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14TH EDITION

RENEWABLE ENERGY BUYERS GUIDE AND PRODUCT CATALOGUE



1-800-265-8898

WWW.ENERGYALTERNATIVES.CA

Welcome

Thank you for choosing Energy Alternatives as your supplier of choice for quality alternative energy products.

Whether you are just curious about alternative energy and how it works, or are seriously considering purchasing your own power system, you will find a wealth of information in the following pages.

Since 1984, Energy Alternatives has been providing high quality renewable energy systems to customers throughout Canada. We supply customers with electricity to build, to clean, to cook, to communicate, and to work. Name a location, and we've probably installed or provided a system there.

We welcome you to stop by and visit us in Victoria, BC, Canada. The showroom is filled with demonstration products and systems that are actively powering aspects of the EA facility. Our knowledgeable sales staff will discuss your needs and come up with solutions. If you are travelling from out of town, we highly recommend calling in advance to set up an appointment to avoid disappointment.

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Where to start?

Energy Alternatives together with an expert team of local representatives is here to help you on your path to energy independence. Choosing an energy system doesn't need to be complicated. This guide will simplify the process for you.

HOW TO USE THIS GUIDE

Depending on your needs, you should focus on different sections of this guide:



Renewable Energy 101

Page 6

New to the world of alternative energy? Energy Alternatives has been designing, selling and installing alternative energy systems for over 23 years. We can guide you through the process of selecting the alternative energy system that is best suited to your needs, site and budget.



Packaged Systems

Page 15

If you are looking for a turn-key system as a starting point or complete energy solution, this section will give you details on our uniquely engineered packaged systems.



System Components

Page 30

If you are looking to build your own system or upgrade an existing one then proceed to this section where we feature many of the components we use and sell.



Information Online

Detailed information is available round-the-clock on our website where you will find extensive collections of owners manuals, design aids, specification sheets, and much more.

www.EnergyAlternatives.ca



Customer Testimonials

A Rodgers, 70 Mile House BC, March 2009

(EA was called in to review an existing system and fix a few problems)

.... By the way, we got that new breaker installed in the inverter without any hitches, thanks to your excellent instructions. The system is working beautifully right now. We've really noticed a difference in how much more power we can hold in the batteries and how much less we are running the generator. We've had several days with no genny at all, solar carrying the full load.

PB, 100 Mile House, BC April 2008

We just wanted to take a moment to thank you so much for all your time at the home show. We really appreciated the opportunity to discuss our system issues with you and receive honest information. We were both very impressed with your obvious expertise with these systems and their day to day operation. We will be in touch with you on the addition of battery charging components to our sytem before the fall season.

G&M, Petawawa, Ontario, October 2007

It seems that these days many people are quick to write a letter when they are upset with, or feel they have received poor service. Therefore, I wanted to take a moment and pass on some positive feed back! My wife and I would like to express our thanks to all the people at Energy Alternatives. The service we have received from you, has been nothing but exemplary. We believe many people came together to work on this project, however one person does stick out, and that is Mr. Hiltz Tanner.

We did not know much about alternative energy sources; other then we had no choice but to go in that direction due to the location of our new house. Mr. Tanner ran us through all the in's and out's, the good and the bad, and we think most importantly, the do's and don't of living off grid. We believe Mr. Tanner went well above, and beyond what would be in his normal job description. Not only did he help us design a system, which is second to none, but he taught us so much about how to change our life style to suit off grid living. His knowledge on the products and alternative energies in general, combined with his honesty, professionalism, and true sincerity to see us get the right system, saved us a lot of time and money. We are very satisfied with our system, and believe we will be for many more years to come. We look forward to working with EA in the future, as we intend to expand our system. We can't thank Energy Alternatives enough!

Thank-you so very much, sincerely,

G&M, Petawawa, Ontario.

SG, Vancouver Island, BC - March 2006

"Kevin I want to thank you!!!!!!!!!!!!!!!!!!!!!! Everything looked so professional & I am so glad to have it done right. I also want to thank you for the extras i.e., generator, power wagon etc., and lastly the best of all that I really appreciate is the follow up, that was absolutely amazing"

Captain J.Q.Cosulich. Vancouver, BC - January 2005

"We have done 4 houses on the island (I own two of them and the other two are close friends) We started buying equipment and expertise from EA in the early 90's. We have micro hydro, 8 large panel racks with various types of solar panels, 3 sets of 8000 watt stacked inverters, 1 4000 watt inverter and various types of controllers running voltage from 24 volt to 96. Kevin runs a first class organization and I personally wouldn't buy from, or recommend anyone else because they 'do it right'."

Let EA's experience benefit your project

Phil LeQuesne, Richmond BC

Published as a letter from a reader in Cottage Magazine, May / June 2007)

Would you please pass this along to your advertising people. Last year I was wanting to upgrade my fifteen year old Solar System that I had in the Baja. I checked with several local suppliers of solar equipment, and then while reading through your magazine I found the ad for Energy Alternatives. Lucky me. I contacted them over the next few weeks by phone and e-mail. I found the staff to be extremely knowledgeable, and always prompt at getting back to you. I purchased one of their Cottage systems. The following is the chain of events that happened once I had purchased the system.

- 1. It arrived at my door, on time and exactly as they said it would, with the inverter etc., all mounted on a board.*
- 2. They suggested I take delivery from a local battery supplier, and they also were dropped off in my driveway.*

Where they went beyond normal customer service, I e-mailed them via satellite from the Baja with a question, and they replied immediately. The system is up and running and is doing all they promised. I have found over the years that there is a lot of mis information out there regarding solar energy, batteries and inverters. Not so with these folks. I recommend them to your readers looking at Solar Energy as an alternative.

JF Vancouver Island, BC - July 2004

"Just wanted to let you know that the system you installed is working great. I know it has been sunny but no matter how much power we use the batteries are back to 100% by noon or 1:00pm the next day.

If you need a referral don't hesitate to have someone call me as I feel the service and product are top rate."

Marcus Gasper Saltspring Island, BC - 2003. www.zensibleliving.com

Kevin Pegg and his company "Energy Alternatives" helped with the off-grid power system design and installation. They also delivered all the components, such as the well pump, inverter, solar panels, wind turbine with tower, switch gear and more. Professional, experienced and passionate. A great partner to have for any alternative energy project.

Steve Leichter. Saltspring Island, BC - March 2003

"Weather has been fierce here all day. High winds, rain and now snow. Power is out all over the island...except here. One of my neighbours is a computer programmer and came knocking on my door this morning asking to borrow some electricity so he could work today. He came back through the storm with the end of a 250 foot extension cord which he ran to his computer set up. Nice to know we have enough to share. We are at 81% on the batteries at the moment and the panels seem to be getting through the high winds with no problem. We are so pleased we decided to provide our own power even though the grid is available to us"

A.M. - Central Coast, BC - December 2004

"I am VERY happy with my set up. You guys are legends here everyone wants to know what you did here. I wouldn't be surprised they get together and get you back up here soon.

New To Alternative Energy?

New to the world of alternative energy? Not sure what you need or want? No problems! We can guide you through the process of selecting the alternative energy system that is best suited to your needs, site and budget.

ON-GRID

Grid Power is electricity supplied by your local utility through its network of power transmission lines and generation sources including Coal, Nuclear, Hydro, Natural Gas, Diesel. Users are charged for the power they use. When you are on the grid, you have access to unlimited amounts of energy. The more you use, of course, the more you pay.

OFF-GRID

Off-Grid customers have power requirements in locations far removed from power lines. These locations may be so remote there are simply no power lines anywhere nearby, in which case options are few. Even if power lines are relatively close, the cost to get power into the property can be comparable to that of an alternative energy system. Alternatives can be more compelling.

ON-GRID RENEWABLE ENERGY SYSTEMS

The last several years have seen a tremendous worldwide awareness and uptake of renewable energy technologies. Europeans have paved the way, with innovative policies to encourage and R&D support to develop products, and the education of an entire new workforce has had a dramatic impact on the whole renewable energy sector.

Here in Canada, we lag about 10 years behind Europeans. For the last few generations, we have existed in a playground of cheap, abundant energy and as a consequence, we have become complacent about the very energy that sustains our lifestyles.

Canadians enjoy the cheapest electricity rates in all of North America!

Despite what you might hope you are hearing, and despite some slow progress in the right direction, Canadians have yet to see the bold type of political actions that have enabled European nations to thrive in this sector.

Economics: No matter how you slice it, in BC with its cheap power rates, the economics are not favorable. A 1 kW PV system will produce on average 5 kWh per day in Southern BC. About \$0.30/day at \$0.06 per kWh. Works out to about \$100 a year of power for a system that will cost you around \$10,000 to purchase. Of course, as electricity prices increase, support for renewables increase, and the costs go down, this equation will only improve.

More and more people are investing in renewable energy systems today to protect them from whatever the future may bring. It gives them direct feedback as to how much energy is being produced. The self-reliance and satisfaction of producing your own energy is hard to quantify.

People purchase grid tie systems because they want to do their part by reducing their impacts and generating their own energy.

New To Alternative Energy?

ON-GRID RENEWABLE ENERGY SYSTEMS

If your site is remote, off-grid, beyond the reach of utility lines that most North American's enjoy, you have a different situation altogether. You initially have two choices - live without power or become your own power provider. Most of us do not want to go without the comforts of electricity. Rest assured, EA will help you design a system to suit your needs.

The old school of thought was to buy a generator and run it whenever you needed electricity. No generator, no power. While fossil-fuel generators do play an important role in alternative energy systems, generator-only situations are inefficient, expensive and a thing to be avoided whenever possible. Don't be fooled by the low initial costs!

Modern remote power systems are hybrid in nature. Yes, we have all heard the buzzword lately. It simply means more than one source.

AN OFF-GRID RENEWABLE ENERGY SYSTEM TYPICALLY CONSISTS OF THE FOLLOWING:

- battery bank, which is the energy repository of your system.
- renewable energy generation such as solar, wind or microhydro.
- control system to prevent overcharge from renewable sources.
- inverter, which converts stored DC energy into AC household, works as a battery charger, and functions as the overall brains of the system - ie starts a generator when required.
- fossil fuel generator, Diesel, Propane or Gasoline to provide a top-up of energy.
- monitoring system to keep track of system performance.

THE SYSTEM THAT WILL WORK FOR YOU CAN BE DETERMINED WITH ANSWERS TO THE FOLLOWING:

- what are your specific electrical requirements?
- what is your budget?
- full-time or part-time use?
- location and weather conditions.

To do this right will take some time. It's the most critically important first step, so it's worthwhile investing some efforts.

Renewable Energy Technologies

Sun, wind, and water. These three natural elements can produce all the power you need with little or no impact on the environment.

Photovoltaic (PV) panel

The simplest form of battery charging available. Power is created when sunlight is absorbed by solar panels and transformed into electricity. It is a common misconception that the heat of the sun is what creates power. In fact, it is the light of the sun reflecting through the solar panels that creates energy.

Solar Thermal

Over one horsepower per square yard falls on your roof on a sunny day. Think of the garden hose left outside in the sun and how hot the water in it gets. That same principle can be used to heat your domestic hot water, your hot tub, your pool, your factory, etc.

It is much more efficient to heat water directly from the sun than to use a solar panel to generate electricity to heat the water.

Wind Turbine

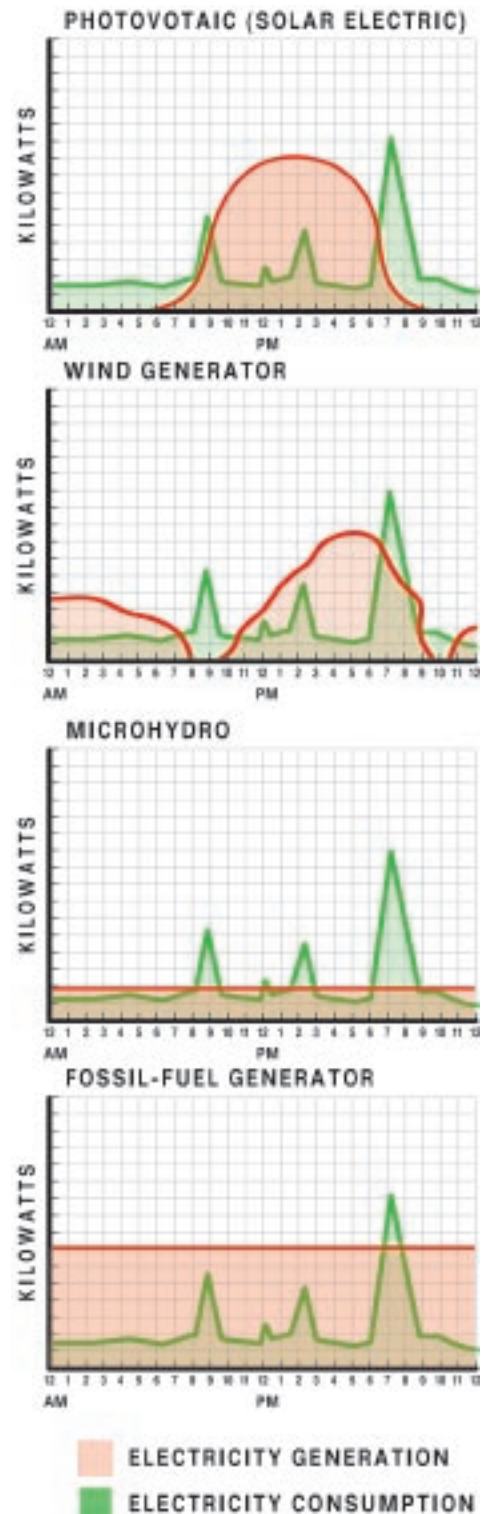
Remember the windmill? This newer model may look like science fiction, but given the right conditions, these sleek, modern turbines can be a great source of energy.

To use a wind turbine year round, you will need constant winds year round. If the wind on your site is not consistent then you could create a hybrid system combining PV panels for electricity in the summer and wind turbines in winter.

Microhydro

By far the greatest renewable energy source. Flowing water can produce between 10 to 10,000 times more power than sun or wind for the same capital investment. It all depends on the amount of water, how far it drops and how close you are to it.

Every microhydro system is unique because every water source is different. Proper planning and design will always yield a better system for your needs.



Electricity Explained

“This is a 1500 Watt/24 Volt performance system that includes a high-quality Xantrex DR 1524 inverter, giving 1500 Watts of continuous / 4000 Watts intermittent power.”

If you read the last sentence and understood what it meant, you can ignore this section. If your eyes glazed over halfway through, read on. The more you know about how electricity works, the less money you will waste and the more confidence you will have in your system.

THE WATTS AND VOLTS OF ELECTRICITY

Amperage (Amp or “A” for short)

- Like water flowing through a pipe, electricity flows through a wire.
- An Amp is the amount of electricity flowing through a wire - this flow is called AMPERAGE or amps. Also known as current.

Voltage (Volt or “V” for short)

- Like water flowing through the hose pipe, if you lift one end, gravity pushes the water through.
- A Volt is the pressure with which the electricity is pushed through the wire.

Power or Wattage (Watt or “W” for short)

- A Watt is the actual power generated from the amount of electricity flowing through a wire (AMP) x the pressure with which it flows (VOLT).
- “A watt, is a watt, is a watt” as the saying goes.
- Watts = Amps X Volts.

Energy (Wh or kWh)

- Watt hours (Wh) and Kilowatt hours (kWh) are units of energy. Power = Energy / Time
- When people talk about how much energy an appliance consumes they use the unit kWh.
- This unit represents how much power something consumes in one hour of use - for example, if you used a 100-watt light bulb for 10 hours, you would have used 1000 Watt hours = 1 kWh.
- Amp/hour (Ah) is another way of measuring energy - kWh is a more universal measurement as Ah will vary according to the system voltage.

Alternating Current (AC)

- AC electricity is the most common type of electrical power used today.
- Most common household appliances operate on AC.
- AC electricity is typically at a higher voltage, which is easier to transmit longer distances.
- It is called Alternating Current as the current changes directions constantly.

Direct Current (DC)

- DC power can be stored in batteries - AC power cannot.
- DC power is converted to AC by the use of an inverter.
- Many appliances that have a wall cube plug-in unit are operating on DC power.
- DC offers significant benefits for efficiency - DC motors are more efficient than AC motors.
- Many renewable energy systems will have some DC loads.
- Water pumps and refrigeration are commonly DC.
- Solar panels produce DC power.
- Common voltages include 12, 24, 48 Volts.

Off-Grid Electrical System Components

The illustration on the next page outlines the basic components of an off-grid renewable energy system.

A. Wind Generator

A wind generator converts the power of the wind into electrical energy. Your site requires good wind in order for a wind generator to be effective.

Solar Photovoltaic (PV) Panels

Solar panels convert the sun's energy into electrical energy. Power output is directly related to how much sun reaches the panel. Panels should be located in an area with the best sun exposure possible while keeping the module as cool as possible for best performance.

Common mounting options include:

B. Pole Mount

C. Roof or Ground Mount

D. Generator

Most year-round systems include a backup generator. A generator will provide the extra bit of power that may be needed occasionally and will ensure that you are never out of power. Propane or Diesel generators offer the best levels of service for full time systems. Gasoline generators are generally cheaper to buy but more expensive to operate.

E. Inverter / Power Panel

Inverters, along with batteries, are at the heart of your system. DC power stored in batteries is converted into AC power needed for most household appliances. The size of the inverter will determine how many appliances you can run at the same time. Some inverters can automate operation of a generator and have sophisticated computer controlled systems to allow you ultimate control of your system. A power panel will typically include fusing and safety, charge controllers and system monitoring functions.

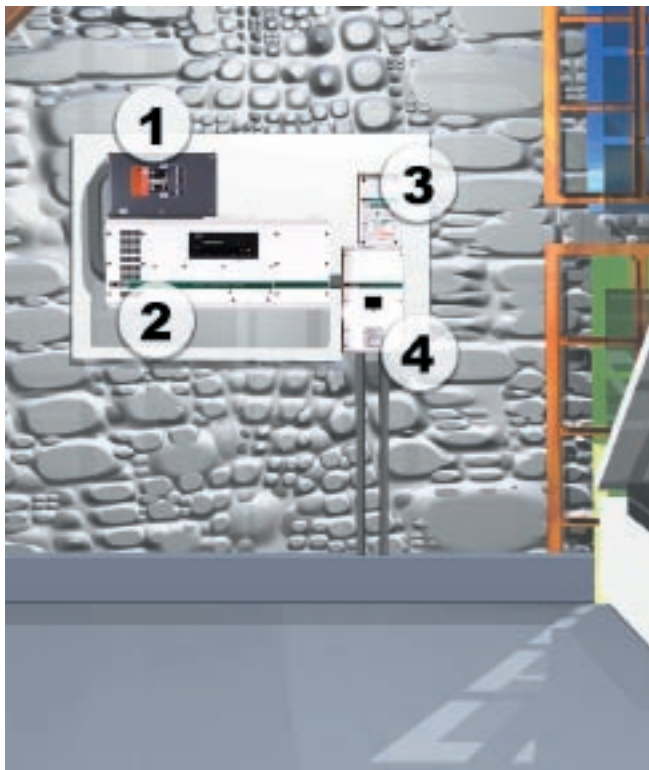
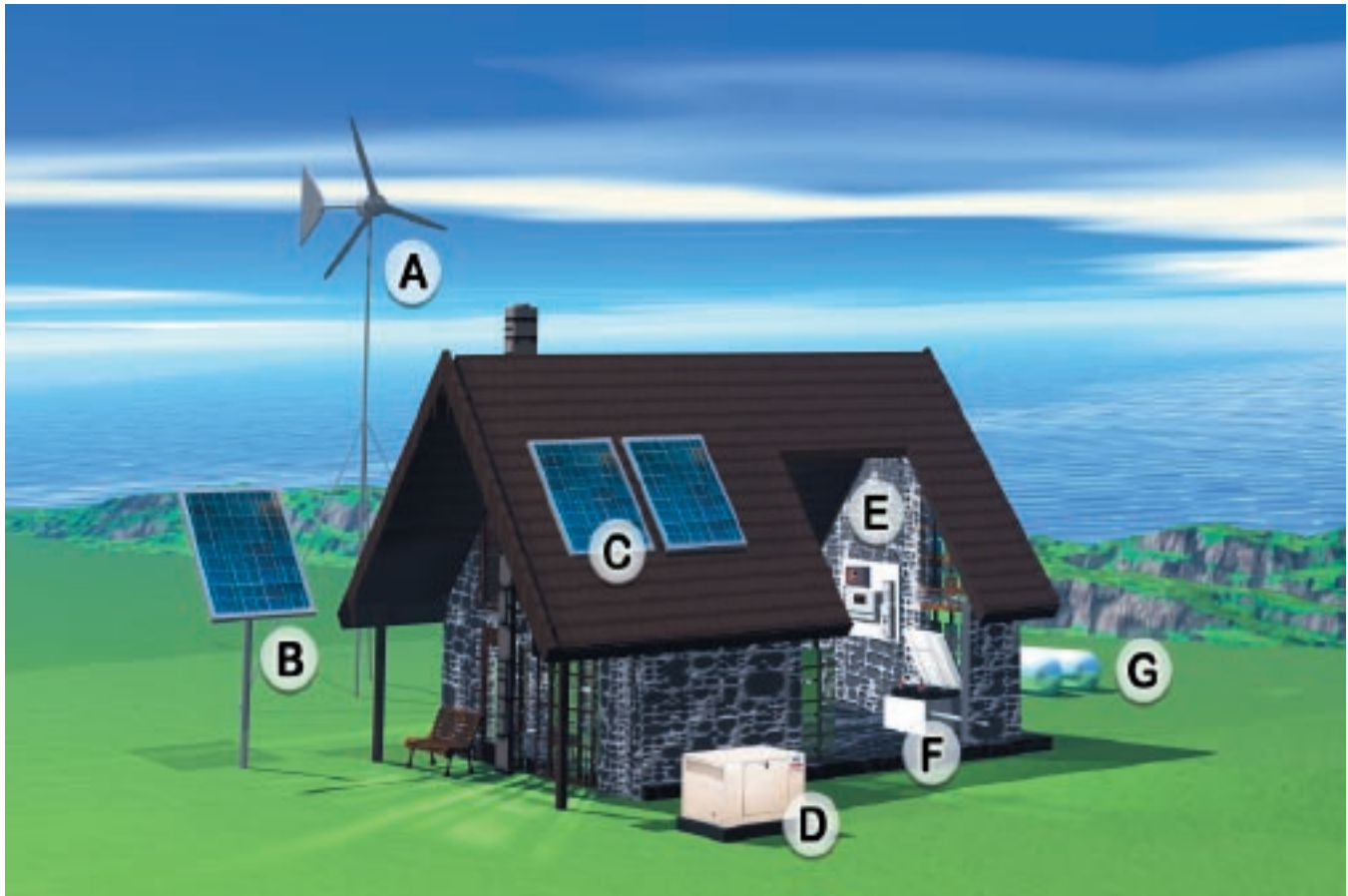
F. Batteries

Batteries are used to store electricity. Choosing the right type of battery is crucial when designing a reliable renewable system. A battery bank that is too small will have a short life and provide poor system performance. A battery bank that is too large can make it difficult to maintain a full charge. For safety reasons, batteries must be in a sealed container that is vented to the outside.

