta.ca/case-studies>

5 Solar Electricity Basics

<http://www.homepower.com/articles/solar-electricity/basics/what-solar-electricity>

6 Solar Potential Data

<http://pv.nrcan.gc.ca/index.php?lang=e&m=r>

NRC chart comparing production for specific locations, time of year and panel angle.

7 How to Generate Your Own Power and Sell It to Alberta’s Grid

<http://www.solaralberta.ca/node/849>

One hour video presentation

8 Alberta Utility Commission Micro Generation Program

<http://www.auc.ab.ca/involving-albertans/micro-generation/Pages/default.aspx>

9 AUC Micro-generation Application Guidelines

http://www.auc.ab.ca/involving-albertans/micro-generation/Documents/MicroGeneratorApplication_Version1-3_20130705%20.pdf

10 Carbon Credits

<https://greenmetrics.ca> <http://carboncreditsolutions.ca>

Two companies that bundle solar generators to access green credits in Alberta’s carbon market.

11 ACE Energy Production Incentives

<http://www.acenergy.ca/green-offset-program/>

A program to receive a 1.8¢ / kWh credit as a green energy generator.

12 EQUUS Solar Financing and Rebate Program

<http://www.equs.ca/services/sustainability/micro-generation/financing-and-incentives-for-solar/>

A program for EQUUS members.

13 Electricity Retailers

Utilities offering a variety of rates and programs, including buy rates for solar generators.

<https://www.greenalbertaenergy.ca/greenretailers.html>

10 Steps to Becoming a Micro-Generator

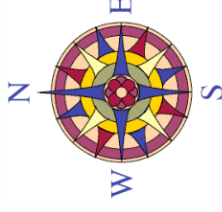
1. Plan your project. Check local permit requirements...
2. Submit Form A - Include a Single Line Drawing and Site Plan.
3. Obtain any applicable development and building permits if required.
4. Confirm Canada Standards Association (CSA) approval for all equipment.
5. Unless you are uniquely qualified, consult with an electrician.
6. Install generation unit.
7. Complete electrical inspection.
8. Submit Interconnection Agreement with finalized Electrical Permit.
9. WSP carries out the final bi-directional meter installation.
10. Micro-generation commences.

AUC Microgenerator Application Guideline v-1.3

1

The NRCan performance predictions are based on ideal conditions.

How Ideal Is My Site?



- ✓ Shading - 100% Solar Access
- ✓ Orientation - Modules face True South
- ✓ Tilt Angle - Equal to Latitude
- ✓ Snow - Snow Cleared
- ✓ Soiling - Minimal Soiling
- ✓ Temperature - Good Array Air Circulation

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Solar Insolation Factors for Various Orientation and Tilt Angles

Array Tilt Angle

Azimuth Angle	Array Tilt Angle									
	0°	15°	30°	45°	60°	75°	90°			
N 0°	75.7%	61.1%	49.0%	39.3%	32.5%	30.0%	28.2%			
NE 45°	75.7%	65.3%	55.9%	48.8%	43.9%	40.0%	36.5%			
E 90°	75.7%	75.1%	73.7%	71.4%	67.6%	62.3%	55.9%			
SE 135°	75.7%	84.3%	89.8%	91.6%	89.4%	83.6%	74.3%			
S 180°	75.7%	87.9%	96.2%	99.9%	98.5%	92.2%	81.7%			
SW 225°	75.7%	84.3%	89.8%	91.6%	89.4%	83.6%	74.3%			
W 270°	75.7%	75.1%	73.7%	71.4%	67.6%	62.3%	55.9%			
NW 315°	75.7%	65.3%	55.9%	48.8%	43.9%	40.0%	36.5%			

Based on Edmonton, Alberta 53.5°N from RETScreen V4 compiled by Gordon Howell

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Snow



Annual Increase
in production from
regular snow clearance*:

Tilt	Increase
90° Vertical	0.0%
53° Latitude	1.5%
45° 12 in 12	1.9%
27° 6 in 12	4.2%
18° 4 in 12	5.2%
14° 3 in 12	5.2%

- NAIT Reference Array cleared half of the array for past 3 years.
- Averaged 24 snow clearance events per year.
- The array output varied by 17% from 2012 to 2013.
- Most grid-tie sites are not manually cleared.
- Off grid sites are often cleared

*NAIT Reference Array Edmonton 2012-2013

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GRID-TIE SOLAR PV SYSTEM SIZING

How much electricity needed?

$$600\text{kWh/month} \times 12 \text{ months} = 7200\text{kWh/year}$$

What will an Didsbury system produce?