G. Fuel

Many off-grid homes make use of propane fuel for heating, cooking and operation of a backup generator. Large tanks are very convenient as the fuel is delivered when needed, freeing you up from carrying fuel back and forth every trip. There is an excellent barge and truck network that serves most locations. Bulk propane is less expensive than when it's purchased in small cylinders.

Off-Grid System Illustration



1. Bypass switch

This allows you to bypass your inverter and run loads from the generator directly.

2. Inverter

Converts DC electricity stored in batteries to AC electricity to run appliances. Many inverters have built-in battery chargers.

3. Controller

Protects your system from overcharge. Some controllers have integrated system monitors.

4. DC Safety Disconnect

Required for code compliance, provides a convenient location for tying together DC wiring.

System Design

TO HELP YOU CHOOSE A SYSTEM, ANSWER THE FOLLOWING QUESTIONS:

1. How much energy do you use in a day (total kWh)?
2. How much energy do you use at once (peak kW)?
3. What resources are available at your site to produce energy?

You can save a lot of money and frustration by sizing your system to suit your energy needs. You could spend too much on a system that is bigger than you need or too little on a system that leaves you short.

POWER CONSUMPTION

The most important factor in designing a power generating system is knowing how much energy will be consumed. It is critical to know where the power is going. A poorly designed system will produce either too little or too much energy. In order to get the best value for your money, it is important to compile accurate information on how the power will be used. This is done with an energy budget.

ENERGY BUDGET

An energy budget is used to assess the electrical loads in a renewable energy system. An energy budget requires that you depart from the traditional concept of unlimited supply of energy. Electricity must be viewed as a finite commodity like flour, firewood, or money. In an energy budget you list of all your electrical appliances and calculate the energy they use.

CONSERVATION FIRST!

Consider this: Conservation is less expensive than generation. For every dollar spent on efficiency you will save five dollars in generation. It is far less expensive to reduce your energy needs first.

The primary method of conserving energy is by using energy efficient appliances. Don't let the sticker price fool you. It is the cost to operate the appliance that really counts. Take the "free fridge" example. An older inefficient fridge consumes many times the amount of electricity of a newer, more efficient unit.

AVOID ELECTRIC HEAT

Appliances such as electric stoves, dryers, heaters and hot water tanks are generally not practical in most renewable energy systems. It is more economical to use other combustible fuel sources (such as propane diesel or firewood) for those needs. If you are lucky enough to have a microhydro resource at your site, electric heat and hot water may be possible.

PHANTOM LOADS

Many appliances consume electricity even when they are "off" Prime culprits are electronic products such as stereos, TV's, VCR's, anything with a clock or remote control, computers and items with wall cube transformers draw constant power. Connecting these items to a power bar and turning it off when not needed will help reduce this wasted power. If you are building a new place, have your electrician wire in some switched outlets.

System Design

CONSUMPTION - HOW MUCH ENERGY YOU USE

In order to complete an energy budget you will need to know how much power an appliance uses. This is often more difficult than you would think. All appliances are required by law to have a power rating marked on the item, typically near the power cord. In most cases, the number on this nameplate would be the peak power - not the most relevant figure. The most accurate method is to measure it yourself. Please see the meters section on Page 73 for details on products to help you with this.

Most new appliances have an EnerGuide rating on them. This is a relatively good measure of the amount of energy the appliance will typically use. This rating is best used to compare different appliances when purchasing, as they are all tested on a level playing field. The actual energy consumed will depend on your usage of that particular appliance.

CAPACITY- HOW MUCH ENERGY YOU USE AT ONE TIME

Knowing how much power you use at one time will help you determine the inverter capacity that is required. Generally speaking, the more people or appliances, the larger the inverter you will want. With larger capacity inverters, think of them in terms of how many large appliances (such as toaster, vacuum, table saw, water pump) you wish to run at the same time. Do you require extra capacity so the water pump can kick in as required?

AC Appliances					
Appliances	Qty	Watts	Hours Day	Days Week	Watt hrs week
RADIO	1	15	8	5	600
Battery Recharger		20			
Belt Sander 3"		1000			
Blender		325			
Circular Saw 8 1/4"		1600			
Compact Fluorescent Light		14			
Computer		60			
Computer Monitor		84			
Colour TV (Tube)		286			
Drill 1/2"		750			
DVD		12			
Hair Dryer		1100			
Jigsaw		300			
Laptop		35			
Microwave Oven		1125			
Power Tool		1350			
Refrigerator/Freezer (16 cu ft)		380			
Satellite TV		40			
Sewing Machine		78			
Toaster Oven		1550			
Vacuum Cleaner		1025			
VCR		35			
Video Game System		45			
Well Pump 1/3 hp		850			

Total AC Watt Hours per Week

[illegible]

Total DC Watt Hours per Week

Watts = Volts x Amps

$$\text{Watt hours/Week} = \text{Qty} \times \text{Watts} \times \text{Hours/Day} \times \text{Days/Week}$$

Note: Power Consumption is based on average appliance power consumption, actual values may vary.

System Design - Selecting System Voltage

This is one of those “fork in the road” decisions when building your energy system. Changing system voltage later is a costly and disruptive process. Forethought into your system design and future expansion possibilities will save you money in the long run.

Here are some general guidelines for selecting system voltage (there are countless exceptions):

12 Volt systems

- Suited to small systems with limited needs for future expansion.
- Charging sources (solar, wind or microhydro) are within 50’ wire run of the batteries.
- The upper limit on inverter capacity is 3 kW.
- Our entry level systems are mostly 12 Volt.
- The lower the voltage, the higher the amperage. The higher the amperage, the greater the resistance and the more expensive the wire will be to carry that higher amperage.

24 Volt systems

- A 24 Volt inverter will use half the amperage of a 12 Volt inverter of the same size and operates more efficiently.
- One of the most common voltages with lots of room for expansion.
- Single inverters up to around 4 kW are possible in these systems.
- Wire costs are reduced.
- Longer transmission distances are possible.
- More 24 Volt appliances are available than 48 Volt (pumps and fridges are common)

48 Volt systems

- For larger, higher performance systems.
- Single inverters up to 6.0 kW.
- Much longer transmission distances are possible.
- Systems are generally AC-only as 48 Volt appliances are limited

Higher Voltages

- For specific projects such as water pumping and grid intertie.
- High voltage systems can economically move power many miles.
- Please contact Energy Alternatives or your local dealer to discuss your application.

Packaged Systems

Energy Alternatives' packaged systems have constantly evolved with the insight of 20 years experience providing thousands of renewable energy systems to customers all over the world. Each system is engineered using top-quality components. New products must pass rigorous testing before we will consider selling them to our customers.

ALL PACKAGED SYSTEMS ARE:

- Complete with all components including wire and connectors.
- Reliable, proven solutions in use all over Canada.
- Engineered for many years of reliable, hassle-free service.
- Based on an average of 5 hours sunshine per day (for PV solar systems).
- Supported by toll-free telephone technical assistance.
- Customizable by adding or changing components to suit your needs.
- Fully expandable for additional future capacity.

INSTALLATION OF PACKAGED SYSTEMS

- Systems are shipped to your location pre-assembled to facilitate easy self-installation.
- If you are appropriately skilled and have some extra help available, installation is straightforward.
- If you prefer professional installation, we can arrange for a professional installer to do the work.
- Depending on the package, your site and your experience, self-installation can usually be completed in 1-5 days.
- Each system comes complete with full installation instructions and is backed by no charge telephone support to get your system up and running.

PRICING

Pricing in this catalogue was current at time of printing. Please verify pricing on the website or with a sales representative. Prices vary significantly for each customer depending on the level of customizing. Please contact Energy Alternatives or your local dealer to get a firm quotation on the system you need.

Please note

- Detailed specification sheets are available online or by contacting us.
- Most packaged systems use solar PV as the primary energy source. We can easily adapt any of these packages to make use of other energy sources such as wind or microhydro.
- Systems include a standard length of wire for each installation. Let us know your exact distance and we will send you the proper length of wire and we will advise you about wire options.
- If you have a long wire run, please contact us for a system design .
- Wind towers require extra supplies (pipe, anchors, wire) that vary depending on your installation.
- Freight charges are additional. Please contact us for a freight quotation.
- Most systems are shipped via truck freight. We have successfully delivered goods to some of the most remote locations in Canada - there is an excellent network for moving of products by truck.

Packaged Systems - Cabin Lights

Cabin Lights Systems are designed for “lights and music” weekend cabin use.

DESIGN PHILOSOPHY

Energy Alternatives cabin lights system is the perfect starter system for people with small loads, primarily in the spring/summer/fall months. This system will generate enough power to run a few lights, charge cell phones, laptops, DC water pump, small radio, etc.

The design is simple: a large battery bank will be fully charged when you arrive at the cottage for the weekend. Energy stored in the batteries will operate your loads.

The solar panel(s) will charge the batteries during the week, to be ready for your next arrival.

On the Basic system, loads must plug into an outlet on the inverter via a power bar with surge protection (not included).

SYSTEM FEATURES

- Pure sine wave inverters.
- 25 year warranty on solar PV.
- Quality deep-cycle golf cart batteries.
- Battery voltage display.
- 12 VDC battery bank.
- 22 Amp solar charge controller.
- Adjustable roof solar mount.
- All cables and connectors included.
- Expanded system includes charger and can be hard-wired into electrical panel.
- Custom battery box as an option.
- Expert installation available.

System	Daily Power	Battery	Inverter	Price
Cabin Lights	400 Wh	3 kWh	600 W	\$2,595
Cabin Lights Expanded	800 Wh	6 kWh	1000 W (includes battery charger)	\$4,295

* prices are subject to change. Please call for latest pricing.

MAGNUM
E N E R G Y



Packaged Systems - Cottage

Cottager Systems are designed for weekend cottage or cabin use.

DESIGN PHILOSOPHY

One of EA's most popular system packages, the cottager series are the perfect packaged systems for cottage use. These systems have enough power to operate major appliances from power tools to kitchen gadgets.

The design is simple: a large battery bank will be fully charged when you arrive at the cottage for the weekend. Energy stored in the batteries will operate your loads.

All systems support adding a backup generator which will provide extra power when needed.

The solar panel(s) will charge the batteries during the week, to be ready for your next arrival.

System Features

- Field-proven Magnum inverter/chargers.
- System status monitor, remote mounted.
- High-efficiency solar modules.
- Quality deep-cycle golf cart batteries.
- 24 VDC systems for efficiency, expansion.
- Adjustable roof or ground solar mount.
- CSA/UL listed components.
- Custom built vented battery box.
- Expert installation available.
- Many options available: Backup generator, auto gen. start (AGS), maintenance contract, maintenance-free batteries, remote monitoring/control, etc.

System	Daily Power	Battery	Inverter	Price
Cottager 1	0.75 kWh	12 kWh	1.5 kW	\$5,995
Cottager 2	1.5 kWh	17 kWh	4 kW	\$9,895
Cottager 3	4 kWh	23 kWh	4 kW	\$14,995

* prices are subject to change. Please call for latest pricing.

MAGNUM
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Packaged Systems - Primary Power

Primary Power Systems are designed for large cottage or full-time use.

DESIGN PHILOSOPHY

Energy Alternatives' primary power systems are designed for large power users - either full time, off-grid residences or seasonal homes with larger power requirements.

The heart of any renewable energy system is it's battery bank. For this reason, we use 2V industrial batteries made by Global-Yuasa. We have been selling them for 24 years and we stick to them because they work. 15-20 years is a typical life expectancy. 6V golf-cart and 2V sealed batteries are also options.

Magnum and Xantrex inverters provide reliable and clean power. Solar modules by Sharp offer a 25 year warranty.

SYSTEM FEATURES

- Magnum MS4024-AE inverter (1,2).
- Xantrex XW series inverter (3,4).
- System status monitor, remote mounted.
- 24/48 VDC systems for efficiency, growth.
- 60 Amp MPPT solar charge controller.
- High-efficiency solar modules.
- Adjustable roof or ground solar mount.
- CSA/UL listed components.
- Custom built vented battery box.
- Expert installation available.
- Many options available: Backup generator, auto gen. start (AGS), maintenance contract, maintenance-free batteries, remote monitoring/control, etc.

System	Daily Power	Battery	Inverter	Price
Primary 1	4 kWh	17 kWh	4 kW	\$13,995
Primary 2	6 kWh	30 kWh	4 kW	\$21,995
Primary 3	10 kWh	47 kWh	6 kW	\$33,995
Primary 4	13 kWh	60 kWh	12 kW	\$49,995

* prices are subject to change. Please call for latest pricing.

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Packaged Systems - Backup Power

Are you becoming concerned with increasingly unreliable utility power? Was your last power outage the last straw? Energy Alternatives offers a wide variety of backup electrical power systems. We can design a backup power system to run any load you can imagine. The price of these systems is directly related to their capacity.

Your answers to these questions will help you choose the backup system you need:

- ***What loads do you want to be able to operate during an outage?***
- ***How long do you want those loads to operate for?***

GENERATORS VS BATTERY/INVERTER SYSTEMS

There are similarities and differences between generator and battery/inverter backup systems. Both provide electricity when the grid power is unavailable. How they go about achieving this goal is vastly different.

A generator's energy is stored in the fuel it burns. You must store enough fuel so that you can operate the generator for as long as the outage. When the generator is on, 100% of the system capacity is available, whether you need it or not. You will have a finite running time if you cannot locate more fuel (which can be difficult during a power outage).

A battery/inverter system, on the other hand, uses energy stored in batteries. Batteries are charged in a number of ways. In most backup systems, the electrical grid charges the batteries, keeps them charged, and will recharge them once the grid comes back online. A generator, the sun, wind, or flowing water can all charge batteries.

Grid-tie backup power systems allow you to produce energy to feed into the power grid when the grid is operational. During an outage, the system automatically and instantly switches into backup power mode.

Batteries deliver the exact amount of power you require at that moment. The running time of the system is directly related to your loads. For instance, if you know the outage will last a long time, you can only operate the most essential loads; whereas if you know the outage will only be brief you can use up much more power knowing the grid will charge the batteries up when it comes back online.

Generators are good for larger power requirements. Generators require maintenance, as with all engines. A generator that will not start when you need it due to lack of maintenance is not very useful to you. Generators also require fuel - your generator is only as reliable as your fuel supply.

INSTALLATION

Backup power systems normally require installation by a qualified electrician. If you are comfortable with advanced wiring, you may be able to do this yourself. Otherwise, you can contact your local electrician. We include full step-by-step instructions for a successful installation. Time will vary from a few hours to a few days depending on the complexity of your system.

Packaged Systems - Backup Power

Backup Power Systems are designed for temporary backup power for utility users.

DESIGN PHILOSOPHY

Energy Alternatives' backup power systems are designed to give you power during utility outages for essential loads.

These systems consist of two main components: battery storage and inverter power. The size of the battery bank will determine how long you can run your equipment and the inverter will determine how many appliances you can run all at once. The Backup-1 package is 120VAC-only, but the other packages have standard 120V / 240VAC power.

Switching from battery power to utility power and recharging the batteries is fully automated.

SYSTEM FEATURES

- Magnum MM and MS series inverters.
- Xantrex XW series inverter (Backup 3).
- Built-in multi-stage battery charger.
- System status monitor, remote mounted.
- Quality deep-cycle golf cart batteries.
- 24/48 VDC systems for efficiency, growth.
- CSA/UL listed components.
- Custom built vented battery box.
- Expert installation available.
- Many options available: Backup generator, auto gen. start (AGS), maintenance contract, maintenance-free batteries, remote monitoring/control, etc.

System	Battery	Inverter	Price
Backup 1	6 kWh	1 kW	\$3,645
Backup 2	12 kWh	4 kW	\$5,995
Backup 3	18 kWh	4 kW	\$7,995

* prices are subject to change. Please call for latest pricing.

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Packaged Systems - Grid Intertie

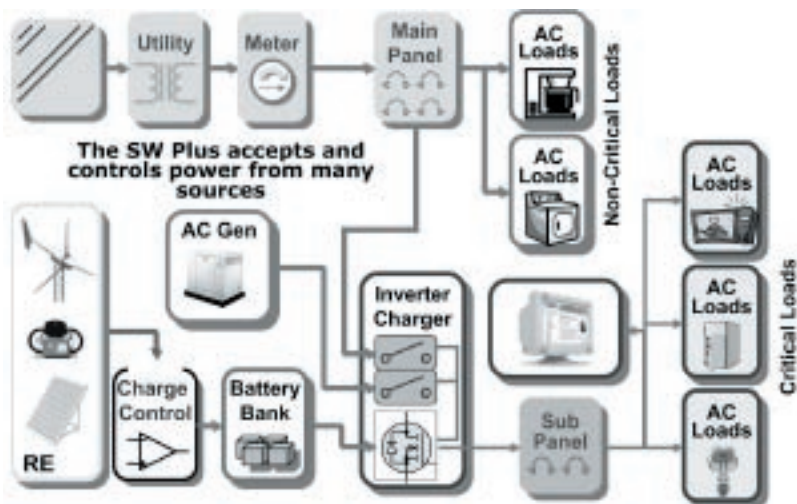
SOLAR ELECTRICAL PACKAGES FOR LOCATIONS WITH UTILITY POWER

Solar power isn't only reserved for those living off the grid. If your power is supplied by a local power company and you wish to generate some electricity from solar, look no further than the systems on this page. These systems convert the sun's energy into electricity, which is fed into the same electrical power grid you draw power from.

Local utilities are becoming more enlightened and / or legally required to accept power from customers. Many utilities are not used to the idea of purchasing power from small users such as yourself. Your local utility will have various rules and regulations for grid intertie. Your local Energy Alternatives dealer can help you with this process.

FOUR GOOD REASONS WHY YOU SHOULD INSTALL A GRID INTERTIE SYSTEM

1. Backup power (feeling like your power grid is becoming more unreliable)? A grid intertie system can generate power and reduce your electrical bill when the grid is working. In the event of a power outage, this same system will keep your lights on, your freezer freezing, your business operating.
2. Reduce greenhouse gasses - Kyoto commitment. In most parts of Canada new electrical generation capacity is being fuelled by natural gas. Don't let the name fool you: natural gas is a fossil fuel that contributes to global warming, is in finite supply and offers unpredictable costs.
3. Save money. However, if financial savings are your sole consideration you should first consider efficiency, which is always a better return on investment. Any energy you produce will go towards reducing your power bill.
4. Be an innovator! Be the first on your block with a solar system. All your neighbours will admire (and hopefully copy) you.



DIFFERENT TYPES OF GRID INTERTIE SYSTEMS

Grid Intertie with battery backup: Slightly more complicated and expensive. Most batteries do require maintenance and have a finite lifespan. They will also keep your lights on and business operating when everyone else is in the dark.

Stand alone Grid Intertie: These systems are the simplest. There are two main components - solar panels and an inverter. The only maintenance required is keeping the panels clean. When the power grid goes down, your system will also go down. A basic safety feature of grid intertie inverters is that no power will be sent to the grid if the grid is not there. This prevents accidental electrocution of utility workers who falsely presume a circuit is off.

Packaged Systems - Grid-Tie

Sell power to your utility!

DESIGN PHILOSOPHY

Grid-tie power systems allow you to feed power to the electrical grid, reducing your reliance on the grid. *BC Hydro is legally obligated to purchase your power!*

If you do not wish backup power, systems without batteries are the best option.

Grid tie systems produce more power than systems that include batteries, require no maintenance and cost less.

SYSTEM FEATURES

- Generate your own electricity and reduce your monthly electricity bill.
- Battery-less design lowers price and improves efficiency.
- Low maintenance.
- High-efficiency solar modules.
- 25-year warranty on solar modules.
- Adjustable roof or ground solar mount.
- All cables and connectors included.
- CSA/UL listed components.
- Expert installation available.

System	Daily Power	Solar	Inverter	Price
GT - 1	7 kWh	1.2 kW	2.8 kW	\$12,795
GT - 2	16 kWh	2.8 kW	2.8 kW	\$25,995
GT - 3	20 kWh	3.5 kW	3.3 kW	\$32,595

* prices are subject to change. Please call for latest pricing.

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Packaged Systems - Grid-Tie Backup

***Sell your power to your electric utility!
Backup electricity during a power outage.***

DESIGN PHILOSOPHY

Grid-tie power systems allow you to feed power to the electrical grid, reducing your reliance from the grid. BC Hydro is legally obligated to purchase your power.

Many grid-tie systems, such as commonly found in California do not include batteries. When the power is out, those systems must disconnect for safety reasons - leaving you in the dark like everyone else.

Grid-tie backup systems incorporate battery storage, allowing you to run your important loads - such as lighting, computer, water pump, radio, refrigeration until the power is back on.

SYSTEM FEATURES

- Generate your own electricity and reduce your monthly electricity bill.
- Backup power to run important loads during a power outage.
- True sine wave inverters.
- 60 Amp MPPT solar charge controller.
- Optional backup generator input (1&2).
- High-efficiency solar modules.
- Quality deep-cycle golf cart batteries.
- Adjustable roof or ground solar mount.
- CSA/UL listed components.
- 25-year warranty on solar modules.
- Expert installation available.
- Custom built vented battery box

System	Daily Power	Battery	Inverter	Price
GTBU 0.5	3 kWh	11 kWh	3.6 kW	\$11,995
GTBU 1.0	6 kWh	17 kWh	4.0 kW	\$18,395
GTBU 2.0	12 kWh	23 kWh	6.0 kW	\$29,495

* prices are subject to change. Please call for latest pricing.

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OutBack
Power Systems



Packaged Systems - Mobile / RV / Boat Power

Energy Alternatives' Solar RV packages are designed for extended periods of off-grid camping.

DESIGN PHILOSOPHY

These systems are designed to charge your batteries and extend the time you can spend away from shore power.

The basic packages (1 & 2) have only solar modules and a controller to charge your house battery bank. The other packages have true sine wave inverters to run your 120VAC loads as well.

With the solar modules mounted flat on your roof, you need to make sure you park in the sun.

SYSTEM FEATURES

- Field-proven sine wave inverters (3 & 4)
- Built-in multi-stage battery charger (4)
- High-efficiency 80W solar modules.
- System status monitor, remote mounted(4)
- 12 VDC systems to match the RV.
- 22 A solar charge controller with meters.
- Flat solar roof mounting kit.
- All cables and connectors included.
- CSA/UL listed components.
- Installation and operation instructions.
- Package 4 will require expert installation.

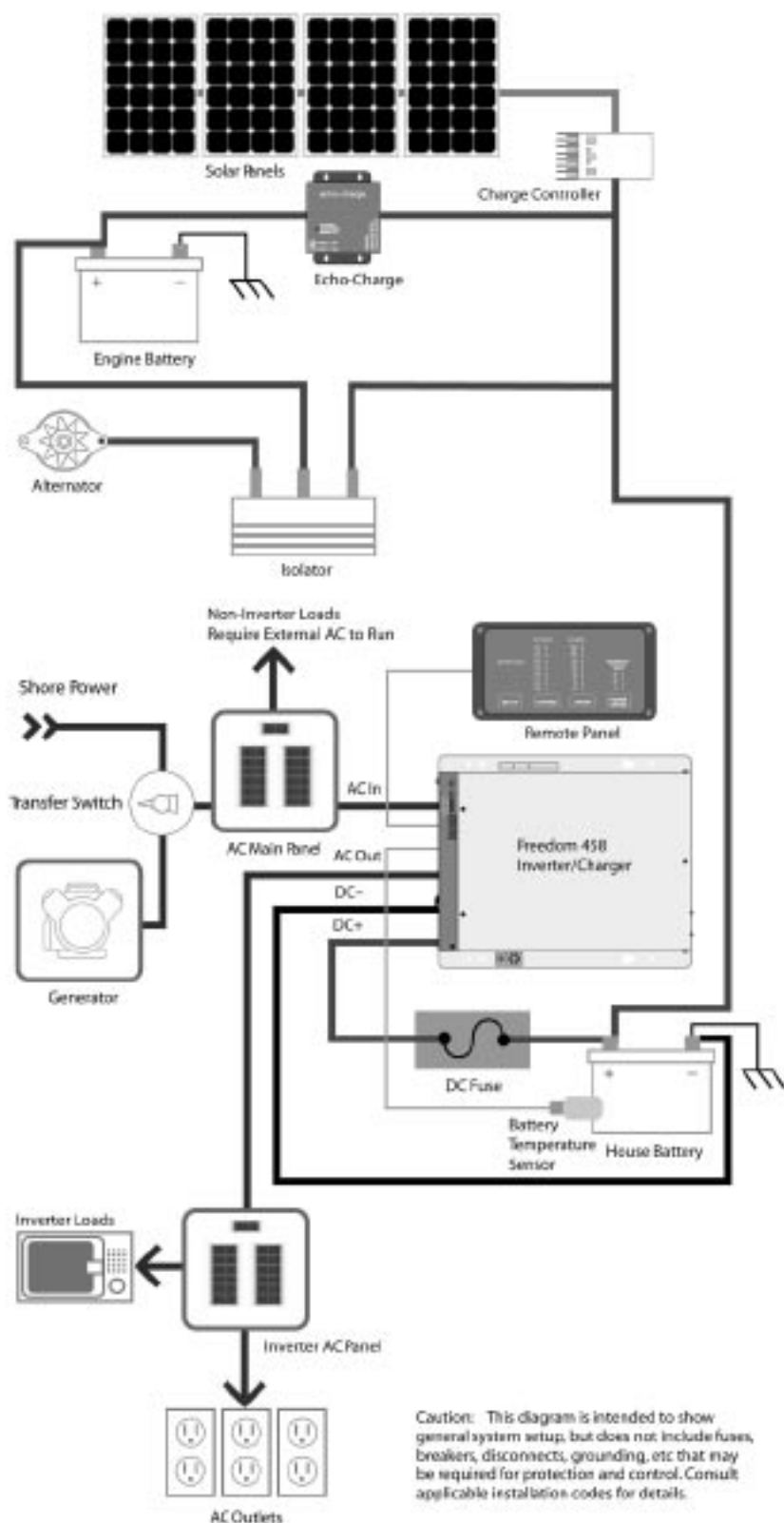
System	Daily Power	Charger	Inverter	Price
RV - 1	30 Ah	N/A	N/A	\$985
RV - 2	60 Ah	N/A	N/A	\$1,785
RV - 3	60 Ah	N/A	1500 W	\$2,785
RV - 4	60 Ah	100 A	2000 W	\$4,185

* prices are subject to change. Please call for latest pricing.

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Packaged Systems - Mobile / RV / Boat Power



This illustration shows an integrated RV / Boat / Work truck electrical system. It covers all sources of AC or DC power.

Batteries, alternator, and solar panels supply DC power.

The shore power connection, generator, and inverter provide AC power.

The inverter component has two functions: to charge batteries from an AC source and to provide continual AC power from either generator or shore power connection.

This diagram is for illustrative purposes only.

Please contact Energy Alternatives or your local dealer for information and to purchase your own performance electrical system.

Caution: This diagram is intended to show general system setup, but does not include fuses, breakers, disconnects, grounding, etc that may be required for protection and control. Consult applicable installation codes for details.

Containerized Power Systems

Are you looking for a pre-built, secure, and transportable power solution for your remote site?

Do you have a remote site that relies on generator-only power?

Searching for a lower cost and greener power solution?

Look no further than EA's containerized Power Systems.

Each system is custom-designed and fabricated for your needs.

- Shipping containers are inexpensive, rugged and secure.
- Common sizes are 8'x8', 8x10, 8x20, 8x40
- Containers are typically new, or used once.
- Can be painted to whatever colours you wish
- If there's a road, we can get it there. No road - can be barged or flown in.
- 120, 120/240, 120/208 3-phase outputs possible.
- Integration of existing site generator, or house new generator in container.
- External or internal fuel tanks.
- Inverter capacities from 4 to 60 kW.
- Easily ties into existing electrical infrastructure.
- Integration of renewable energy sources such as wind, solar or microhydro.
- Battery bank - numerous options suited to the site and budget.
- Satellite Internet / Phone systems. Voice over IP.
- Computer networks. EA can design and deploy a wired or wireless network.
- Remote monitoring and control systems allow technicians to monitor system.
- Keeps track of energy used / fuel consumed.



Installed Fall 2008. Hybrid power system for research camp. 12 kW inverter, 150 kWh battery bank, 20 kW generator to provide 24 hr power without generator. Satellite provides remote system monitoring and internet access for camp.

More details: <http://www.EnergyAlternatives.ca/Installations/JPRF.htm>

Containerized Power Systems



Spring 2007. A long-term customer requested a custom installation inside a 17' shipping container. This site was the very first field installation of Xantrex's new XW series inverter. Energy Alternatives has been involved with the development of this new inverter since its inception.

Details: <http://www.EnergyAlternatives.ca/Installations/Container1.htm>



Winter 2008 Custom grid tie system, 4.2 kW PV, 18 kW diesel backup, water catchment, storage and filtration.

Details: <http://www.EnergyAlternatives.ca/Installations/Moondance.htm>



Installed Summer 2007 250 kms from the nearest town. Hybrid power system for mining camp. 7 kW inverter, 60 kWh battery bank, 20 kW generator to provide 24 hr power without running generator.

Details: <http://www.EnergyAlternatives.ca/Installations/Vanderhoof.htm>

Energy Alternatives Installations

RUMBLE RIDGE WIND MONITORING SITE - BC HYDRO

www.EnergyAlternatives.ca/Installations/Rumble.htm

In the early winter of 2002, EA was contacted by BC Hydro. They had a problem and needed a rapid solution. They had installed a wind monitoring tower (met tower) to measure the wind resource on a remote mountain top on northern Vancouver Island. But the instruments were freezing up, and they needed a few hundred watts of power to operate heaters. They were facing a significant expense to house and operate a small generator continuously in a very remote site to power this load.

After considering this problem for a few minutes during the initial phone call, we asked them if they had considered using a small scale wind generator for this purpose. It was a prospective wind site, after all. EA was awarded the contract and the installation was started shortly thereafter.

System Details:

- 24 VDC system.
- Small 500W inverter for running small site tools.
- Whisper H40 wind generator on 60' reinforced tilt-up tower.
- 1800 Ah battery bank, Global-Yuasa 2V cells.
- Custom insulated, weatherproof, snowproof enclosure.
- Remote monitoring via cellular system.
- Installed during extreme snowstorms on very short time line.



ZENSIBLE LIVING, SALTSPRING ISLAND, BC 2003

www.EnergyAlternatives.ca/Installations/Zenliving.htm

www.zensibleliving.com

Marcus and Eva Gasper approached Energy Alternatives in 2003 with a very interesting and challenging project: the ultimate eco-friendly, low-impact, low voltage off-grid power system, installed in a rammed earth home.

This system evolved in a few phases. The initial power system was battery/inverter system, with generator-only charging. A DC well pump powered by a couple solar panels kept water flowing for the construction phases.

A couple years later, a wind generator was added to the system. A made-in-china wind generator was originally installed, looking like a good option. We have now learned our lesson after replacing this unit twice in two years. This was replaced in 2007 (at EA's cost) with a Whisper 2000 generator.

System Details:

- Home was wired mixed 120 VAC inverter/generator power as well as 24 VDC for low EMR (Electro Magnetic Radiation).
- All wiring was shielded and routed to minimize EMR exposure.
- Customer generally operates with the main inverter off, unless running a large AC-powered appliance.
- Statpower Prosine 3kW pure sine wave inverter with charger.
- Global Yuasa 1800 Ah 24VDC 2 volt long-life battery bank.
- Kyocera KC120 solar modules on custom adjustable pole mount.
- Yamaha diesel generator, manually operated.
- Made-in-China wind generator replaced with Whisper 200.
- Sunfrost 24V refrigerator
- 24 VDC water pumping (domestic water supply and hydronic heating system).



Energy Alternatives Installations

OUTBACK TO XANTREX XW UPGRADE. 2007

www.EnergyAlternatives.ca/Installations/Townsend.htm

It all started with a well-timed E-mail that reached one of our staff installers who happened to be within an hour's drive of the client's site in southwestern Alberta. It turned into a fairly large project.

The client had recently purchased an off-grid home that was partially completed. The renewable energy system was in place, but was having some issues with battery capacity and generator.

We were able to attend to the site, inspect his system and determine:

- His battery bank (two huge forklift banks weighting approximately 4000 lbs each) had the equivalent capacity of 4 golf cart batteries weighing 65 lbs a piece. Batteries were very old, and well past their lifespan, liability.
- Aside from some minor programming issues, his Outback inverter system was working ok. Reprogrammed the automatic generator start controls to better compensate for batteries that are barely usable.
- His PV modules were not suitably located. Not facing south, and subject to cover-up by snow.
- Existing generator, older Onan was very tired and had been run by previous owner without oil so was seriously damaged and unreliable.
- A Proven wind generator mounted on a robust, home-made tower. Very directional wind, tower should be 40' taller to clear obstructions on site.

Upgrade # 1

- 48V 1800 a/h bank of Global-Yuasa 2V industrial batteries.
- New Onan RS12000 generator on Natural Gas.
- Relocation of PV and additional modules on ground-mount rack.

These upgrades were completed and the system operated ok until winter time came, and the client's hydronic heating system was kicked in. After much head-scratching, it was determined that the Outback inverter charging circuit causes problems with some electronic devices, and this client had several problem devices.

Upgrade # 2

- Remove Outback VFX3648 dual inverter configuration
- Replace with Xantrex XW6048 inverter



Photovoltaics

Photovoltaics are the simplest form of alternative energy. There are no moving parts in photovoltaic modules and little maintenance is required. A photovoltaic module converts the sun's energy into electricity which is either used immediately (grid intertie or water pumping) or is stored for future use (batteries). Solar electric systems are modular, allowing you to start with a small system. As your power requirements grow, you can easily add more modules.

TYPES OF SOLAR CELLS

Mono-Crystalline

Single crystal silicon cells are extremely thin wafers of silicon cut from a single silicon crystal. These are the most efficient type of silicon cells and have a life expectancy exceeding 25 years. The cells are fragile and must be mounted in a rigid frame. You can tell it is a single crystal due to the uniform, rounded individual cells.

Poly-Crystalline

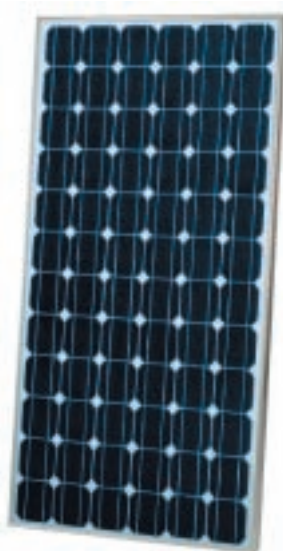
Multi crystal silicon cells are also extremely thin wafers of silicon but are cut from multiple crystals grown together in an ingot. They are similar to single crystal cells in life expectancy and fragility. However, they are slightly less efficient than single crystal cells and require more surface area to produce a given amount of electricity. These types of cells are usually square and will have a varied appearance.

New Technologies

Innovative new technologies that will allow us to capture energy from the sun will undoubtedly be hitting the market in years to come. Energy Alternatives is constantly reviewing new technologies.

How to Choose

There are many different considerations when selecting a specific type of solar panel. Energy Alternatives only sells PV modules that have an extensive, proven track record and a solid company backing the product. There are many cheap products on the market which we avoid. A 25 year warranty is only useful if the company is still in business.



SUNSHINE AND SHADING

PV modules produce electricity in proportion to the amount of sunlight falling on them. In full overhead or “peak” sun (1000 Watts/m²) they will produce their rated power. Reduced sunlight caused by clouds or location will diminish the amount of electricity generated. Modules will produce electricity even when there is no direct sunlight. A cloudy sky with an occasional blue patch will often be equivalent to approximately 50% peak sun. A cloudy day with rain in the forecast will produce approximately 10% to 20% peak sun. Reflected sunlight from snow or water can also increase the output of solar panels.

It is very important to note that shading even one cell of a module will reduce the output of the entire module. The only exception to this found in the Uni-Solar modules which have built-in diodes between the cells to reduce the effect. However, it is better to mount solar modules so shading is avoided.

TEMPERATURE

It is a common misconception that heat is required for PV modules to produce electricity. High temperatures actually decrease the power output. Warmer climates require PV modules with a higher maximum voltage than those used in cold climates. Cold temperatures decrease resistance and increase voltage. Modules with a lower voltage rating are ideal in colder climates such as Canada.

SIZE AND COST

There are two primary factors that determine the size of your solar array:

- ***The daily power consumed by your electrical loads.***
- ***The sunlight levels (insolation) available at your particular location.***

INSOLATION

Insolation or sunlight intensity is measured in peak sun hours. A full sun hour is equal to the amount of sunlight striking the earth in one hour when the sun is directly overhead in a clear sky. Bright sunshine hours do not equal peak sun hours. Bright sunshine first thing in the morning or just before sunset is not the same as bright sunshine at noon from a PV module’s perspective.

The lower the sun is in the sky, the more atmosphere the light must pass through. Water molecules and other gases in the atmosphere reflect and absorb some of the light passing through it, reducing the insolation. Smog or other pollutants will also block or reflect sunlight. Most of the sun’s energy is delivered between 10 AM and 3 PM when the sun is highest in the sky.

LOCATION - GETTING THE BEST SUN

Your PV array is a valuable investment. To achieve the best performance from your array it should be aimed in the direction of the most sunlight and angled correctly for the season. The array should be adjusted to the latitude plus or minus 15° from summer to winter for optimal output. If your mounting structure is not seasonally adjustable the modules should be mounted to achieve maximum output during the period of highest usage. For example, if you use your cottage during the summer months your array should be angled accordingly.

PV modules should always be aimed in the direction where they receive full exposure to sunlight. In areas with little or no shading, modules should face true south (not magnetic). True south is calculated by using the magnetic declination information for your site (available on most maps) and adjusting your compass accordingly.

New technology allows for PV arrays to be located much further away from the battery bank. If your site dictates a longer transmission distance, please contact your local dealer or Energy Alternatives for design details.

You likely already know the Sharp name for consumer electronics like TVs, and microwaves. It is a trusted, reliable brand that has been around for over 90 years. What you may not know is that Sharp is the world's leader in photovoltaics. Last year they shipped more modules than the second and third place companies (Kyocera and BP) put together. It's only recently that they have launched their products in the North American market. In 2003, Sharp opened a 20 MW solar PV production facility in Memphis, Tennessee.

As the world's leading manufacturer of Photovoltaics, Sharp produces both single and multi-crystalline solar cells. These cells are incorporated into an extensive line of high-power modules for every electrical power requirement. Based on the technology of crystalline silicon solar cells developed over the years, these modules have superb durability to withstand rigorous operating conditions and are suitable for use in most solar systems.

SHARP SOLAR MODULE FEATURES

- Bypass diodes minimize the power drop caused by shade.
- Textured cell surface to reduce the reflection of sunlight.
- BSF (Back Surface Field) structure to improve cell conversion efficiency.
- White tempered glass, EVA resin and a waterproof file, plus aluminum frame provides reliability and durability.
- Choice of Junction Boxes: Integrated wire leads with MC connectors or standard.
- CUL and UL1703 certification. Built in ISO 9001 facilities.

SH224	Sharp 224W, 7.6A, 29.3V mono-crystalline PV module. 65x39"
SH175	Sharp 175W, 4.95 A, 35.4V mono-crystalline PV module. 62x33"
SH130	Sharp 123W, 7.5 A, 17.4V poly-crystalline PV module. 59x26"
SH80	Sharp 80W, 4.6A, 17.3V poly-crystalline PV module. 48x20"



Based in Burnaby, BC Canada, Day4 Energy Solar Panels are poised to revolutionize the world's electricity generation markets. With their high power density, refined appearance and premium quality materials and workmanship, these panels can be used in a variety of both grid-connected and off-grid applications.

Here's what you get:



Improved performance - our highly advanced cell interconnection means more power from less area. Because our new technology doesn't use ribbon bonding on the front of the panel, no energy is lost in this transfer.

Lower installation costs - with One-Sun Solar Solar Panels you get more power from each panel, meaning less panels are needed, meaning lower installation costs. Plus, our market-driven design incorporates aluminum framing with extra grounding and water draining holes -- features that make our panels easier to install and guarantee better reliability.

Esthetically pleasing appearance - the Day4 Electrode (a key component of our One-Sun panels) uses a fundamentally new method of contacting and interconnecting crystalline silicon PV cells - instead of solder-ribbon bonding on the front of the panel, you get an highly efficient, uniform-looking panel, able to blend with and enhance the background of any installation.

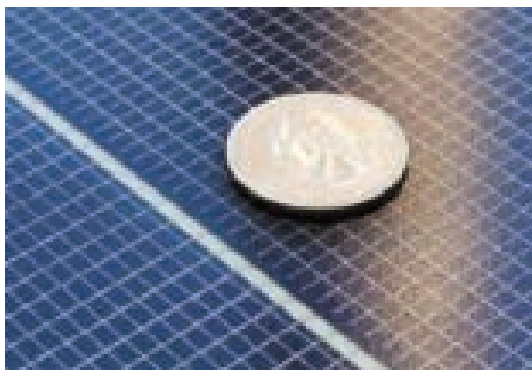
Durability and long product life - we use the finest materials, resulting in premium power output and definitive protection against the elements

DAY4-48MC-170 170W, 22 VDC PV Module, 51.4x39

DAY4-48MC-180 180W, 22 VDC PV Module, 51.4x39

DAY4-48MC-190 190W, 22 VDC PV Module, 51.4x39"

Day 4 has developed a new style of electrode that replaces the bus bars commonly found on the front side of solar cells. This eliminates a couple steps in the manufacturing process, as well as reduces the lead required. This results in a more uniform pattern, and less of the crystalline cells being blocked by the lead conductors.



PV Mounting Hardware

Once you have selected solar power as the best option for your electrical needs, it is necessary to choose a mounting structure. The first step is to select the location of your PV array. The ideal location is an area receiving full sunlight exposure, and as close as possible to the location where electricity will be used or stored. There are several options for mounting PV modules. There are two main types: roof and pole mounts.

ROOF MOUNTS

Roof mounts are the most popular choice for locations that have a suitable roof. The modules are located above most objects that would cause shading problems and the large roof surface makes it easy to attach the mounting structure. A roof mount also locates the modules out of the way and out of sight, reducing the possibility of vandalism or theft.

GROUND MOUNTS

Similar to the roof mounts, these structures mount on the ground, typically on concrete footings. These mounts are usually taller than a roof mount, to avoid grass and shrubs blocking the sun. Ground mounts are easy to install and provide easy means of seasonal angle adjustment at ground level.

POLE MOUNTS

Pole mounts are easy to install and allow the array angle to be adjusted after installation. The mounting frame fits on a length of schedule 40 pipe (available locally at any metal shop) set securely in a concrete form in the ground.

TRACKING RACKS

There is no question that moving your panels throughout the day to follow the sun will notably increase the energy produced. An ideal use for an old-style satellite dish is converting it into a low-tech tracking unit for the project types. Zomeworks and Wattsun offer factory assembled tracking racks that have proven to be a popular choice. A fixed rack will require less maintenance than a tracking rack.

AIR CIRCULATION

All PV mounting structures must provide good air circulation around the modules. Air circulation provides natural cooling for the modules and increases efficiency by allowing them to operate at lower temperatures. If the site where your array will be mounted receives high winds, you must ensure the back of the modules are not exposed. High winds and northerly winds during the winter can create uplifting forces strong enough to seriously damage your array. Spacing your modules a few inches apart decreases the likelihood your array will be damaged by the wind.

SNOW

In regions with heavy snowfall, an array should be installed where snow can be easily brushed off. A pole mount allows snow to slide off easily. If modules are tilted at an angle of 45° or more then a few sunny days will usually melt snow off the array.

PV Mounting Products

CUSTOM MOUNTS

Energy Alternatives designs and manufactures our own line of mounting products, allowing us the flexibility to design a rack that is perfect for your site. If you require a custom racking solution for your site, please give us a call to go over your options.