$$1 \text{ watt solar PV} = 1.27 \text{ kWh/year}^*$$

What size solar array?

$$\frac{7200\text{kWh/year}}{1.223\text{kWh/year}} = 5889 \text{ Watt Solar Array}$$

(For ideal site conditions)

*For location production data: <http://pv.mrcan.gc.ca/index.php>

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Determining the value of your solar electricity

In Summary:

Export Solar Electricity

- Exported solar electricity is worth less than self-consumed solar electricity.
- Exported electricity is recorded as a credit.
- You can accumulate credits over a period of a year.
- Contracting with a "Green Retailer" may add value to your exported electricity.
- A Green Retailer may actually write you a cheque for your exported electricity.

Consume Solar Electricity

- It is preferable to consume it rather than export it.
- The value of self consumed solar depends on what percentage of your distribution and transmission charges are variable.
- This can be challenging to determine.

There is a built in incentive to consume what you generate.
Every system owner will have a different Export/Self Consumption ratio.
The closer to 100% consumption the higher the value of solar electricity.

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Economic Calculation Considerations Summary

- * Location-specific solar resource (from Natural Resources Canada database)
- * Solar access (shading considerations)
- * Other site-specific factors (array orientation & tilt, tracking, snow, dust, etc.)
- * On-site use: the self-consumption/export ratio
- * Utility bill inflation rate (assume 3.8%/yr)
- * Decrease in the value of money (assume 2.0%/yr.)
- * Capital Cost Allowance benefits (varies)
- * Tax savings benefits (varies)
- * Solar module output degradation (0.5%/yr.)
- * Maintenance and replacement costs (assume \$10/kW/yr.)
- * Special green contract rate (if available 1.85¢/kWh exported)
- * Carbon offset revenue (if available)
- * Growing Forward solar incentive program
- * Government incentive programs (federal, provincial, county or municipal)

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Solar System Economic Analysis

Some Conclusions:

- ◆ A true economic analysis is quite complicated.
- ◆ Site conditions and utility pricing schedules will vary substantially.
- ◆ Simple Payback is not an accurate calculation tool.
- ◆ There are significant additional costs and benefits to consider.
- ◆ When utility rates go up solar system owners smile.
- ◆ Not installing a solar system can be expensive.
- ◆ Once the investment is amortized the savings can be extraordinary.
- ◆ Growing Forward 2 on-line solar cost calculator.
- ◆ Take advantage of the solar and efficiency incentive programs.

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Hiring A Solar PV Contractor

1. Do your research

- ☐ Check the Solar Energy Society's "Alberta Solar Providers Directory" at <https://solaralberta.ca/directory/solar-providers> for companies that offer the services you want.
- ☐ Compare the companies at <https://solaralberta.ca/compare>

2. Solicit multiple quotes

- ☐ It is best to ask for quotes from 2 to 4 companies.

3. Expectations from the quoting companies

- ☐ A phone conversation to answer all of your questions
- ☐ An economic analysis based on the information you provide, satellite photos of your site, and your electricity bills. Make sure they don't "just" divide your bill by the kWh on your bill to come up with an electricity price because that is not the correct way to do it.
- ☐ A visit to your site – usually free or with a small deposit fee if there is a large distance to travel. The fee can be refundable if you choose their company for your PV system. We do not recommend hiring any company that does not visit your site before submitting a bid.

4. Enquire about

- ☐ Number of systems the company has installed
- ☐ PV installation certification for their company
- ☐ Length of time being in business
- ☐ Warranties for their products and their installation labour

5. Request references

- ☐ It is really important to ask for 3 to 6 references of similar projects.

6. Request documentation

- ☐ Proof of comprehensive general liability (CGL) insurance
- ☐ Proof of Workers Compensation Board (WCB) insurance, both at the start and at the end of their work on your PV system

7. Require a complete contract, showing

- ☐ the project and installation timetable
- ☐ which company is doing the work
- ☐ data sheets providing the specifications of the equipment they will be installing
- ☐ the DC and the AC capacity of the PV system that they will be installing
- ☐ the amount of energy they expect your PV system will generate over the year
- ☐ warranties for their product and their installation labour
- ☐ schedule for payments
- ☐ details of their change order process
- ☐ their dispute resolution process