PV Mounting Products

ROOF & GROUND MOUNTS

Instead of a constantly changing, hard to understand list of part numbers we make ordering these mounts simple:

Example: **RM4-SH175** is a roof mount for 4 Sharp 175 Watt modules

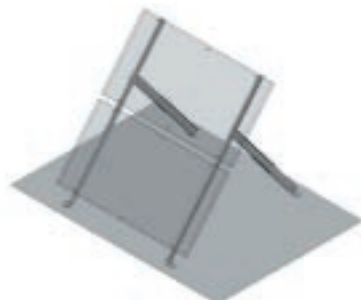
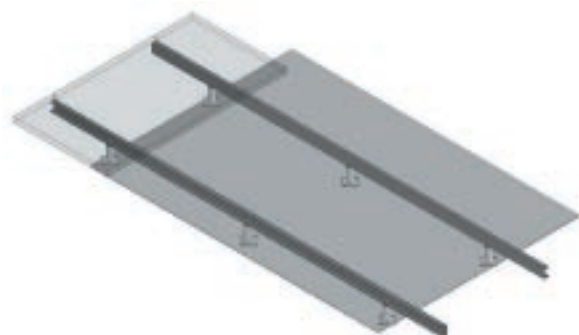
RM Angled Roof Mount

FM Flush Roof Mount

GM Ground Mount

xx Number of modules

xxxx Module Type



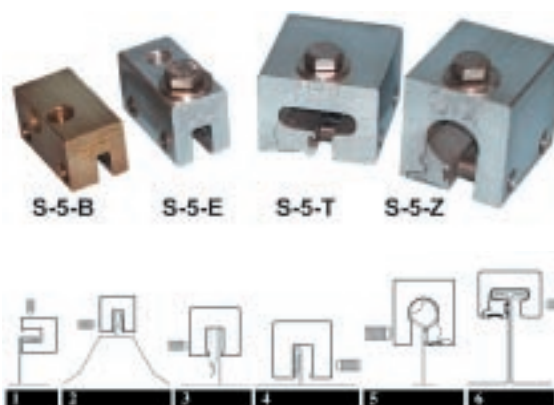
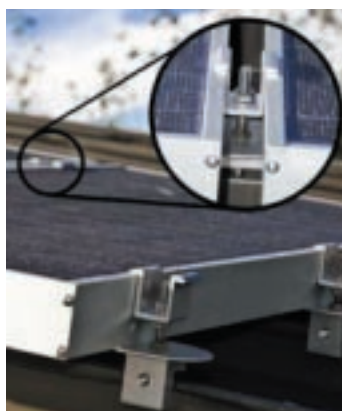
S-5! CLAMPS FOR STANDING SEAM METAL ROOFS

The concept of combining photovoltaic arrays with standing seam metal roofing is growing - and for good reasons. A standing seam metal roof has a life expectancy consistent with that of PV modules. The challenge has been in how to attach the PV modules to the standing seam roof systems without jeopardizing roof material and weather-tightness warranties. The answer is the S-5-PV Kit and the S-5!™ Mini. With the S-5-PV Kit and any of the Mini clamps, installing a leakfree solar assembly is a quick and easy process. The S-5!™ Mini clamps are a handy way to install everything from the PV modules to the electrical chases. The S-5-U model clamp will work with 85% off all roofing types. For the other 15% of standing seam roof types, we can special order four other types of clamps as well. To ensure we have the proper equipment for your installation, please visit our website to download the brochure for these clamps in our PV-Fixed Mounts section.

S-5-U Universal utility S-5 clamp (can be used with our flush mount rack designs).

S-5-U-mini Universal utility S-5 mini clamp (can be used with the S-5-PV-KIT.)

S-5-PV-KIT Used with the mini clamps to clamp a PV module directly to standing seam roof.



PV Mounting Products

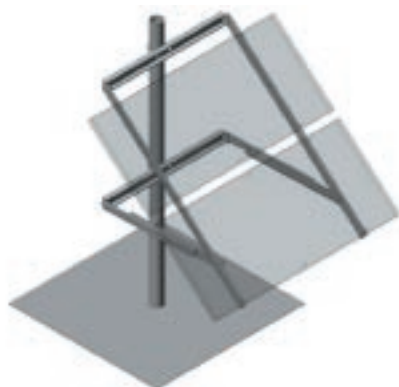
POLE MOUNTS

These are often used at locations where there is not a suitable roof space available. Single pole mounts can hold as many as 12 panels. They can be mounted in pretty much any soil type (including rocks). Taller pole mounts provide an extra level of security for the solar panels.

How to select your mount

Example: **SP4-SH80** is a side pole mount for 4 Sharp 80 Watt modules

- TP** Top of Pole Mount
- SP** Side of Pole Mount
- xx** Number of modules
- xxxx** Module Type



SECURITY HARDWARE

Concerned about theft of your solar panels? There are a few options. The most obvious solution is to mount the solar panels where they are difficult to access. If this is not possible, or you wish another layer of security, consider the Energy Alternatives security hardware kit. This kit includes specialty fasteners, removal tool, and locking compound.

- SEC-HW** Security hardware kit - includes fasteners for 1 pv module, removal tool, lock compound

PV Mounting Products - Trackers

Tracking racks are used to track the sun through the day for higher output. EA carries two styles of track rack: passive and mechanical. Passive units, manufactured by Zomeworks work by expansion and contraction of gasses shifting the weight balance to one side, causing the array to move. Active units, manufactured by Wattsun use an electronic sensor to locate the sun and a series of gear motors to mechanically rotate the panels.

There are pros and cons of each model, however we sell far more Zomeworks units than any other due to their simplicity. Due to their passive design, the Zomeworks trackers will end the day facing the wrong direction, and will take typically 30 mins of sunshine the next morning to rotate into proper position.

Trackers are built to order and have many options that will be specific to your project.

ZOMEWORKS

UTRF020	Up to 20 Sq. Ft of PV module surface area
UTRF040	Up to 40 Sq. Ft of PV module surface area
UTRF64	Up to 64 Sq. Ft of PV module surface area
URTF90	Up to 90 Sq. Ft of PV module surface area
UTRF120	Up to 120 Sq. Ft of PV module surface area
UTRF168	Up to 168 Sq. Ft of PV module surface area

WATTSUN

AZ125	Up to 125 Sq. Ft of PV module surface area
AZ-225-170	Up to 170 Sq. Ft of PV module surface area
AZ-225-190	Up to 190 Sq. Ft of PV module surface area
AZ-225-225	Up to 225 Sq. Ft of PV module surface area
AZ-DA	Dual-Axis rotation option



Zomeworks UTRF168, 12 x Sharp 175 Watt PV Modules - front view, installed Fall 2008



Zomeworks UTRF168, 12 x Sharp 175 Watt PV Modules - rear view, installed Fall 2008

PV Installation Accessories & Safety

Photovoltaic panels produce electricity, and if not installed properly can cause damage to person or property. Depending on the size and configuration of your array potentially lethal amounts of electricity will be present. Use the products below for a safe, code-compliant installation.

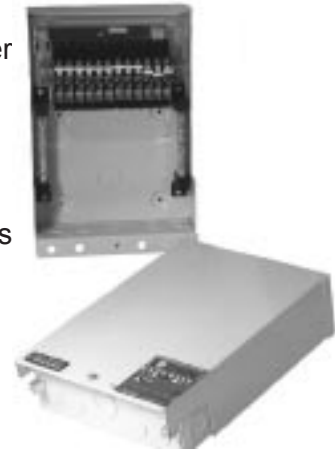
COMBINER BOXES

These are used to facilitate the interconnection of multiple strings of PV modules. Each string has its own fused disconnect as per Canadian Electrical Code.

MNPV & FW-PV

Manufactured by Midnite Solar and Outback Power, these combiner boxes accommodate up to 12 breakers.

MNEPV	Midnite PV combiner box, up to 6 circuits
FW-PV	Outback PV combiner box, up to 12 circuits
MNEPV-10	Midnite combiner breaker - 10 amp
MNEPV-15	Midnite combiner breaker - 15 amp
MNEPV-30	Midnite combiner breaker - 30 amp



LIGHTNING ARRESTOR

Install one or more on your system to help reduce the impact of a lightning strike - either direct or nearby. These are recommended for installations in lightning prone areas. They can be used to protect various components of your system.

LA-302-DC	Lightning Arrestor, DC
LA-302-AC	Lightning Arrestor, AC



GROUND FAULT PROTECTION

The US NEC requires this protection on PV modules installed on the roof of a residential building. It is not currently required in Canada, but will likely be added to the CEC in the near future.

PVGPF-1	Xantrex PV Ground Protection Fault protector - 100A
PVGPF-2	Xantrex PV Ground Protection Fault protector - 200A
PVGPF-3	Xantrex PV Ground Protection Fault protector - 300A
PVGPF-4	Xantrex PV Ground Protection Fault protector - 400A
OBGFP/2	Outback DC Ground Fault Protection system - 60A



Wind Energy

Wind energy has been used for centuries, for grinding grain, pumping water and generating electricity. Small wind turbines were an important source of electricity for rural families in North America in the 1920s and 1930s. Wind energy faded into the background with the rural electrification efforts of the 1940s and the development of reliable small engine generators.

Today, we are seeing wind gaining tremendous popularity in generating significant amounts of power both off-grid and as a source of energy for large utilities.

HOW IT WORKS

Wind turns the blades of the turbine which spins a shaft within the turbine structure. The shaft drives a generator to produce electricity.

TYPES OF WIND GENERATORS

There are many different types and styles of wind generators. Many of the older, multi-blade units as seen on farms across the nation generate mechanical energy, often used to pump water.

Small-scale units (under 3 kW): used to charge batteries or direct use (such as pumping water). We feature a selection of small scale units on the following pages.

Medium sized units (up to 50 kW): commonly used in a grid-intertie environment to generate power and feed it to the utility grid. Energy Alternatives designs and installs medium scale units. Due to the nature of these projects, each system requires a detailed assessment prior to quotation or ordering products. Please contact us for further information.

Large-scale units (megawatts): large, towering units that cost millions of dollars and generate power to run hundreds or thousands of homes or businesses. Generally suited to large utilities and power co-operatives.

HORIZONTAL AXIS WIND TURBINE (HAWT)

HAWT's are the most common wind generators, with the familiar propellor type of design. These units have been proven in the field for decades and are the most common type of wind generator in the world.

VERTICAL AXIS WIND TURBINE (VAWT)

Recently there has been a new revival for the VAWT design, which has been around for many years. The advantage of these turbines is they are less affected by turbulent winds and are much quieter than standard horizontal-axis wind turbines (HAWT). These turbines are often marketed as a low-cost solution to high power bills that can be mounted right on your roof with no need for a tower in your backyard. The reality is these turbines are still quite new and unproven. Also, they are still affected by wind turbulence and installing one on your roof will guarantee you will get reduced power production. Add to that the fact they do not start spinning by themselves (they use a small motor to jump-start the spinning and the wind keeps them going), and you have a turbine that will not produce a significant amount of power for most applications. These turbines show a lot of promise for future applications, but the technology is still too new to see a reasonable return on your investment for most applications. Also, if you have sufficient wind speeds and enough space, a conventional turbine will produce much more power at lower cost on the same site.



WIND AND PV

In many Canadian locations, a wind turbine is an excellent supplement to a solar electric system. Small wind systems are often combined with photovoltaics because seasonal variations in wind and solar resources are complementary. Most places in Canada do not have adequate wind to use as a primary power source. Locations such as the prairies that have constant prevailing winds are most suited to wind power. Contrary to popular belief, coastal areas do not always provide the best source of wind power - the winds are not as constant and predictable as those on the prairies.

BATTERY SIZE

Wind is a variable resource. The winds may be calm for a week or more, but when it does become windy it often blows very hard, most notably in the winter. For this reason wind energy systems usually require a larger battery to take advantage of the energy when it is available and to store it for extended calm periods.

MAINTENANCE

Unlike photovoltaic modules, wind turbines have moving parts. Periodic maintenance of bearings, brushes and shafts is required. It is important when installing a wind generator to consider how easy it will be to access the generator and conduct maintenance.

Towers are a critical component of wind power systems. Proper location and height of your tower is necessary to get maximum energy from a wind turbine. Improper tower design or installation may result in personal injury, property damage or a damaged generator. It will also likely result in less-than-satisfactory performance from your wind turbine.

You should be completely familiar with the installation procedures before you begin. Safety equipment should be used at all times. Check your local building department for bylaw or zoning restrictions for towers.

TOWER HEIGHT

Wind generator operation is dependent on the quantity and quality of the wind hitting the blades. Turbulent wind will reduce the power output as the turbine swings back and forth hunting for the wind. The unequal stresses caused by turbulence and the variation in wind speed between the upper and lower blades of a wind turbine installed too close to the ground will reduce power output and wind turbine life.

Wind speed increases rapidly with tower height. Doubling tower height typically increases the available wind power by about 40%. It is often more economical to install a higher tower rather than purchasing a larger generator. .

TOWER CONSTRUCTION

Guyed towers are economical and are able to withstand very high winds if properly installed. They require a fairly large area of cleared land around the tower to facilitate the installation of the guy lines. To supply the desired amount of support and keep the stresses on the tower to a minimum, the guy lines should extend as far as possible around the tower to a maximum radius of 80% of the tower height. Guyed towers may be either lattice towers or tubular towers. The tubular towers are frequently designed for tilt up installation. They have the advantage of easy installation and turbine maintenance.

Self-supporting towers are the least visibly intrusive wind turbine towers. They can be installed in rough terrain with a minimum of cleared area. Very small wind turbines may be installed on a short self-supporting tubular tower, but larger turbines require a lattice tower.

Wind Systems

WHAT YOU NEED FOR A WIND SYSTEM

Wind

- Wind generation is dependent on the quality and quantity of the wind hitting the blades. The better the wind you have, the more power you will generate.
- The power available in wind increases by the cube of the wind speed - if wind speed doubles, power output increases by eight.
- Turbulent wind (from obstructions, geographical features, etc.) will reduce the power output as the turbine swings back and forth hunting for the wind.

A Good Site

- We generally recommend a monthly average wind speed of at least 5m/s (12mph) for the operating season (ie. winter only for a solar/wind hybrid system).
- The higher a turbine, the more power is generated, the better quality the wind.
- A wind turbine should be at least 40 ft (12 meters) above any object within a 400 ft (122 meters) radius to avoid turbulent winds. Note there are often exceptions to this rule depending on your site.
- It is often more economical to install a higher tower than purchasing a larger turbine.
- Space. Generally locations with an acre or more will be suitable. Most urban locations will not permit you to install a wind generator in your yard. A guyed tower requires 1/2 the height of the tower as a radius at a minimum for location of anchor points. Space is also required for ground assembly and erection of the tower. Lattice towers require less surface area, but are more complex and expensive to install.

GET THE DATA

Measuring Wind

There are three primary ways of determining how much wind is available on your site:

1. Installing an anemometer:

- The most accurate way to determine wind speed.
- Can take several years of readings and some expensive equipment to compile accurate data - unless you plan on spending \$15 000 or more on a wind energy system, this is usually not a necessary step.
- Inexpensive anemometers can be read manually on a daily or weekly basis - a minimum of 3 months of data should be recorded and correlated with another source of wind data for a small wind generator.
- Some people install a small wind generator and use it as an anemometer if they are planning for a much larger installation.

2. Using existing data:

- Local airport or meteorological stations.
- Universities, colleges and radio stations.
- There may be some data from government sources, but unless a weather station is nearby the data may not be accurate for your site.
- Wind speeds can vary a great deal within a small area, so this information should be correlated with another method such as visual observations.

3. Visual observations (the Griggs-Putnam Index):

- The simplest and quickest method of determining average wind speed is to observe the effects on vegetation at the site.
- If the trees or shrubs are growing with a definite slant to one direction, or only branches on one side of the tree, you will have a very good wind site. It takes constant, prevailing winds to affect vegetation in this way.
- If you have a flag at your site and the flag is stiff in the wind for a few hours a day then the site is a good candidate for wind power. Keep a log book of flagpole observations to help give you some idea.
- Flying a kite is a lot of fun and lets you get to know the wind at your site and offers you some predictions as to what height of tower will be best for your site.
- If there is another wind turbine in your area, track down the owner or person responsible and they will more than likely be willing to share their observations of wind patterns.

Wind Products - Bergey

Bergey Windpower is one of the world's leading suppliers of small wind turbines. These turbines are very durable, long lasting and trouble free. Bergey turbines let homeowners and businesses generate their own clean power and even spin their utility meter backwards. Common uses are off-grid homes, rural electrification, and to boost the performance of solar electric systems. They feature an unprecedented 5-year warranty (industry leading) as well as a wide variety of turbines to suit any application. Each turbine has a unique selection of controllers, designed for battery charging, water pumping, grid intertie and high voltage options.

BERGEY XL.1

Rated at 1kW with a 24.6 MPH (68 km/h), it is the smallest of the Bergey family. Priced affordably, this is an excellent generator for people looking for more performance and durability than the smaller 400 Watt capacity turbines offer. Boasting excellent low-wind performance, and super quiet operation, this is a very popular turbine.

BERGEY EXCEL

For those with higher demands, the Excel lineup of turbines offer you a very durable, long lasting and reliable turbine. It is available with many options including controllers for battery charging, water pumping and grid intertie and a wide variety of voltages. These units are built to order at the factory with your application in mind. These turbines are intended for larger power demands.

Please contact us for exact pricing and delivery times.

XL.1	Bergey XL.1 Wind Turbine, 24 VDC
EXCEL-R48	Bergey Excel 7.5 kW 48 VDC
EXCEL-R/120	Bergey Excel 7.5 kW 120 VAC
EXCEL-R/240	Bergey Excel 7.5 kW 240 VAC
EXCEL-S/60	Bergey Excel 10 kW Grid Intertie
TOW-XL.1/30	30' Tilt-up Tower Kit for XL.1
TOW-XL.1/42	42' Tilt-up Tower Kit for XL.1
TOW-XL.1/64	64' Tilt-up Tower Kit for XL.1
TOW-XL.1/84	84' Tilt-up Tower Kit for XL.1
TOW-XL.1/104	104' Tilt-up Tower Kit for XL.1



Summer 2008 Installation of Bergey Excel 10 kW wind generator on 100' monopole tower. Photo courtesy of EnerGreen Builders Co-Op, New Brunswick, Canada.

Wind Products - Southwest Wind

The world's leading company in the small wind turbine sector, Southwest Wind continues to produce high quality, reliable small wind generators.

AIR-X & AIR-BREEZE

A very popular small wind generator which has been completely redesigned. There are thousands of these units installed generating power throughout the world today, and it is a very tough little turbine. New features include much less noise, improved microprocessor-based controller, better bearings and new blades. All Air Series turbines mount on a 1.5" SCH40 pipe. There are three different models available in 12, 24 or 48 Volts.

The Air-Breeze sacrifices a bit of power production at high wind speeds in favor of less noise production. This turbine is ideal for installation in areas where noise is a concern

These wind turbines are the most common turbine installed for small cabin systems.



AIR-X & AIR-BREEZE - MARINE VERSION

The marine version uses a higher grade of stainless fastenings, improved sealing to the environment and a powder-coated covering designed for a saltwater environment. Recommended for any land-based site that will experience significant salt spray during storms.

AIR-X-[volts]	Air-X 12V, 24V, or 48VDC wind turbine
AIR-BREEZE-[volts]	Air Breeze 12V, 24V, or 48VDC wind turbine
AIR-X-MARINE-[volts]	Air-X wind turbine - marine version, 12V or 24VDC
AIR-BREEZE-MAR-[volts]	Air-X wind turbine - marine version, 12V or 24VDC

AIR-SW	Air shutoff / breaker switch
TOW27A	27' Tilt-up tubular tower kit for Air (requires pipe & anchors)
TOW45A	45' Tilt-up tubular tower kit for Air (requires pipe & anchors)
TOW-Marine-9ft	9' tower kit with everything you need to install on a boat.



Wind Products - Southwest Wind

WHISPER 100 & 200

The Whisper 100 & 200 are designed to operate in moderate to high wind speeds (averages of 9 mph and greater). The Whisper 100 is rated at 900W and the Whisper 200 is rated at 1,000W. This small difference in ratings actually results in a large difference in power production. Since the installation for both turbines is the same and the 200 only costs slightly more, most people purchase the 200 model. Years of reliable operation by thousands of customers have made the Whisper 200 the number one selling small wind turbine in its class. With thousands in the field, this unit is the standard for remote homes, telecommunications sites, etc.

The Whisper 200 provides 200+ kWh per month, with a 12 mph average monthly wind speed. That translates to about 5-6kWh/day on average, which is enough power for most off-grid homes.

This turbine incorporates a permanent magnet brushless alternator, which combined with Whisper's high efficiency composite airfoil blade design (9ft diameter) delivers 1000 Watts peak power at 26 mph (12 m/s).



WHI-100	Whisper 100 900W, 12, 24, 48VDC (field adjustable)
WHI-200	Whisper 200 1 kW, 12, 24, 48VDC (field adjustable)
WHI-200-HV	Whisper 200 High-Voltage 1kW, 3 Blade Wind Turbine
WHI-200-TRANS	High voltage transformer
TOW-30-WHI	Tilt-up Tower Kit for Whisper 100, 200 - 30'(9m) 8-guy wires
TOW-50-WHI	Tilt-up Tower Kit for Whisper 100, 200 - 50' (15m) 12-guy wires
TOW-65-WHI	Tilt-up Tower Kit for Whisper 100, 200 - 65' (20m) 16-guy wires
TOW-80-WHI	Tilt-up Tower Kit for Whisper 100, 200 - 80' (24m) 20-guy wires

** All tower kits require 2.5"sch40 galvanized steel pipe and guy wire anchors.

WHISPER 500

This unit will provide serious power production for an entire home. The 3 kW turbine will deliver in excess of 500 kWh per month in a 12 mph (5.2 m/s) wind. This machine has a 15 ft. (4.5 m) rotor diameter providing 175 sq. ft. of swept area. The 500 was redesigned several years ago, incorporating a stronger, larger yaw shaft, new blade stabilizer straps and a third spindle bearing for increased reliability.

The Whisper 500 features a fiberglass and structural foam core blade for smooth, high efficiency operation and low wind start-up. The 500 is an excellent machine for village power projects, farms, ranches, back-up power and remote homes with large energy demands.

WHI-500-24	Whisper 500, 3kW, 24 VDC 2 blade wind turbine
WHI-500-48	Whisper 500, 3kW, 48 VDC 2 blade wind turbine
WHI-500-HVC	Whisper 500, 3kW, 220 VAC high voltage model
WHI-500-TRANS	High voltage transformer
TOW-42-WHI500	Tilt-up Tower Kit for Whisper 500 - 42' (13m)
TOW-70-WHI500	Tilt-up Tower Kit for Whisper 500 - 70' (21m)

** All tower kits require 5"sch40 galvanized steel pipe and guy wire anchors.

** All Whisper turbines incorporate the patented "angle governor" for quiet operation in high winds.



SKYSTREAM 3.7 - BECOME YOUR OWN ELECTRIC COMPANY

The Skystream 3.7™ is a new generation residential wind generator that hooks up to your home to reduce your monthly electrical bill. It's the first all-inclusive wind generator (with controls and inverter built in) designed to provide quiet, clean electricity from the wind. This makes Skystream ideal for residential homes and small businesses.

IS SKYSTREAM RIGHT FOR YOUR PROPERTY?

Skystream 3.7™ is designed to make wind power accessible to more people than ever before. If your site fits the following criteria, chances are Skystream 3.7 will work for you:

- At least 10 MPH average monthly wind speed (up to 200kWh/month savings)
- Your property is greater than 1/2 acre and is unobstructed
- The local zoning allows a structure that is at least 35' tall
- Your local utility has an existing interconnection agreement

Certification: UL (US & Canada)

Rated Capacity: 1.8 KW

Rotor: 12 feet (3.72 m); 50-325 RPM

Interconnection: Utility connected or battery charging

Alternator: Gearless, permanent magnet brushless

Voltage Output: 240 VAC (Optional 208 VAC)

Estimated Energy Production: 400 KWh per month at 12 MPH (5.4 m/s)

Weight: 170 pounds (77 kg)

Tower: Towers from 34-70 feet (10.4-21.3 m) are available; height is dependent by site

Warranty: Five year limited

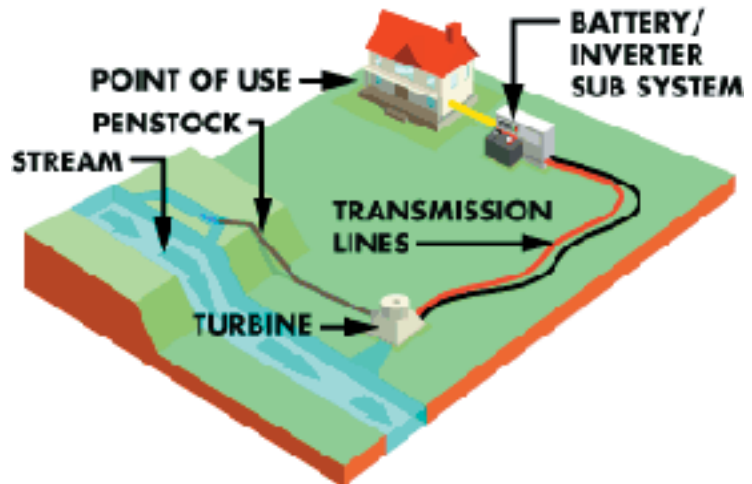


Microhydro Systems

If your site has a source of running water, you simply must investigate its potential as a source of electricity. Our experience has demonstrated that water power will produce between 10 and 100 times more power than solar or wind for the same capital investment. Since water flows day and night, a microhydro system requires far less battery storage than other technologies. Even if the stream is far away, it may still be viable. Seasonal streams offer great performance when a hybrid water and solar system is designed. When your power requirements are the highest - in the winter - the water is usually flowing the fastest. Solar modules are most efficient when there is the most sun in the summer.

Electricity is produced from the energy in water flowing from a high level to a lower level. This change in elevation is called “head” and supplies the pressure which drives the turbine. “Flow” is the other factor contributing to power production. It is usually limited by the size of the creek. The amount of electricity produced is directly related to the head and flow. If the head or flow is increased the power output increases proportionally.

Many microhydro systems can utilize the existing pipe used by a gravity fed water system. A couple of sprinklers on a two-inch pipe are the equivalent of many kilowatt-hours per month of microhydro electricity.



SITE CONSIDERATIONS

Many factors work together to make a successful microhydro site. In order to have optimal performance your equipment must be neither too big nor too small. A turbine can be up to a couple of kilometres away from where the power is being used and still be cost effective. Correctly-sized transmission lines and high-voltage generators can deliver significant amounts of power a great distance with acceptable losses and in a cost effective way.

A large inverter will deliver remarkable service from a small battery-based system and save a lot of plumbing and water handling. On the other hand, merely going a little higher up the mountain or using larger pipes can produce enough extra power to provide space heating and eliminate batteries altogether by generating AC directly.

If your site permits, you can have a large AC turbine with all the functionality of a 120/240 VAC fossil-fuel generator running 24 hours a day, but without the noise, smell, pollution and ongoing fuel and maintenance costs. While more expensive than a battery charging system, continuous outputs of 3 kW or more will heat a home for much of the year in addition to supplying town-lifestyle appliance and lighting loads.

Hydro systems are very site specific. If you are calling us to get a quote for your potential system, please have the head and flow information ready (minimum 20ft of head and 20gpm of flow). We can do a quick estimate of your power potential with the head and flow. To offer a detailed power prediction, we have a more detailed site survey document which must be completed first.

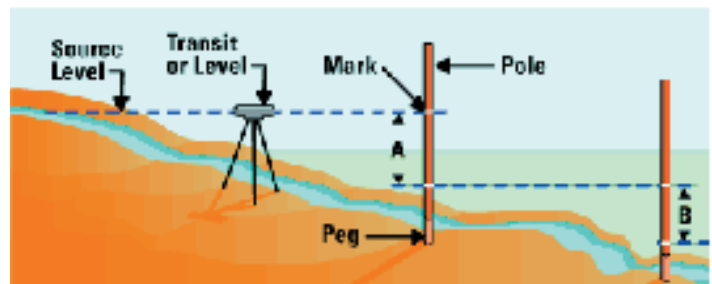
Microhydro Surveying

MEASURING PRESSURE

Water pressure is what produces power and must be measured carefully. Microhydro sites range from a few pounds of pressure up to 150 PSI or more. The easiest way to measure pressure is to look at a pressure gauge located at the lowest point of an existing pipeline. When no water is moving in the pipe (static pressure) you can determine the vertical head by multiplying the pressure by 2.31.

If there is no pressure gauge or pipe available, survey the site the old fashioned way (see illustration below). A rod is a stick that is eight feet long with each foot marked. Hold it straight up in the air at the starting point. Every place that is level with the top of the ruler is also eight feet higher than the base. Using a level, sight along to a point that is level with the top of the rod. This is also eight feet above the starting point. Next move the rod so that you can place the bottom on the piece of ground that you marked as even with the top before. Now, every place that is level with the top of the second setting of the staff is 16 feet higher than the starting point. Repeat as necessary. Heavy brush means setting up more often. Add up your totals to get the elevation in feet.

Modern handheld digital altimeters can be used as a survey tool with great accuracy. Modern GPS receivers can also provide good data depending on signal strength. (GPS needs to have a clear view of the sky). Record the elevation at the bottom. Move to the top, and record the altitude again. The difference in feet is your gross head. Repeat the process and average the results for better accuracy. Because altimeters measure the difference in atmospheric pressure, choose a day when the weather is not changing rapidly.



MEASURING FLOW

Flow is the volume of water per unit of time available to the turbine. It varies seasonally and may vary along a creek's length if tributaries flow into it. Measuring the flow at different times of the year helps estimate the maximum and minimum usable flow. Most microhydro systems use less than a hundred gallons per minute. These flows can be measured by timing how long it takes to fill a bucket. A hundred gallons per minute will take three seconds to fill a five-gallon bucket. A microhydro system typically only uses a small portion of the stream's flow and has a very minor impact to the overall stream. Diverting too much of the water from a stream will cause a negative environmental impact and should be avoided.



Usually the pipe is the limiting factor in determining what flow is available. You'd be surprised how small a stream of water even 50 gallons per minute is.

MEASURING DISTANCE

There are many different ways you can measure distance. It is a vital step, to ensure you are buying the proper lengths of pipe and wire you need to have accurate measurements. Sizing of electrical cable is critical to have the proper distance. For shorter runs, there are a wide variety of tape measures available at your local hardware store. For longer distances, a hip-chain is a common tool as well. If you have a known length of rope you can use it with the help of a friend or two to measure.

Microhydro Design

EQUATIONS

1 cubic ft/sec = 450 USGM = 28.3 liters/ sec
1 psi = 2.31 feet of head = 0.7 meters of head

A good approximation of the power available to a battery charging micro hydro system is given by:

$$\text{Power [Watts]} = \frac{\text{Net Head [ft]} \times \text{Flow [USGM]}}{14}$$

Hydro turbines and generators for AC only microhydro systems are more efficient, so the above power equation needs to be modified:

$$\text{Power [Watts]} = \frac{\text{Net Head [ft]} \times \text{Flow [USGM]}}{9}$$

EXAMPLE BATTERY SYSTEM

The total distance between where we wish to draw the water from the creek and where the turbine will be located is 600 feet. Thus the length of the pipeline (LP) must be 600 feet long. Along this 600 foot pipeline there is a drop in elevation of 80 feet. Thus the static head (HS) is 80 feet. The flow (F) available from the creek is measured to be 48 US Gallons per minute.

L_p = Length of pipeline = 600 feet
 H_s = Static Head = 80 feet
 F = Flow = 48 USGM

H_f = Friction head = 2.7 feet/ 100 feet x 600 feet
= 16 feet
 H_n = Net Head = $H_s - H_f$ = 80 feet - 16 feet
= 64 feet

$$\text{Total Power} = \frac{64 \text{ feet} \times 48 \text{ USGM}}{14} = 219 \text{ watts}$$

Power generated would be approximately 219 Watts. Over 24 hours more than 5 kWh of energy would be produced. In a nominal 12 Volt system the turbine and generator would deliver approximately 15 amps continuously or 360 amp / hours per day.

MICROHYDRO EDUCATION



Energy Alternatives' Online Microhydro course is based on the hands-on experience of Energy Alternatives staff, having designed, installed, and used microhydro systems for decades.

Everything you need to know to design and install your own microhydro system is included, with tips on what to do and what not to do - because it has been tried before.

Please visit www.EnergyAlternatives.ca/hydrocourse for full details.

MICROHYDRO POWER CALCULATOR

Free download from our website! This microhydro calculator allows you to very quickly perform rough calculations as to the potential of various microhydro resources.

www.EnergyAlternatives.ca/downloads/MicroHydroCalc.exe



Microhydro Design

EXAMPLE SITES

Site 1: 50 Feet Head

Vertical head = 50 feet

Pipe = 600 feet of 2 inch pipe

Power = 80 kWh/month

Site 2: 100 Feet Head

Vertical head = 100 feet

Pipe = 600 feet of 2 inch pipe

Power = 235 kWh/month

Greater head = Greater power!

Site 3: Longer Pipe

Vertical head = 100 feet

Pipe = 6000 feet of 2 inch pipe

Power = 85 kWh/month

Even with more pipe, this is still more economical than solar, wind.

Site 4: Spring Water

Flow = 5 GPM

Head = 200 feet

Pipe = 1000 feet of 1.5 inch pipe

Power = 70 kWh/month

Spring water is generally warmer so less likely to freeze.

Site 5: High Flow, Low Head

Flow = 200 GPM

Vertical head = 20 feet

Pipe = 300 feet of 4 inch pipe

Power = 185 kWh/month

Site 6: Large Site

Flow = 200 GPM

Vertical head = 310 feet

Pipe = 900 feet of 4 inch pipe

Power = thousands kWh/month

Customer Profile: H.V., Remote Island, BC. Two Stream Engines working in tandem produce 30 kWh per day. The turbines are wired for 220 VAC three phase, which is transmitted 2000' to the home, where it is rectified and converted to 24 VDC system voltage. A 12 year old bank of 85T15s continue to perform well. The stream dries up in the summer and they rely on the PV panels on their home. They have never needed a backup generator.



Microhydro Turbines

ENERGY SYSTEMS & DESIGN

STREAM ENGINE. Energy Systems & Design has been producing microhydro turbines since 1980. Their turbines use 4" pitch diameter bronze Turgo runners. Brushless alternators offer many advantages including an adjustable field to provide the most efficient output over a range of pressures and lower maintenance as there are no more brushes requiring replacement. It can produce up to 45 kWh per day with the proper resource. The Turgo design allows larger jets and thus is used in situations that require a lot of water flow.

ESD-SE-2	ES&D Stream Engine - 2 nozzles
ESD-SE-4	ES&D Stream Engine - 4 nozzles
ESD-HV OPT	ES&D high voltage option (for use with transformer pack)
ESD-MAN2	2 nozzle manifold for Stream Engine
ESD-MAN4	4 nozzle manifold for Stream Engine
ESD-LH1000	ES&D Low-Head LH1000 - 1000W @ 10' head
ESD-TR400	400 Watt high voltage transformer pack
ESD-TR1000	1000 Watt high voltage transformer pack
ESD-N	ES&D extra nozzle
SE-MOUNT	Custom plastic base for Stream Engine

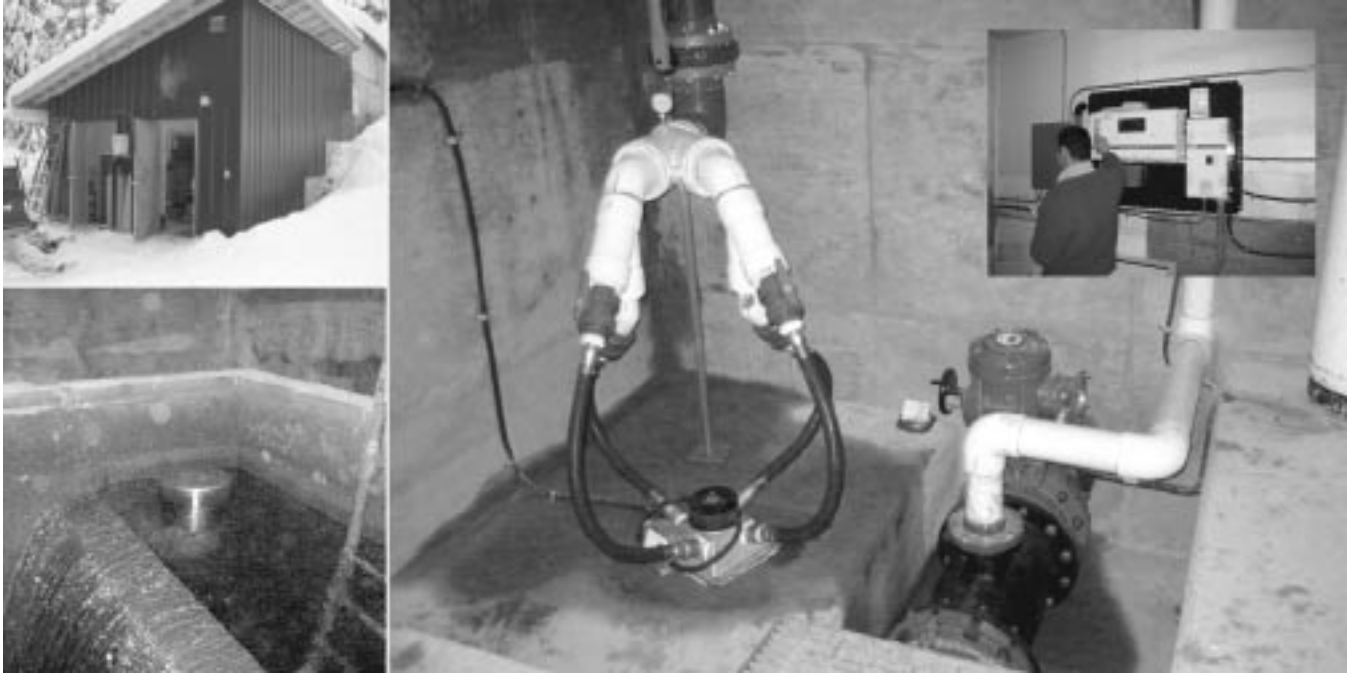


CUSTOM TURBINES

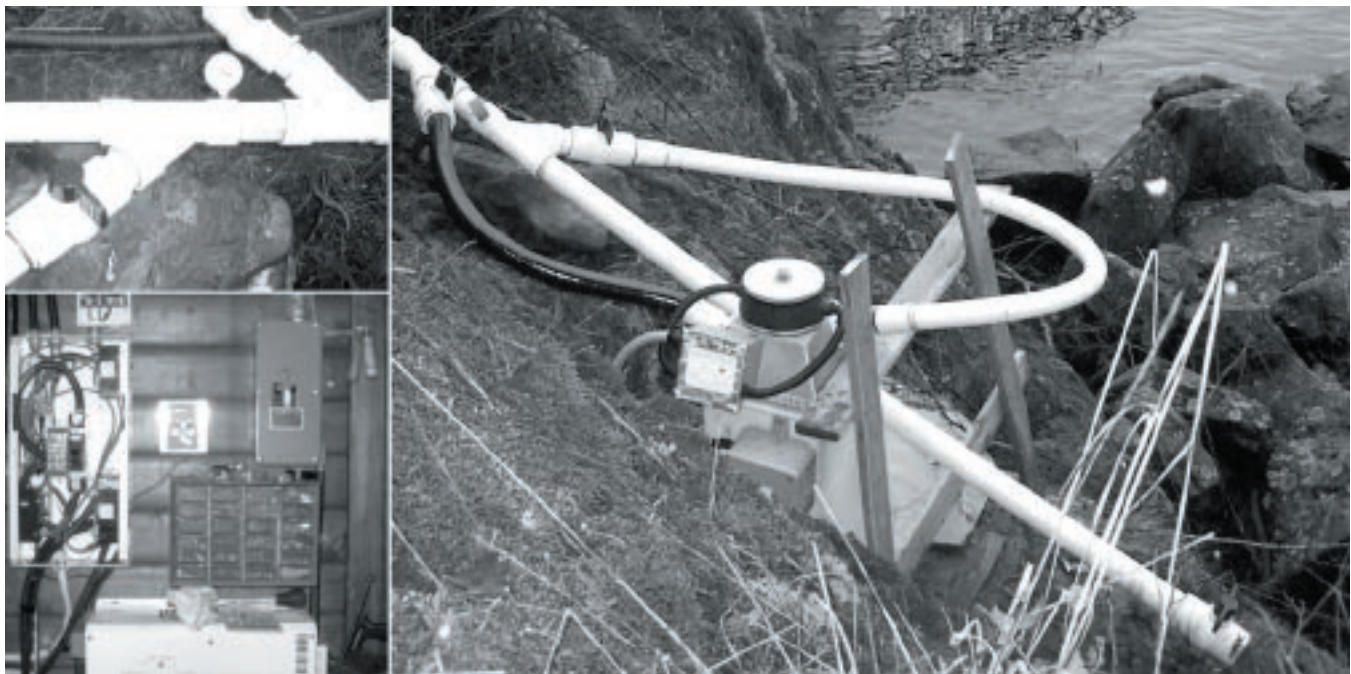
Many other turbines are available. Please contact us with your requirements

Microhydro Installations

Nelson, BC. This small microhydro system using water from the municipal waterworks allows for remote operation of a main valve. This saved the village of Nelson considerable money and eliminated the need for cutting power line right of ways through a park.



Vancouver Island, BC. This microhydro system works in conjunction with a solar system in the summer to provide the residents with power. 500 Watts continuous, 12 kWh per day means that they don't need to run the generator during winter months, saving tremendously on fuel bills.



Inverters

Inverters are a basic component of any independent power system that requires AC power. An inverter converts DC power stored in batteries into AC power used to run conventional appliances like computers, fridges, power tools and entertainment systems.

Inverters differ in the quality of electricity they produce. Quality can vary in waveform, frequency and voltage. The type of appliance that can run off an inverter depends on the quality of electricity converted.

JARGON

Waveform: Represents how AC electricity varies with time.

Frequency: Number of complete cycles per second of an AC current. Standard unit is Hertz (Hz).

Harmonics: Varying frequencies within one wave cycle. The more harmonics, the worse the quality of the electricity.

Rated power: The maximum power output of an inverter.

TYPES OF INVERTERS

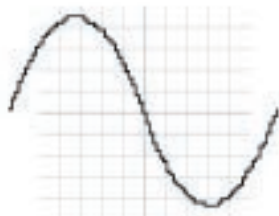
Commonly used inverters come in three types:

1. True Sine Wave Inverter



- Produces electricity similar to, or better than, utilities.
- Virtually no harmonics.
- Will run any appliance - typically used to run appliances sensitive to other waveforms like computers and electronic entertainment equipment.
- More expensive than modified sine wave inverters.

2. Modified Sine Wave Inverter



- Slightly compromised wave (some harmonics, “dirty” power) at a lower cost.
- Main disadvantage is peak voltage varies with battery voltage. Electronic devices with no regulation of power supply may behave erratically when battery voltage fluctuates. This may damage the appliance or just result in unexpected performance (ex: interference in television and radio signals, clocks won’t keep time, battery chargers can overheat, microwave power level is erratic, etc.)
- Not all modified sine wave inverters are created equal. A high quality modified sine wave inverters such as the Magnum RD series will run 90% of loads without a problem.

3. Grid Intertie Inverter

- Designed to “sell” power back to the utility when there is a surplus.
- Certified products available off the shelf and easy to use.
- Available with or without batteries depending on your needs.

What to look for in an Inverter

Surge Capacity

- Allows the inverter to deliver enough power to start large electric motors such as pump motors or power tools.
- Most inverters will deliver up to two times their continuous rated power for surge loads.

Idle Current

- Power used by an inverter even when no loads are turned on.
- Fixed amount that is always present as a load on your battery when your inverter is turned on.
- Some inverters have a search mode which reduces idle current by allowing the inverter to go into a low power consumption mode when not in use like when your computer goes into “sleep” mode.

Battery Charger

- Many inverters feature a built-in battery charger to allow the battery to be charged by an AC power source like a generator or the utility. These chargers are always higher quality than external chargers and are an important part of most off-grid power systems.
- Crucial if inverter is used as a back-up power system.

Efficiency

- Modern inverters can achieve efficiencies as high as 95%, typically operating above 85% at full power.
- True sine wave inverters are usually more efficient than modified sine wave inverters.

Chargers / Transfer Relay

- Transfers generator or grid to inverter power fast enough to allow electronics to function on an uninterruptible power supply (UPS).
- Most of the electronic equipment at Energy Alternatives Head Office is operated from a Xantrex SW Inverter for uninterrupted power usage during power failures and brownouts.

Stacking

- Stacking two inverters together allows them to produce double their rated capacity as efficiently as 220 VAC power.
- Enables you to operate large loads like power tools and deep well pumps.

GENERATORS AND INVERTERS

- Generators and inverters are an ideal match - small jobs are tough on a generator.
- An inverter operates small loads (like lights and computers) or intermittent loads (pumps, power tools and microwaves) more efficiently than a generator.
- A generator drinks almost as much fuel for light duty as it does for heavy duty.
- With an inverter, the generator can operate as a battery charger eliminating the need for the generator to run continuously - when the generator is off, loads are powered by the inverter taking only as much energy as is required from the batteries.

Battery and Inverter Subsystem vs. Generator

- AC power is available 24 hours a day with the flick of a switch.
- Generator can be run for battery charging and direct AC power when convenient.
- Generator operation is made much more efficient and capacity is better utilized.
- Fuel costs are lowered because generator run time is reduced.

The MagnaSine - MS Series Inverter/Charger is a pure sine wave inverter designed specifically for the most demanding mobile and off grid applications. The MS Series is powerful, easy-to-use, and best of all, cost effective. These inverters do not have all of the bells & whistles like the Outback and Xantrex inverters, but they have the features most people will require and they are much less complex than the other leading inverters. Instead of being fully-programmable, these inverters have presets that will cover almost any application. These inverters provide the best value in terms of quality and features in a low cost solution.