Approved Energy Assessment Providers

Code (F, I, FI)*	Company Name	Phone	Main Contact	Email	HQ Location	Service Area	Website	REC ‡ or IEC†
F	Carbonbite Innovations	403-358-7762	Mark Whittaker	sales@cbisolar.com	Red Deer	Western Canada	www.cbisolar.com	REC
F	Dandelion Renewables	780-566-6058 or 780-566-3000	Mikhail Ivanchikov	info@dandelionrenewables.com	Edmonton	Alberta	www.dandelionrenewables.com/energy-conservation-services.html	REC
F	Enveritas Energy Inc.	780-554-6455	Darren Achtymichuk	darrena@enveritasenergy.com	Calgary	Western Canada	www.enveritasenergy.com	REC
F	Evergreen & Gold Renewable Energy	780-429-4731	Warren Sarauer	info@evergreenandgold.ca	Edmonton	Alberta	www.evergreenandgold.ca	REC
F	Generate Energy Ltd.	780-916-3104 or 780-999-2148	Brandon Sandmaier	info@generateenergy.ca	St. Albert	Alberta	www.generateenergy.ca	REC
F	Integrated Sustainable Consultants Ltd.	587-226-6981	Pat Leslie	Patrick.leslie@integratedsustainability.ca	Calgary	Western Canada	www.integratedsustainability.ca	REC
I	LWP Technical Solutions	403-915-6082	Lawrence Papworth	papworth@xplornet.ca	Magrath	Alberta, South of Calgary	lwptechncialsolutions.com	IEC
F	Northern Brea Renewables	780-689-4487	Stephen Sulz	Stephen.Sulz@gmail.com	Athabasca	Alberta	N/A	REC
F	NuEnergy	780-443-4242	Trevor Locke	tlocke@nuenergygroup.com	Edmonton	Alberta	www.nuenergygroup.com	REC
F	Solaré Distributors Inc.	780-960-2044	Jay Kaminsky	jay@solaredistributors.com	Spruce Grove	Western Canada	www.thesolarevolution.com	REC
F	Sustainability Resources Ltd. Pathways 2 Sustainability	403-975-2973	Lisa Maria Fox	lisafox@sustainabilitycircle.ca	Calgary	Alberta	ca.linkedin.com/in/lisamariafox/	REC
F	Think Energy	403-617-6719	Chris Fuhrer	chrisifuhrer@gmail.com	Calgary	Alberta	N/A	REC

*Code (F, I, FI): What type of assessment the provider is approved to perform; F=Farms Excluding Irrigation, I=Irrigation Only, FI=Farms Including Irrigation

‡REC = Renewable Energy Company

†IEC = Independent Energy Consultant

For examples of successful case studies as well as fact sheets on equipment up-grades go to: <http://www.growingforward.alberta.ca/index.htm>
Click on On-Farm Energy Management (2X)

For more information on the Energy Management Grants:
Phone: 780-427-3819 Email: loretta.orr@gov.ab.ca
Website: www.growingforward.alberta.ca

ABOUT US



“The Solar Energy Society of Alberta is the trusted community resource for the widespread understanding and use of solar energy in Alberta.”

The Solar Energy Society of Alberta (SESA) was formed in 1976 as the Northern Alberta Chapter of the Solar Energy Society of Canada Inc. (SESCI-NAC) to advance the awareness, understanding and use of solar energy as well as other renewable energy and conservation technologies. We are located in Edmonton, Alberta, Canada.

Our membership comes from many walks of life; from educators and engineers to solar installers and homeowners. The only real requirement is an interest in alternative ways of thinking about our energy use.

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. To this end SESA has partnered with Grant MacEwan University, the University of Alberta, the Northern Alberta Institute of Technology, the Telus World of Science, the City of Edmonton, the Edmonton Federation of Community Leagues, the Electrical Industry Training Centre, the Canadian Solar Industries Association and a number of Alberta elementary and high schools.

SESA holds seminars, workshops, classes, exhibits and public demonstrations and provides a solar technology demonstration trailer for public events in the Northern Alberta area.

You can find out more about us on our website at: solaralberta.ca



Board of Directors



ABOUT US



The Foothills Forage & Grazing Association is a **non-profit producer driven group** that addresses issues, ideas, and innovations for forage and livestock producers in southern Alberta.



We look at a wide variety of topics including: soil health, pasture management, cattle handling, animal health, business management, biological weed control, livestock watering systems, environmental impact, forage varieties, winter grazing and much more!



FFGA strives to bring current information to producers by hosting demonstration projects, events and workshops, **hands-on days**, as well as networking with like-minded producers and the sharing of information through our monthly newsletter, website, and social media.



The board of directors is currently made up of 11 volunteer forage producers from across the FFGA region. FFGA brings producers together by finding profitable and regenerative ways to produce forages and livestock.