FEATURES

- 120/240-volt split-phase operation on AE models
- True sine wave output
- High surge capacity
- Robust battery charger, works with lower quality generators better than any other charge on the market.
- Efficient, power factor corrected, high-current, multistage battery charging
- ON/OFF inverter mounted switch with LED indicator
- Up to 50A AC transfer from shorepower, grid, or generator.
- Designed for easy field installation
- Comes standard with battery temperature sensor

MS2012	2.0 kW, 12V pure sine wave inverter with 100A charger, 120VAC input/output
MS2812	2.8 kW, 12V pure sine wave inverter with 125A charger, 120VAC input/output
MS4024	4.0 kW, 24V pure sine wave inverter with 105A charger, 120VAC input/output
MS4024-AE	4.0 kW, 24V pure sine wave inverter with 105A charger, 120/240VAC input/output
MS4448-AE	4.4 kW, 48V pure sine wave inverter with 60A charger, 120/240VAC input/output

ME-RC50	System controller display for Magnum Inverters with 50ft cable
ME-AGS	Automatic generator starting (AGS) for 2-wire and 3-wire electronic start generators

** Highly recommend the Midnite Solar E-Panel power distribution centre (shown below).



Introducing the MM-AE Series Inverter/Charger from Magnum Energy – a new modified or true sine wave inverter providing a cost effective solution for those with smaller power needs in off-grid applications. Versatile, easy-to-use, and lightweight, the MM Series provides a reliable base for your energy system.

Attractive styling: The modern, hourglass case, paired with the die cast aluminum base combines form with function, creating an attractive unit that uses its base as a heat sink for superior high temperature operation.

FEATURES

- Standard transfer relay: The standard 7 or 16 amp, transfer relay will pass AC power through the inverter when using grid or generator power.
- Versatile mounting: Mount on a shelf, wall, or even upside down.
- Fan cooled, enabling the unit to work well in confined spaces. If the inverter does exceed its temperature limits, it will automatically shut down and then restart when it cools down.
- Low battery protection: below 10 VDC the MM-AE Series will automatically shut down.
- High battery protection: over 15.5 VDC the MM-AE Series will shut down.
- Current overload protection The MM-AE Series will automatically shut down if its output wattage is exceeded or it detects a short in the wiring, saving the unit from costly damage.
- Convenient switches: an on/off front mounted switch with an easy-to read LED indicator.
- Circuit breaker protection: built in AC input and output circuit breakers for ease of installation.
- Battery temp sensor: The standard battery temp sensor monitors temperatures from 0 - 50° C on all inverter models with a charger.
- Buy with ease: The MM Series is backed by a two-year (24-month) parts and labour warranty.

MM612-AE	Magnum 600W, 12V inverter / 30A charger, modified sine wave
MM1212-AE	Magnum 1200W 12V inverter / 70A charger, modified sine wave
MM1524-AE	Magnum 1500W 24V inverter / 35A charger, modified sine wave
MMS1012-PS	Magnum 1000W 12V inverter / 50A charger, true sine wave

ME-RC50	System controller display for Magnum Inverters with 50ft cable
ME-AGS	Automatic generator starting (AGS) for 2-wire and 3-wire electronic start generators



The OutBack FX/VFX series is a modular “building block” sine wave inverter/charger that can be used for both small and large power systems. Each OutBack inverter/charger is a complete power conversion system including a DC to AC inverter, battery charger, and AC transfer switch. These inverters have a 120VAC input and output; 240VAC is only possible with two inverters stacked. Additional inverter/chargers can be connected at any time in either parallel (120 VAC), series (120/240 VAC), or three-phase (120Y208 VAC) configurations. This allows a system to be tailored to meet the specific power conversion requirements of the application, both at the time of the installation and in the future.



The OutBack FX is designed to survive harsh environments anywhere in the world. The unique sealed, gasketed die cast aluminum chassis protects and keeps the power conversion components cool - without requiring outside air to be blown through the sensitive electronics.

The OutBack VFX series is similar, but in a vented enclosure. Keeping the inverter cool by means of circulation fans improves the power output dramatically.

The OutBack inverter/charger system is designed for both residential and commercial stand-alone or back-up power applications with battery energy storage. It is designed to operate as a coordinated system with the other OutBack products i.e. the Flexware enclosures as well as the FlexMax MPPT charge controllers and MATE system controller and display. Grid-intertie versions are available, as well as non-standard voltages such as 32 VDC.

INVERTER/CHARGERS

FX2012T	2.0 kW, 12V pure sine wave inverter with 100A charger, sealed
FX2524T	2.5 kW, 24V pure sine wave inverter with 55A charger, sealed
FX3048T	3.0 kW, 48V pure sine wave inverter with 35A charger, sealed
VFX2812	2.8 kW, 12V pure sine wave inverter with 125A charger, vented
VFX3524	3.5 kW, 24V pure sine wave inverter with 85A charger, vented
VFX3648	3.6 kW, 48V pure sine wave inverter with 45A charger, vented
GTFX2524	2.5 kW, 24V grid-intertie, pure sine wave inverter with 55A charger, sealed
GTFX3048	3.0 kW, 48V grid-intertie, pure sine wave inverter with 35A charger, sealed
GVFX3524	3.5 kW, 24V grid-intertie, pure sine wave inverter with 85A charger, vented
GVFX3648	3.6 kW, 48V grid-intertie, pure sine wave inverter with 45A charger, vented

COMMON ACCESSORIES

FX-DCA	DC side cover and conduit adapter for use with Flexware
FX-ACA	AC side cover and conduit adapter for use with Flexware
RTS	Remote battery temperature sensor
MATE	System controller display for FX/VFX inverter/charger & FlexMax controllers

** See also compatible Midnite Solar E-Panel power distribution centre.

Inverter Accessories - Outback

FLEXWARE

Flexware is the latest example of Outback's continuous efforts to bring you the most value packed and technologically advanced products available.

FW250

This is the lowest-cost solution for single inverter installations where space and budget are primary concerns. Please see also Midnite Solar E-panel.



FW500

The Flexware 500 will support up to two inverters and two charge controllers in a versatile and code-compliant package.

- FW500-AC** AC Conduit Box with ground bar
- FW500-DC** DC Conduit Box with ground bar, 500A Shunt
- FW-MP** Mounting plate



FW1000

For large systems, the Flexware 1000 will support up to four inverters and four charge controllers. Multiple FW1000's can be used together for systems up to 36 kW.

- FW1000-AC** AC Conduit Box with ground bar
- FW1000-DC** DC Conduit Box with ground bar, 1000A Shunt
- FW-MP** Mounting plate



X240

The OutBack X-240 auto-transformer is used for step-up, step-down or for generator and split phase output balancing applications. Includes a 25 amp two pole breaker for manual control and overload protection of the transformer and wiring. Rated up to 4kVA at 40°C without the OutBack cooling fan kit.

- OB-X240** 4 KW autotransformer
- OB-X240-FAN** Autotransformer fan - increases continuous rating to 6 kW
- OB-PSX-240** 6 KW autotransformer with enclosure and fan

MATE

The OutBack MATE is a complete system controller and display for both the Out-Back FX and VFX inverter/chargers and FlexMax charge controller. It provides a display of the operation as well as allows control and adjustment of the set points. The OutBack Mate also coordinates the operation of the entire system to maximize performance and to prevent multiple products from conflicting.



HUB-4/10

The OutBack HUB-4 and HUB-10 system communications managers allow the interconnection of up to ten OutBack power conversion devices with the MATE. The interconnection creates a completely integrated Power System that is coordinated and managed by the MATE.

Inverters - Xantrex XW System **XANTREX** Smart Choice For Power

The XW Hybrid Inverter/Charger is a true sine wave inverter/charger that can be used for both residential and commercial applications; stand-alone, grid-backup, and grid-tie with battery energy storage. Capable of being grid-interactive or grid-independent, the XW Series will operate with generators and renewable energy sources to provide full-time or backup power.

FEATURES

- 120/240-volt split-phase operation
- True sine wave output
- Huge surge capacity - Full 200% rated output power is delivered to the load
- Efficient, power factor corrected, high-current, multistage battery charging
- Certified to UL1741 and CSA for utility-interactive applications
- Local display on inverter shows output power, charge current and battery level, to provide system status at a glance
- Designed for easy field installation with manageable building blocks
- Will Accomodate two AC inputs (generator and grid as a common example) without need for external transfer switches.

XW-AGS	Auto generator start
XW-CB	Conduit box
XW-PDP	Power distribution panel
XW-SCP	System control panel for remote monitor / control
XW-STACK	Connection kit for 2 inverters
XW4024	4kW, 120/240VAC, 24VDC inverter
XW6048	6kW, 120/240VAC, 48VDC inverter
XWMPPT60	60A advanced MPPT charge controller
XW-GATEWAY	Display system performance remotely on computer.



Standalone Grid-Tie Inverter - Xantrex GT

Grid-intertie or Net Metering is simply the ability for individuals to produce their own power and sell it back to the power company. Power utilities are becoming enlightened (or required legally in most cases) and are allowing their customers to generate their own power.

There are two distinct types of grid-intertie inverters: With or without batteries. The key decision point here is do you want your solar system to be able to provide power in the event that the grid is down? If you wish that ability, you will require a system with batteries. The Xantrex XW series and some Outback inverters listed in the surrounding pages provide those features.

XANTREX GT SERIES INVERTER

When Xantrex set out to develop the GT Grid Tie Solar Inverter they listened to the experts – renewable energy dealers and installers. The result is a high performance inverter that makes utility interactive installations easier and more cost effective. The GT series is a high quality product that offers the best price/performance ratio in the industry.

A High Performance String Inverter:

- >94% peak and average efficiency maximizes your PV investment
- Fast MPPT tracking algorithm ensures maximum energy harvest from your array under any conditions
- Excellent thermal performance: provides 3.0 kW up to 30° C and 2.5 kW to 45° C with no fan required
- Optional fan kit extends thermal performance for extremely hot climates (see graph on reverse)
- FCC Part B compliance means less potential interference with communication, radio, and consumer electronics

Easy and Less Costly to Install:

- Wide PV input MPPT tracking voltage range makes module selection and sizing extremely flexible
- Includes a lightweight and versatile mounting bracket that simplifies installation
- Modular design allows inverters to be mounted side by side using each wiring box as a wiring raceway
- Easy access PV and utility terminal block simplifies wiring
- Integrated lockable utility/PV disconnect saves installation time and balance of system component cost
- Wiring box can be separated from the sealed inverter enclosure allowing DC/AC connections to remain intact in the unlikely event that the inverter needs to be serviced
- Rugged NEMA 3R inverter enclosure allows reliable outdoor and indoor installations

Full Featured Inverter Display and Communications:

- Liquid Crystal Display (LCD) provides instantaneous power, daily and lifetime energy production, PV array voltage and current, utility voltage and frequency, time online “selling” today, fault messages, and installer customizable screens
- LCD vibration sensor allows the tap of a finger to turn backlight on and display screen cycling
- Bright LED indicators provide system status at a glance
- Integrated RS232 and Xanbus RJ45 communication ports
- PC software for remote monitoring and system troubleshooting



Inverters - Samlex Sine Wave

Samlex “S” Series true sine wave inverters are designed for heavy duty commercial and industrial applications. “S” series inverters are microprocessor controlled and UL listed to Canadian and USA standards, as well as CE and FCC compliant.

Features

- True sine wave output (THD 6% Typ.)
- Power ON-OFF remote control
- Input & output fully isolated
- Thermo control cooling fan
- Advanced microprocessor
- Input polarity reverse / under voltage / over voltage protections
- Output short circuit / overload / over temperature protections
- Capable of driving highly reactive and capacitive loads
- Tri-color indicators display input, output level & failure status
- UL / e-13 / CE / FCC approved



S150-12	Samlex 150W, 12V pure sine wave inverter
S150-24	Samlex 150W, 24V pure sine wave inverter
S300-12	Samlex 300W, 12V pure sine wave inverter
S300-24	Samlex 300W, 24V pure sine wave inverter
S600-12	Samlex 600W, 12V pure sine wave inverter
S600-24	Samlex 600W, 24V pure sine wave inverter
S600-48	Samlex 600W, 48V pure sine wave inverter
S1500-12	Samlex 1500W, 12V pure sine wave inverter
S1500-24	Samlex 1500W, 24V pure sine wave inverter
S1500-48	Samlex 1500W, 48V pure sine wave inverter
CR-5	Remote on/off for S1500 only

MAGNUM RD SERIES

The RD series inverter/charger sets the standard for modified sine wave inverters ranging in size from 1.8 kW to 3.9 kW. The RD provides dependable power for vacation homes and is an excellent choice for use in a workshop. This hard working inverter runs common tools and kitchen appliances without a worry. Its high-surge capacity gives it the ability to start difficult motor loads. Once the unit is set up all functions of the inverter/charger are fully automatic. LED status indicators provide vital information such as charge mode, high or low battery voltage, over temperature or overload.

These inverters make more noise than true sinewave inverters, so they should be installed in a power shed or separate room in the cottage. Modified sine wave inverters can have issues with electronic equipment such as televisions, radios, microwaves, battery chargers, computers, etc.



RD2212	2.2 kW - 12V inverter with 110A charger and transfer relay
RD1824	1.8 kW - 24V inverter with 50A charger and transfer relay
RD2824	2.8 kW - 24V inverter with 80A charger and transfer relay
RD3924	3.9 kW - 24V inverter with 105A charger and transfer relay

MM-RC	Basic ON/OFF remote
ME-RC50	System controller display for Magnum Inverters with 50ft cable
ME-AGS	Automatic generator starting (AGS) for 2-wire and 3-wire electronic start generators

** Highly recommend the Midnite Solar E-Panel power distribution centre.



XANTREX PROWATT SERIES

If you are looking for an economical modified sine wave inverter that does not have a charger built in, this is the one for you. With sizes from 150 Watts through 3000 Watts, there is a unit that fits your needs.

These inverters will run most loads, but are not the best choice if you are running sensitive electronics such as entertainment systems, electronics, etc. They are designed for light-duty occasional use. For full-time applications, we highly recommend using a true sine wave inverter/charger.

PW600	600W, 12V modified sine wave inverter
PW1750	1750W, 12V modified sine wave inverter
PW3000	3000W, 12V modified sine wave inverter
PW800/24	800W, 24V modified sine wave inverter



Inverter Accessories - Midnite



The Midnite Solar E-Panel saves time money and space. It is a compact, affordable panel for mounting a single inverter. But it is also modular for mounting multiple inverters.

Easy Access to Wiring - Concerned that such a compact panel will not have sufficient access to the wiring? Once again, the hinged door makes it easy. Simply swing it out of the way and you have unobstructed access to all wiring. To meet Canadian Electrical Code (CEC) requirements, you must have a power distribution centre and the Midnite E-Panel is the lowest cost solution to meet these requirements. By federal law, all electrical installations must be CEC compliant. Most house insurance companies will require CEC compliancy.

FEATURES

- Small size compared to existing products
- Pre-wired to save time, money and complexity. All wiring connections clearly labelled
- Standard gray powder coated steel
- Six slots per unit for 13 mm wide Din Rail mount breakers; PV, Wind, Hydro and AC distribution or three 19mm wide breakers
- 500 amp 50 mV shunt for battery status monitoring systems
- Pre-wired 50 amp inverter AC bypass switch
- Pre-wired 50 amp AC input disconnect
- Mounting hardware for inverter and charge controller
- Snap in plastic conduit for wires
- Mounting brackets for hanging E-panel on wall
- Heavy duty 175 amp AC distribution block
- ETL listed to UL and CSA standards
- Right hand hinged door to mount inverter (left hand available on request)
- Knock outs for AC and DC conduits
- Cut outs for two North American style GFCI outlets
- 250A DC inverter-battery breaker
- Internal inverter DC cables
- Bus bars for solar input, DC positive, DC negative, AC hot, AC neutral, and ground



MNDC250	Mini DC Disconnect with 250A breaker
MNE125STMM	E-Panel with 125A breaker Magnum MM
MNE250LT	E-Panel Lite with 250A breaker
MNE250STS	E-Panel with 250A breaker Outback FX/VFX
MNE250STM	E-Panel with 250A breaker Magnum MS/RD
MNE250STM-240	E-Panel with 250A breaker Magnum AE
MNE250XW	E-Panel large with 250A breaker Xantrex XW



Inverter Accessories - Midnite

Midnite solar provides a full selection of accessories for use with their E-Panel products and for general balance of system uses.

AC Breakers

MNEAC10	10A, 120VAC breaker
MNEAC15	15A, 120VAC breaker
MNEAC20	20A, 120VAC breaker

DC Breakers

MNEPV10	10A, 150VDC breaker
MNEPV15	15A, 150VDC breaker
MNEPV20	20A, 150VDC breaker
MNEPV30	30A, 150VDC breaker
MNEPV40	40A, 150VDC breaker
MNEPV50	50A, 150VDC breaker
MNEPV63	63A, 150VDC breaker
MNEPV10-250	10A, 250VDC high voltage breaker
MNEPV15-250	15A, 250VDC high voltage breaker
MNEPV50-250	50A, 250VDC high voltage breaker
MNEDC80	80A, 125VDC breaker
MNEDC175	175A, 125VDC breaker
MNEDC250	250A, 125VDC breaker



Small DC breaker box

MNENCL4	Enclosure for 1-4 MNEPV or MNEAC breakers
MNENCL4-LG	Larger enclosure for 1-4 MNEPV or MNEAC breakers with ground/negative bus bar
MNENCL4-80	Enclosure for 1-4 MNEDC80 breakers

Solar Array Combiner Box

MNPV3	Outdoor rated breaker box for MNEPV breakers
MNPV6	Outdoor rated breaker box for MNEPV breakers



Terminal Bus Bars

MNTBR	Red feet with space for four 1/0 and eleven #6AWG wire slots with set screws
MNTBW	White feet with space for four 1/0 and eleven #6AWG wire slots with set screws
MNTBB	Black feet with space for four 1/0 and eleven #6AWG wire slots with set screws

Inverter Bypass Breaker Assemblies

These are built in-house by our own technicians. If you do not have an E-Panel installed, then you are likely running your backup generator power through the inverter to your loads. That means if the inverter should fail, it will disconnect your generator from your loads and leave you in the dark. With an inverter bypass assembly, you can bypass your inverter and connect your generator directly to your loads with the flip of a switch. A bypass switch is highly recommended for all installations (included with E-Panel).

INV-BYPASS-30	30A Inverter Bypass Isolation Switch
INV-BYPASS-60	60A Inverter Bypass Isolation Switch

Batteries

Batteries are the heart of an independent power system. They store electricity for use at a later time when a charging source is not available. They also provide a reserve of available energy to run loads that require more power than provided by the renewable energy source.

Batteries wear out and must eventually be replaced. Regular monitoring and maintenance will extend the life of your battery and save you money.

Batteries don't just die; they are murdered

How you use and maintain your battery bank will have a direct relationship to their lifespan. The deeper you discharge these batteries, the shorter their lifespan will be. A battery bank that is too small will tend to be discharged deeper. Your battery bank is a long-term investment. Consider how you might want to expand the system in the future.

TYPES OF BATTERIES

Getting the right battery for the job is a critical step in designing a reliable renewable energy system.

Starting battery

- Includes automotive batteries, 8D, 4D “cat batteries”.
- A poor choice for a renewable energy system, will have a very short life, poor performance.
- Designed to provide a brief, high current for engine starting.
- Not designed for deep discharge applications - this causes rapid deterioration.

RV / Marine “Deep Cycle” batteries

- Includes group 24 or group 27 battery, sold in hardware, automotive and marine stores.
- A poor choice for a renewable energy system, lasting only a season or two.
- A compromise between engine starting batteries and deep cycle batteries.
- Will not withstand repeated deep discharging - even through their label claims to be “deep cycle”

Motive power deep cycle batteries

- Includes golf cart, floor scrubber and forklift batteries.
- Used to provide energy for electric vehicles like golf carts and forklifts.
- Durable, have good storage capacity and are cost effective.
- Golf cart batteries will typically will last 4 to 6 years; forklift batteries can last 15 to 20 years.

Stationary batteries

- Includes UPS batteries, telephone company batteries, standby power.
- Poor choice for most renewable energy systems - not designed for frequent deep discharges.
- May be suitable for use in microhydro systems to store reserve energy for peak load demands.

Sealed batteries

- Includes AGM (Absorbent Glass Mat).
- More expensive than liquid filled batteries.
- Require no maintenance, tolerate low temperatures, do not produce corrosive gasses.
- Good at remote sites where maintenance is not possible and cold weather prevails.
- Precise charge control is critical, low tolerance for over-charging.

TEMPERATURE

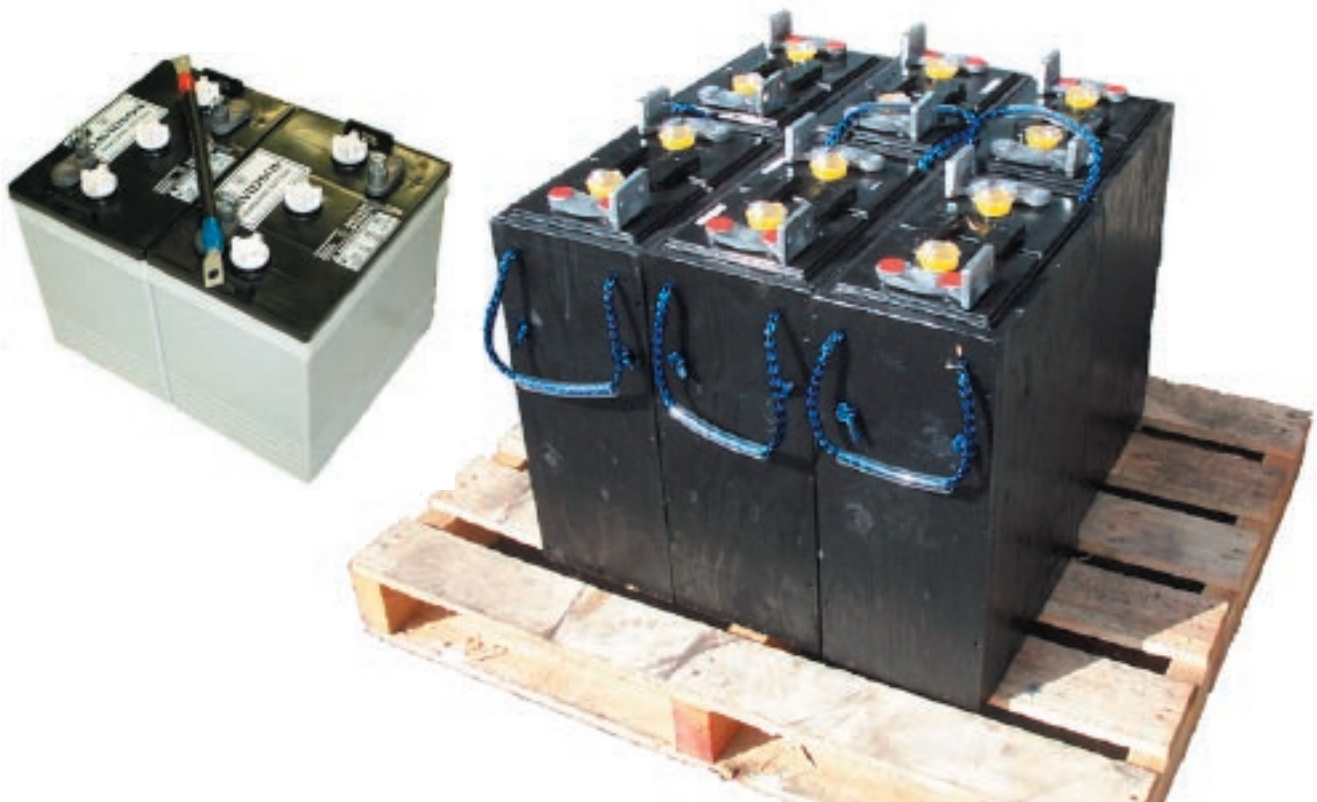
- Ideally the battery bank should be maintained at a constant temperature.
- Must be protected from the cold. Battery capacity is significantly reduced as temperatures decrease.

INSTALLATION

- Sufficient protection from west coast weather can be achieved by placing the batteries in an insulated box adjacent to the building.
- In colder parts of the country, it is ideal to have the batteries inside a heated building.
- Batteries must always be located in a sealed and ventilated enclosure when mounted inside a building.

BATTERY CARE

- Keep terminals clean and tight.
- Keep batteries charged - storing them in a discharged state will shorten their life.
- An equalization charge every 3-6 months will restore capacity to a battery bank.
- Avoid discharging your batteries below 50% - this shortens their life considerably.
- Inspect cells every three months for water loss.
- Fill only with distilled or reverse osmosis purified water.



Batteries - Flooded

GLOBAL YUASA FORKLIFT BATTERIES

Global batteries are heavy duty, deep cycle, forklift cells. They are ideal for larger independent power systems. Tubular type plates firmly hold the active materials in place ensuring a long service life. The cases and covers are made of impact resistant polypropylene for durability. The long life expectancy of these cells easily makes up for the slightly higher cost. Generally, they cost twice as much as golf cart batteries yet their lifespan is four times that of a golf cart battery. It is not uncommon for these batteries to last over 20 years! To make handling easier, we recommend our painted plywood boxes with handles. Each box holds two cells and comes with welded interconnects for greater reliability.

85T11	2 Volt - 665 amp hour; 1.5 kWh @ 72 hour discharge (per cell) - 21" tall
85T13	2 Volt - 800 amp hour; 1.8 kWh @ 72 hour discharge (per cell) - 21" tall
85T15	2 Volt - 930 amp hour; 2.0 kWh @ 72 hour discharge (per cell) - 21" tall
85T17	2 Volt - 1065 amp hour; 2.3 kWh @ 72 hour discharge (per cell) - 21" tall
85T19	2 Volt - 1200 amp hour; 2.6 kWh @ 72 hour discharge (per cell) - 21" tall
85T21	2 Volt - 1330 amp hour; 2.9 kWh @ 72 hour discharge (per cell) - 21" tall
85T25	2 Volt - 1595 amp hour; 3.5 kWh @ 72 hour discharge (per cell) - 21" tall
85T27	2 Volt - 1725 amp hour; 3.8 kWh @ 72 hour discharge (per cell) - 21" tall



6 VOLT BATTERIES

Commonly known as golf cart or floor scrubber batteries these are an economical battery for smaller systems. Sold in pairs for 12V systems, fours for 24V system and eights for 48V systems. Interconnection cables are required for series/parallel connections. Typical life expectancy is 5 years.

GC220	220 Ah @ 20 hr 6 Volt Deep Cycle Battery
L-16	350 Ah @ 20 hr 6 Volt Deep Cycle Battery

BATTERY ACCESSORIES

85T-BOX	Painted plywood containers, holds two Global-Yuasa cells, with carry handles
BATBOX	Custom sealed and ventilated battery box - indoor use. Includes vent hardware
MAINT-KIT	Includes filling jug, distilled water, hydrometer, baking soda, gloves and safety goggles
BC20-2/0	20" 2/0 battery interconnection cable
BC8-2/0	8" 2/0 battery interconnection cable
PV-12	12 Volt power vent battery box ventilator
PV-24	24 Volt power vent battery box ventilator
PV-48	48 Volt power vent battery box ventilator
SCI-BD-2	Battery Desulphator

Batteries - Sealed

AGM (ABSORBED GLASS MAT)

AGM batteries are extremely popular for small, remote systems that may operate unattended. They are particularly well suited to extreme cold or warm temperatures. An AGM battery uses plates that are separated by an absorbent fiberglass mat that is saturated with acid. Their sealed nature allows them to be installed in any position without the need for a sealed and vented battery box. They have a much shorter self-discharge rate than gel or liquid electrolyte batteries. AGM batteries are capable of handling substantially higher charge rates and discharge rates than gel type batteries.



AGM-1255	12V 55 Ah (20 hr) AGM Sealed Lead Acid battery
AGM-1275	12V 75 Ah (20 hr) AGM Sealed Lead Acid battery
AGM-1290	12V 90 Ah (20 hr) AGM Sealed Lead Acid battery
AGM-12105	12V 105 Ah (20 hr) AGM Sealed Lead Acid battery
AGM-12150	12V 150 Ah (20 hr) AGM Sealed Lead Acid battery
AGM-4D	12V 200 Ah (20 hr) 4-D style AGM Sealed Lead Acid battery
AGM-8D	12V 245 Ah (20 hr) 8-D style AGM Sealed Lead Acid battery
AGM-GC	6V 190 Ah (20 hr) Golf-cart style AGM Sealed Lead Acid battery
EV-L16A-A	6V 390 Ah (20 hr) L-16 style AGM Sealed Lead Acid battery

DEKA UNIGY II SPACESAVER BATTERIES

These are the highest quality, longest lasting sealed batteries we carry. If you are looking for a robust and problem-free battery bank, look no further. These are 2V industrial batteries with a 15-20 year lifetime. This line of batteries utilizes a smaller footprint to save space while providing optimal power. The new reduction in space enables less restriction for ground and vertical space confinements and meets the latest UBC 97 Zone 4 specifications, certified up to 8 modules high. Assembly is quick and easy with a simplified, yet advanced layout configuration and "two-way" post design allowing quick connector assembly and optimized current transfer.

AVR95-7:	395Ah @ 72hr discharge rate
AVR95-9:	525Ah @ 72hr discharge rate
AVR95-11:	660Ah @ 72hr discharge rate
AVR95-13:	790Ah @ 72hr discharge rate
AVR95-15:	920Ah @ 72hr discharge rate
AVR95-17:	1050Ah @ 72hr discharge rate
AVR95-19:	1190Ah @ 72hr discharge rate
AVR95-21:	1320Ah @ 72hr discharge rate
AVR95-23:	1450Ah @ 72hr discharge rate
AVR95-25:	1575Ah @ 72hr discharge rate
AVR95-27:	1715Ah @ 72hr discharge rate
AVR95-29:	1840Ah @ 72hr discharge rate
AVR95-31:	1975Ah @ 72hr discharge rate
AVR95-33:	2100Ah @ 72hr discharge rate



Battery Chargers

Battery chargers are used to charge batteries from an external AC electricity source - typically a generator. Some sites may use shore power or grid power. Many inverters have built-in battery chargers which are generally the best value. If you are shopping for a new inverter and require battery charging as well you should consider buying an inverter with that function built in.

External chargers are used for systems that do not have battery charging built on, or require additional charging power. If you have a large battery bank and a large generator, you may find you can make use of additional battery chargers, reducing the running time of your generator.

MULTI-STAGE CHARGING

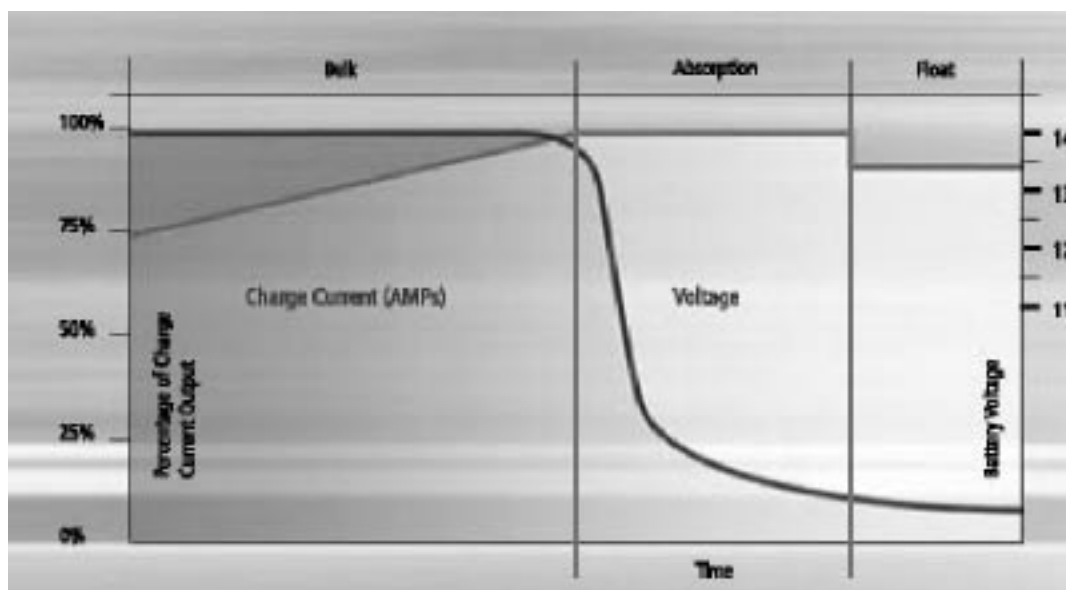
Modern, high-capacity battery banks use multiple stages in the charging process to bring your batteries to a full, proper charge.

Bulk: This is the first stage of a battery charge cycle. The voltage of the battery is the lowest and the charger will deliver its highest current to the battery. The current will remain constant until the voltage rises to the maximum voltage as per charger settings.

Absorption: The second stage. Once a battery has reached its peak voltage, the charger will begin reducing the current as needed to maintain the voltage at its peak level. With generator charging, you want to do as much of your charging as possible at the bulk or early absorption stages.

Float: When the absorption stage is complete, the charger will kick into float mode. In this mode, only a trickle power is being delivered to the battery, which is considered fully charged.

Equalization: is a controlled overcharge of the battery. This stirs up the electrolyte and dislodges some sulphation which may have occurred during periods of discharge. Do not attempt this on sealed batteries!



Battery Chargers

IOTA ENGINEERING

These are extremely cost effective power supplies / battery chargers. They can be used as a DC power supply with no batteries if desired. No special filters are required for radios and stereos. They operate at a wide range of input voltages and frequencies and still maintain full power output and constant voltage. Iota chargers automatically taper the charge current as batteries reach full charge. A manual jumper allows you to choose between 14.2 VDC charging and 13.4 VDC for float service. An optional IQ-4 adapter turns this unit into a smart, 3-stage charger. Solid state electronics and lightweight ferrite transformers are used to achieve a remarkable 86% charging efficiency. Iota chargers currently do not offer an equalization charge feature.

DLS-15-12	15A, 12V Adjustable 13.6, 14.2 VDC
DLS-30-12	30A, 12V Adjustable 13.6, 14.2 VDC
DLS-45-12	45A, 12V Adjustable 13.6, 14.2 VDC
DLS-55-12	55A, 12V Adjustable 13.6, 14.2 VDC
DLS-75-12	75A, 12V Adjustable 13.6, 14.2 VDC
DLS-90-12	90A, 12V Adjustable 13.6, 14.2 VDC
DLS-15-24	15A, 24V Adjustable 27.2, 28.4 VDC
DLS-25-24	25A, 24V Adjustable 27.2, 28.4 VDC
DLS-40-24	40A, 24V Adjustable 27.2, 28.4 VDC
DLS-15-48	15A, 48V, Adjustable
IQ4	3-Stage Charger Module for DLS chargers
IQ4-54V	3-Stage Charger Module for DLS-15-48



XANTREX TRUECHARGE-2

Xantrex TRUECHARGE-2 Battery Chargers lead the industry with a small footprint and ultra-compact design. These chargers can be mounted virtually anywhere, given their unique drip-proof design. Designed primarily for marine and commercial applications worldwide, these chargers are unmatched for reliability. They are versatile enough to be used in a wide variety of conditions and locations. Auto-ranging AC input voltage capability (90 - 265 volts AC) makes traveling abroad and handling poor-quality power a breeze. The easy-to-read display can be augmented with an optional remote panel.

COMMON FEATURES:

- Microprocessor controlled, multi-stage charging
- Settings for flooded, gel, AGM, or lead-calcium batteries
- Temperature compensated charging
- Charges up to 3 battery banks simultaneously
- Equalization settings

TC-2012	20A, 12V Battery Charger.
TC-4012	40A, 12V Battery Charger.
TC-6012	60A, 12V Battery Charger.
TC-2024	20A, 24V Battery Charger.
TC-3024	30A, 24V Battery Charger.
TC-5024	50A, 24V Battery Charger.
TC-BTS	Battery Temperature Sensor
TC-REMOTE	Remote display for TC chargers



Charge Controllers

Do you need a charge controller – the simple answer is yes! Charge controllers are devices used to protect batteries from damage due to overcharging. They limit the voltage and current delivered to a battery by solar, wind or microhydro generation.

CHOOSING A CHARGE CONTROLLER

Modern day controllers with sophisticated microprocessor-based circuitry have all but replaced the older on / off type controllers. When choosing a charge controller for your system keep in mind that you may want to expand your charging capability in the future. A larger controller may be a wise investment.

Rated Current

This is the current that the controller is able to regulate on a constant basis. Make sure to be on the safe side and estimate on the large side when choosing a controller.

Load Controller

This function allows an auxiliary load to be turned on and off according to battery voltage. Depending on how you wire this, it will allow an unattended site to completely shut down during low voltage conditions to protect the battery or can shut off only non-essential loads.

Load Diversion Controller

Allows excessive current to be diverted to an auxiliary load such as a resistive heating element. This style of controller is essential on hydro and some wind systems that require a constant load on the generator.

Lighting Controller

Some controllers offer the ability to control the operation of a light in addition to its function as a charge controller. Great for small, independent lighting systems.

Equalization

Some controllers have built in equalization features that can be operated automatically or manually.

Battery Temperature Sensor

The use of an external battery temperature sensor will enable the controller to adjust the voltage of the charge based on the temperature of the battery. This ensures your battery will get a proper charge year round.

Display

Many controllers offer either an integrated or external information display. It is good to know how well your system is performing.

DIVERSION LOADS

Some energy sources such as microhydro and wind must maintain a constant load on the turbine regardless of the battery state of charge. These systems make use of a diversion type controller and must find somewhere to “waste” the energy. Air heaters or water heaters are common ways to make use of a bit of extra power.

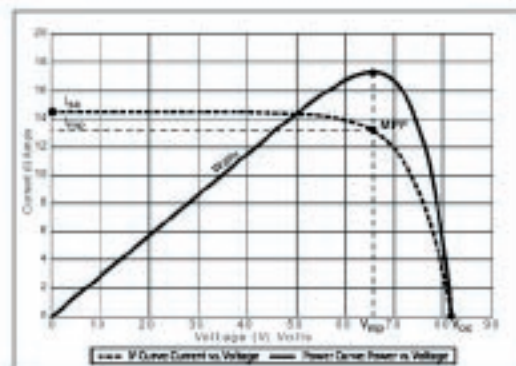
HL-100	Air Heater Load - 30/60A @ 12V; 30A @ 24V; 15A @ 48 V
HL-75	Air Heater Load - 20A @ 12V; 40A @ 24V ; 20A @ 48V
WHE12-24	Water Heater Element - 25/50A @ 12V; 25A @ 24V
WHE24-48	Water Heater Element - 45A @ 24V; 22A @ 48V



MPPT Charge Controllers

MAXIMUM POWER POINT TRACKING

Maximum Power Point Tracking (MPPT) allows the charge controller to harvest the maximum energy available from the PV array and deliver it to the batteries. The MPPT algorithm continuously adjusts the operating points in an attempt to find the maximum power point of the array. The algorithm can then determine if it is harvesting more or less power than the previous operating points. The charge controller applies a variable load on the array (shown by the power curve - solid line - in the figure to the right) until it finds the maximum wattage (the point at which both operating voltage and current can be maximized at the same time), as indicated by "MPP" in the figure. The charge controller then holds the array at this point for as long as the array continues to produce the maximum power possible. As the panel shading, cloud cover, or sunlight angle shift, the charge controllers find the new maximum power point for the solar array without interrupting its output power flow. The MPPT solar charge controller is the next generation of ultra high efficiency devices to help you harness the power of the sun.



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Common Features:

- Fully programmable 4-stage charging.
- Fully programmable auxillary relay (vent fan, diversion load, etc).
- Adjustable battery voltage from 12VDC to 60VDC.
- Temperature compensated charging.
- Daily power production history.
- Higher efficiency charging produces 15-30% more power. Overall efficiency will vary with application, but a higher efficiency will be achieved if the entire solar array consists of identical solar modules
- PV array can be higher voltage than batteries (48V array connected to 24V battery) reduces size/cost of transmission cable
- 5 year warranty

SS-MPPT-15 15A, Morningstar Sunsaver charge controller, 75Voc max input

OB-FM60 60A, Outback FlexMax charge controller, 140Voc max input

OB-FM80 80A, Outback FlexMax charge controller, 140Voc max input

XW-MPPT60 60A, Xantrex XW charge controller, 140Voc max input

T80 80A, Apollo Turbocharger charge controller, 140Voc max input

T100 100A, Apollo Turbocharger charge controller, 200Voc max input



Charge Controllers - Advanced

XANTREX C35 / C40 / C60

These are the most popular Pulse-Width Modulation (PWM) charge controllers we carry. Field proven through thousands of installations across the world. These controllers are economical and fully programmable providing good value for your money.



C35	35A, 12/24V Charge Controller or Load Controller or Diversion Controller
C40	40A, 12/24/48V Charge Controller or Load Controller or Diversion Controller
C60	60A, 12/24V Charge Controller or Load Controller or Diversion Controller
CM	Faceplate DVM for the C40
CM-R50	Remote DVM for the C40 with 50 foot connector cord for remote installation
CM-R100	Remote DVM for the C40 with 100 foot connector cord for remote installation
BTS-15	Remote battery temperature sensor with 15ft cable

MORNINGSTAR TRISTAR

Morningstar's newest controller, the TriStar is a three function controller that provides reliable solar battery charging, load control or diversion regulation. This controller operates in any one of these three modes at one time. Multiple controllers may be used in the same system to provide multiple functions. This unit will integrate into the rest of your system as it uses standardized knockout spacing. It will directly replace a Xantrex C-series controller.



All units will operate at 12/24/48V. Integrated serial port allows connection to a computer for programming, data logging and remote monitoring or control. Internal dip switches allow you to choose from preset configurations. LED indicators provide basic status information. Optional digital meter displays extensive system information. Fully protected against reverse polarity, short, over current, high temperature, and over voltage.

TS45	TriStar 45 A controller
TS60	TriStar 60 A controller
TS-DM	Faceplate digital meter for TriStar
TS-DMR	Remote digital meter for TriStar
TS-BTS	Battery Temperature Sensor for TriStar

MORNINGSTAR PROSTAR

This series of controllers are simple to use with battery presets in a very rugged case. The controller is available with or without a display. The version with the display shows your battery voltage, charging current, and has a self-diagnostic tool. These controllers also come stand with a low voltage disconnect for your loads. The Prostar series is ideal for remote power sites where it is essential the controller has high reliability.



PS15	Prostar 12V/24V, 15A solar/load controller
PS30	Prostar 12V/24V, 30A solar/load controller
PS15M	Prostar 12V/24V, 15A solar/load controller with display
PS30M	Prostar 12V/24V, 30A solar/load controller with display

Charge Controllers - Basic

SCI MARK 15 / 22

This is a cost effective, flush mount, battery charge controller with digital system monitoring. The MARK series provides efficient charging while protecting the batteries from damage due to overcharging. This controller is designed for use in mobile or stationary photovoltaic energy systems, with complete system monitoring of battery voltage, solar charging current, and charge set-point calibration. Charge mode status lights, battery condition LED bar-graph, a blocking diode, battery fuse and array fuse are standard.



- MARK-15** 12 Volt, 15 amp charge controller with digital meter
- MARK-22** 12 Volt, 22 amp charge controller with digital meter
- MARK-BOX** 4x7 surface mount box for Mark controllers above

MORNINGSTAR SG4

The most advanced small (4.5A) controller available. Featuring advanced circuitry as found in larger controllers. The circuit board is encapsulated in epoxy with integrated leads for ease of installation.



- SG4** Sunguard 12V, 4.5A PWM Controller

MORNINGSTAR SUNSAVER

These small controllers are field proven, reliable and economical. The circuits are encapsulated in epoxy for protection from the elements and are simple to use. LVD versions feature a non-adjustable low voltage disconnect. UL listed for installation in hazardous locations. LED status indicator.

- SS6** Sunsaver 12V, 6.5A Controller
- SS6L** Sunsaver 12V, 6.5A Controller with LVD
- SS10** Sunsaver 12V, 10A Controller
- SS10L-24** Sunsaver 24V, 10A Controller with LVD
- SS10L** Sunsaver 12V, 10A Controller with LVD
- SS20L** Sunsaver 12V, 20A Controller with LVD
- SS20L-24** Sunsaver 24V, 20A Controller with LVD



MORNINGSTAR SUNLIGHT

Similar in function to the SunSaver above, these units offer integrated lighting control in addition to solar charge control. Rotary adjustment allows you to select from 10 different lighting control options. Test button allows you to test the operation of your setting. Low voltage disconnect prevents over-discharge of batteries.

- SL10** SunLight 12V, 10A solar / lighting controller
- SL10-12** SunLight 24V, 10A solar / lighting controller
- SL20** SunLight 12V, 20A solar / lighting controller
- SL20-24** SunLight 24V, 20A solar / lighting controller



Having a reliable fuel gauge for your alternative energy system is essential. Knowing the status of the batteries and charging system allows you to spot trends and problems before damage occurs. Just as you wouldn't mount the fuel gauge in the trunk of your car, your system meter should be located somewhere easily visible by everyone.

VOLT METER

The most important meter in your system is a volt meter. This allows you to see, at a glance, the approximate state of charge of your batteries. It also verifies the presence of electrical power in a circuit. When trouble shooting a battery system, a voltmeter is very useful.

AMP METER

If you want to see how much power you are producing or using, you need an amp meter to measure current. Amp meters display the current flowing in a circuit. An amp meter allows you to monitor the performance of your charging equipment and to measure the power consumed by various loads. It is also useful in tracking down phantom loads. A phantom load is a electrical device that continues to use power even when it is "off". Typically found in anything with a clock or timer, remote control, or wall-cube power transformers.

AMP - HOUR METER

Amp-hour (Ah) meters work like a utility kWh meter. In a battery system, Ah are more commonly used as a measure of energy than kWh. An Ah meter measures the amperes flowing into or out of the battery and integrates this with time. They indicate the battery state of charge by displaying the net remaining energy stored in the battery. To do this, you need to program a value for the charging efficiency of your batteries into the meter. On a new set of batteries at room temperature this is typically about 90%, which means 90% of the energy you put into the batteries is actually used to restore their capacity and the remaining 10% of power is lost (usually to heat). That means the information logged in this type of meter is only as accurate as the number you programmed for the charging efficiency. The problem is the charging efficiency of your batteries will change with the temperature and with the lifetime of your batteries. You can also reduce the charging efficiency with improper maintenance. So, the longer you use this type of meter, the more inaccurate it becomes. For this reason, we generally recommend using a combination of a voltmeter and ammeter to monitor the performance of your batteries.

SHUNTS

Shunts are used to measure current. They are accurate, very low resistance resistors. They are connected in series in the circuit you wish to measure current. A millivolt meter connected across the terminals of a shunt will accurately reflect the current flowing through that shunt since the voltage drop across it is directly proportional to the current. Shunts are usually installed in the negative conductor and allow for a meter to be located up to hundreds of feet away from the batteries.



ANALOGUE AMP METERS

These high quality amp meters mount in a 72 mm square hole. The meter movement is very smooth and accurate. The 30A meter has an internal shunt. Mounting plate below mounts on a standard 2-gang electrical box.

ANA30A 0-30A Analogue meter

ANA60A 0-60A Analogue meter, includes external shunt



BASIC DIGITAL METERS

Measure amps and volts with these quality, low-cost LCD digital meters. The surface mount, plastic enclosure can be easily attached to any flat surface.

DVM11-65 VDC 11-65 VDC digital meter, basic LCD

DAM Digital Amp meter, basic, requires shunt



TRIMETRIC 2020

Our most popular system meter, the TriMetric 2020 is a sophisticated amp-hour meter that also displays system voltage and net amps with the push of a button. Seven other data monitoring functions provide information on battery efficiency, battery life, minimum battery voltage, maximum battery voltage, and more. Easily installed in a standard double-gang switch box this meter may be located hundreds of feet from your battery. The TriMetric requires a shunt.



TM2020 TriMetric 2020 Battery Monitor 12 or 24 Volt.

TM202048V 48V Adapter / Lightning Arrestor for TM2020

TM-BOX Surface mount enclosure for TM2020

18-4 18-4 Stranded unshielded for TM2020 meter

PENTAMETRIC 5000

The PentaMetric battery monitor system offers a lot more capability than the TriMetric monitor. It measures 1 or 2 battery systems with a common negative. With one battery system, battery current plus two charging sources/loads can be measured.

There are also many data logging functions such as: Amp-hours, Watt-hours, temperature, Volts, Amps, battery charging efficiency,

A programmable relay output that can be used to monitor battery voltage levels and you can set an alarm to sound when a specific voltage is reached.

Add the computer interface for a low-cost datalogging system.

PM-5000-U Pentametric Input Unit

PM-100-D LCD display

PM-100-C Computer Interface

SH-100 100A shunt

SH-500 500A shunt



Remote Monitoring and Control System

Energy Alternative's Remote Monitoring and Control System is a unique device providing you with remote information and control of your renewable energy system. The RMCS is based on a powerful, yet energy miserly (1.5 watt) custom-designed computer, running the Linux operating system. Its flexible design allows the units to be completely tailored to your needs.

No more guessing what your battery levels are. No more wondering if your system is operating properly. No more long drives to start a generator. Let RMCS do this all remotely via the Internet.

Remotely monitor your system. A choice of interfaces: Yahoo Widgets, or direct HTTP access allows you to keep track of system performance. Widgets are simple programs that float on your computer's desktop and are ideal for providing at-a-glance status.

Turn devices on and off via remote. RMCS has 4 built-in relays allowing you to turn on/off devices remotely. This can interface to virtually any appliance. Common uses: start/stop generator, turn lights on and off, turn on a furnaces, restart networks.

Watch what's going on. Using an optional USB camera, you can keep an eye on your property. Camera can be manually controlled, or can be triggered by event (ie a motion sensor is triggered, camera starts taking pictures and emails them to you immediately).

Let you know. RMCS can alert you via remote alarm, email or SMS messages when any number of programmable conditions warrant. Examples would be: low battery, temperature, generator running abnormally long, security breach, etc. All completely configurable with selectable delays, duration, and alarm sound.

Monitor DC voltage / current. RMCS allows monitoring of battery voltage or current, via 8 isolated voltage inputs from 0 to 125 VDC. To measure current, optional 100 or 500A shunts are used

Monitor AC voltage and current. The optional AC demand board will allow you to monitor voltage and current for 1, 2 and 3-wire systems. Typical uses would be to monitor overall building demand, or specific loads (ie kWh from a generator).

Monitor room temperature. An onboard temperature sensor reports the temperature of the room. Optional programmable remote temperature sensors available. Install a sensor in your deep freeze to alert if it's too warm. Use a sensor in the pump room to alert of freezing conditions.

Monitor your Outback power system. Remotely display data from the Mate.

Monitor and Control Xantrex power systems. Remote interface to GT and XW series Xantrex inverters. Utilizing the Xanbus network, the RMCS allows complete remote control of the inverter, including programming.

Automatically turn devices on and off. Scripting language allows automatic control of relays based on other triggers. Example: low battery triggers generator start, high temperature triggers ventilation fan.

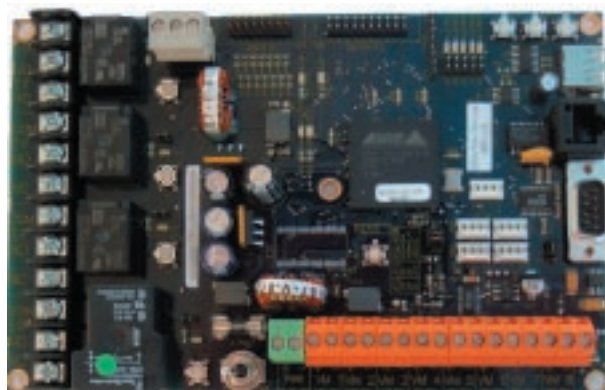
Secure your building. RMCS has 10 inputs used for door alarms and motion sensors. Use to sound an alarm, turn lights on, activate the camera, and send you an alert via email or SMS.

System Logging. RMCS can operate stand-alone to give you real-time live data and system control. Optional system logging can record all information on the RMCS to a remote database. This data can be analyzed in a virtually unlimited number of ways.

Network Monitor. Integrated network uptime monitor can be used to reboot routers if they fail to respond.

Datalogging. Using the optional EA RMCS portal, system performance will be logged to an off-site server allowing you to graph, compare, or just export raw values that you can manipulate in a spreadsheet.

* Please contact EA to discuss the specifics of your RMCS deployment.



Plug-in Meter Products

KILL A WATT

Simply plug this unit into an AC receptacle and then plug the appliance into the meter. It will assess how efficient - or inefficient your appliance is. A large LCD display with a count consumption by Kilowatt-hours, the same as your local utility. You can then figure out how much that appliance will cost to operate by day, week, month or year.

The Kill A Watt meter also allows you to check the quality of your power by monitoring voltage, line frequency and power factor.



KILL A WATT - EZ

This unit has all the same functions as the Kill-A-Watt plus it has an internal memory and can show your power consumption in dollars. The internal memory is useful for off-grid applications where the inverter goes into search mode each night and cuts the power to the meter.

KILL A WATT - PS

This unit has all the same features as the Kill-A-Watt EZ in the form of a power bar with several outlets. This will allow you to easily measure several appliances at once like an entertainment system or computer work station.



watts up?

WATTS UP?

Simply plug any 120 VAC appliance into Watts up?, and the meter instantaneously displays the wattage being used. Watts up? measures true power (including power factor) which is what utilities charge for, not just RMS voltage.

Press the mode button and the display shows the cumulative amount of kilowatt hours consumed since the meter was plugged in, or last reset. Press the mode button again and the display shows the cumulative time Watts up? has been plugged in, so controlled experiments are easily accomplished. Finally, press the mode button again and the display shows the amount of money the electricity has cost. Watts up? uses a default rate of 8 cents per kilowatt hour, or simply change the rate to match your local area. Any 120 VAC appliance can be plugged in. A 15 amp circuit breaker protects against overloads. Watts up? can be plugged in for seconds, days, weeks, or months for ongoing data collection.

WATTS UP? PRO

In addition to all the standard features of Watts up?, the Watts up? PRO includes memory storage and the ability to download data to a computer. The included serial cable and software program allows the data to be quickly downloaded to a PC for creating usage charts.



WATTS UP? .NET

In addition to all the standard features of Watts up PRO, the Watts up? .Net includes a built-in web server that allows you to log energy demand so you can view anywhere with an internet connection. It also allows you to switch the load plugged into the device remotely - ideal if you want to turn loads on or off remotely at low cost.



Wire

Wire is essential in alternative energy systems for moving the power from place-to-place. The bigger the wire, the less resistance. The higher the voltage, the lower the current and therefore the smaller the wire. There is a fine balance between voltage, current, distance, and economics to determine what is the best wire for your application. Reducing voltage drop is fairly critical with PV and less critical with microhydro. Keep in mind that if you plan to add more solar modules later it could make sense to buy bigger wire initially. We find undersized wire the most prevalent mistake in existing systems - many of which were installed by professionals. While it may look very neat and tidy, it may not be sized properly. It does not pay to go cheap on wire and might prevent the proper functioning of your system.

The Canadian Electrical Code states that wires must be sized so that no more than 3% voltage drop occurs in distribution circuits and less than a 5% drop over the entire system.

Please discuss your wiring needs with Energy Alternatives or your local dealer.

Common Wire types

NMD	Normal household wire. Typically 14/2 or 14/3.
NMW	Similar to NMD, but waterproof.
TECK	Heavy-duty, conductors wrapped in a metal armour and then plastic. UV protected.
VNTC	Commonly used for interconnection of solar modules. UV protected, two conductor.

IC20-10	10' 2/0 Inverter cable, pair
IC20-7	7' 2/0 Inverter cable, pair
IC20-5	5' 2/0 Inverter cable, pair
IC40-10	10' 4/0 Inverter cable, pair
IC40-7	7' 4/0 Inverter cable, pair
IC40-5	5' 4/0 Inverter cable, pair
BC20-20	20" 2/0 battery interconnection cable
BC20-8	8" 2/0 battery interconnection cable
BC40-20	20" 4/0 battery interconnection cable
BC40-10	10" 4/0 battery interconnection cable



TK10-2	10 AWG 2 conductor UV resistant, weatherproof armoured cable
TK08-3	8 AWG 3 conductor UV resistant, weatherproof armoured cable
TK06-3	6 AWG 3 conductor UV resistant, weatherproof armoured cable
TK04-3	4 AWG 3 conductor UV resistant, weatherproof armoured cable
TK02-3	2 AWG 3 conductor UV resistant, weatherproof armoured cable

VNTC12-2	12 AWG 2 conductor, Direct Burial, UV Protected Wire
VNTC10-2	10 AWG 2 conductor, Direct Burial, UV Protected Wire



The ability to have bright, reliable light at any time is often the largest benefit of an alternative energy system. Electric lights are far superior to other options such as candles, kerosene, or propane. In many renewable energy systems, lighting is one of the larger electrical loads. It pays to use the most efficient lighting technology. Replacing standard incandescent lights with compact fluorescents (CFLs) can reduce the energy consumed by as much as 75% with no reduction in light quality.

EFFICIENCY TIPS

Lights used more often have the opportunity to save the most energy. Put the most efficient lights in main rooms, desk lights, the kitchen, and the dining room. Task lighting is a more efficient way of using lights. By illuminating a specific area rather than the whole room a much smaller light may be used.

DC vs AC?

If your building is already wired for AC electricity, it is often the simplest to install an inverter and use efficient AC lighting. There is a wider selection of AC light fixtures available at a much lower cost due to mass production. Some very small systems or dedicated lighting systems may benefit from running directly off DC.

There is often a mis-conception that when a light operates on DC it is efficient. Unfortunately this is not the case. Some systems, notably RV's use automotive bulbs which are incredibly inefficient.

COMPACT FLUORESCENTS (CFL)

Photovoltaics convert approximately 15% of the sun's energy into electricity. Incandescent light bulbs convert only 5% of that electricity back into light (the rest becomes heat). Compact fluorescent tubes are four times more efficient. They produce less heat and more light.

A 15 Watt CFL equals a 60 Watt incandescent in light quality and brightness. The extra cost of these lamps is much less than the extra solar modules required to run ordinary incandescent bulbs. The objectionable blue glaring light and annoying flicker associated with fluorescent tubes is not a problem with modern CFL bulbs. We no longer carry lighting products because they are now commonly available.

LIGHT EMITTING DIODE (LED)

LED lighting is incredibly efficient and works well for some very specific applications such as exit lights and outdoor sign lighting. LED lighting is advancing quite rapidly and there are many products now available to provide lighting for almost any application. However these lights are still not useful for light an entire room unless you are using pot lights because they are a directional light. In general, we do not recommend using pot lighting for off-grid homes due to the high power consumption of having 10 lights or more turned on to light a room. You can do the same job with two CFL's. LED lighting works very well for task lighting over counters.

At this time, EA does not offer LED lighting. We suggest you investigate some of the Internet-based sellers of LED lighting products for the most diverse and up to date selection.

System Accessories - Solar Converters

Solar Converters Inc., based in Guelph, Ontario, has been making top-quality, no nonsense specialized controllers for the renewable energy industry for many years. We have always been impressed by their so-called “black boxes” that perform small miracles that were previously unavailable. The following is a small listing of the products that we have readily available. Custom units are always available.

DC CONVERTER

Many systems have some loads with a voltage different than the system voltage. Many people make the fatal mistake of “tapping” half their battery bank to get 12V from a 24V bank. Unknown to them, they are rapidly destroying their battery bank by creating an unbalanced situation. We carry a wide selection of converters that will convert your system voltage to the needed voltage for your load. Many different configurations are available.



CV12-24-6	12V battery - 24.0V, 6A step-up converter
FB12-5	12V battery - 12.0V, 5A constant voltage converter
PPT-24-20-R12	24V battery - 12.0V, 20A step-down converter

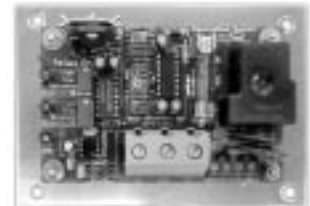
BATTERY DESULPHATOR

When batteries age and/or spend too much time in a discharged or abused state, sulphite crystals can form on the battery plates which impede the flow of electricity. This is the main cause of poor battery performance. It uses a sharp pulse of current forced into the battery suddenly to “jar” the sulphite crystals and cause internal resonance, both mechanical and electrical, to grind down the sulphite crystals that form so they can be re-combined into the battery acid.



VOLTAGE CONTROLLED SWITCH

This is a unique controller for devices that need to be turned on and off at a specific voltage. The most common application is a battery vent controller. Other applications include a basic load controller, low voltage disconnect, grid intertie controller, generator start controller, simple charge controller, etc.



SCI-VCS-1A	Voltage controlled switch - open frame
SCI-VCS-2A	Voltage controlled switch - enclosed case

LINEAR CURRENT BOOSTER

Also known as an LCB, these devices are used with PV direct applications such as water pumping. This unit will allow a pump to start earlier in the day, run longer and pump more water. Typical increases in daily water volume of up to 40% is common. Almost every water PV-direct water pumping system requires one of these.



PPT12-2	12V 2A Linear Current Booster
PPT12-24-3	12/24V 3A Linear Current Booster
PPT12-24-7	12/24V 7A Linear Current Booster
PPT12-24-10	12/24V 10A Linear Current Booster
PPT12-24-15	12/24V 15A Linear Current Booster
PPT12-24-30	12/24V 30A Linear Current Booster

System Accessories - Circuit Protection

Proper overload protection is mandatory in all electrical systems. The fact that it's an alternative energy system does not change the fact that electricity can be dangerous if not properly protected. Even a small solar panel is quite capable of delivering short-circuit current capable of melting wires, or placing your person or property at risk.

DC FUSING

MX30	30A Maxi-Fuse
MX40	40A Maxi-Fuse
MX50	50A Maxi-Fuse
MX60	60A Maxi-Fuse
MX70	70A Maxi-Fuse
MX-HOLD	Maxi-Fuse Holder, wall mount
MX-INLINE	Maxi-Fuse Holder, in-line with protective cover



FB6	6 Position Fuse Block, standard automotive fuses, clear cover
FB12	12 Position Fuse Block, standard automotive fuses, clear cover

AC LOAD CENTRES

We carry an extensive line of Square-D over current protection products according to your system requirements. Order the load centre and breakers that you require from below.

QO403L100S	3 position load centre
QO404L100S	4 position load centre
QO408L100S	8 position load centre
CQO116M100C100	16 position load centre with 100 A main
CQO124M125C100	24 position load centre with 100 A main



QO115	1 pole 15A breaker
QO215	2 pole 15A breaker
QO120	1 pole 20A breaker
QO220	2 pole 20A breaker
QO130	1 pole 30A breaker
QO230	2 pole 30A breaker
QO140	1 pole 40A breaker
QO240	2 pole 40A breaker
QO160	1 pole 60A breaker
QO260	2 pole 60A breaker



System Accessories - Transfer Switches

Transfer switches are used to switch between different sources of AC electricity. Many inverters have transfer switches integrated. Some inverters allow for two AC inputs (generator or grid power), others will require an external transfer switch.

MANUAL INVERTER BYPASS

Used on power panels to provide input protection and a means to manually bypass the inverter and run your loads directly from an external AC power source such as a generator. This product is useful when your inverter fails because without it, the inverter blocks power from the generator to the breaker box and leaves you in the dark.

INV-BYPASS-30	30A inverter bypass breaker enclosure, indoor
INV-BYPASS-60	60A inverter bypass breaker enclosure, indoor



AUTOMATIC TRANSFER SWITCHES

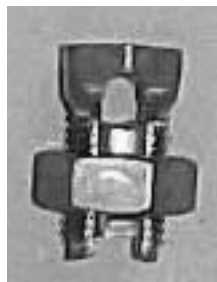
Iota Engineering Transfer Switches provide automatic power switching between two or three separate 120/240 volt AC input sources, including grid power, generators, inverters, or all three. The ITS will sense the presence of available supplies and automatically select the proper one. A selectable delay will allow a generator to warm up before the load is transferred.

ITS-30R	Iota Auto Transfer Switch, 30A, 120 VAC
ITS-50R	Iota Auto Transfer Switch, 50A 120/240 VAC
ITS-100R	Iota Auto Transfer Switch, 100A 120/240 VAC



Miscellaneous Connectors

ILC-SK-6	Split Bolt Connector - use to splice wires up to #6 AWG (picture below, left)
ILC-SK-4	Split Bolt Connector - use to splice wires up to #4 AWG
ILC-SK-2	Split Bolt Connector - use to splice wires up to #2 AWG
ILC-SK-002	Split Bolt Connector - use to splice wires up to 2/0 AWG
PDC1120-1	Splice wires up to 2/0 AWG
PDB1420-1	Join four #6-#14 AWG wires to one #8-2/0 wire
PDB1620-1	Join six #6-#14 AWG wires to one #8-2/0 wire
PDB1620-2	Join six #6-#14 AWG wires to one #8-2/0 wire - 2 poles (picture below, right)



Water pumps

Water is the foundation of all life, and access to water is critical for a wide range of daily tasks in our homes and businesses. Alternative energy is used to bring water to hundreds of thousands of people across the world. Many developing nations are currently furiously installing water pumping systems to solve water crises. Many remote homes or businesses do not have city water available and must use some other form of water pumping.

There are two common forms of water pumping:

PV Direct - this is a system that has no batteries. It uses the sun or the wind to directly power the water pump. When it is sunny or windy, the pump is working. The volume of water pumped will depend on the intensity of the energy source. Instead of storing energy in batteries, the stored energy is in the form of water, typically a several day supply.

Battery Powered - typically tied into an existing alternative energy system, this pump can be either DC powered or AC powered through an inverter. These pumps will kick in whenever required and fill a pressure tank.

DC pumps are much more efficient than AC pumps. As they are run from the batteries directly, it does not present an additional inverter load, often allowing you to run a smaller inverter. Common AC jet pumps are incredibly inefficient.

Circulation Pumps

CIRCULATION PUMPS

These tiny brushless, magnetic drive circulators can be driven by PV modules or 12 Volt batteries for closed-loop circulation in solar water heating systems, individual space heat zones and individual loop radiant floor loops. Use of several small pumps in a radiant floor system allows each loop to be controlled by a different thermostat. Model SID10 is designed to be powered by a 10 Watt PV module and can pump 3 gallons per minute at no head and ½ GPM at 2.5 feet of head at 17 Volt input. Model SID10B is designed to be battery powered and has the same specifications.



EL-SID10	3 GPM, 17V (PV direct) hot water circulation pump
EL-SID20	5 GPM, 17V (PV direct) hot water circulation pump
EL-SID10B-12	3 GPM, 12V (battery powered) hot water circulation pump
EL-SID10B-24	3 GPM, 24V (battery powered) hot water circulation pump
EL-SID20B-12	5 GPM, 12V (battery powered) hot water circulation pump
MAR-809-BR-12	5.5 GPM, 12V (battery powered) hot water circulation pump
MAR-809-BR-24	5.5 GPM, 24V (battery powered) hot water circulation pump
MAR-809-BR-HS12	7.5 GPM, 12V (battery powered) hot water circulation pump
MAR-809-BR-HS24	7.5 GPM, 24V (battery powered) hot water circulation pump

Submersible Pump Design

For many remote homes one of the first projects is to secure a water supply. One common method is to drill a well and install a submersible well pump. We find far too many customers with the wrong type of pumps installed. A typical 220 VAC deep well pump is incredibly inefficient, and the pricing is not far off a much more efficient pump. Installing a 220V pump will mean additional expenses either for a second 120VAC stacked inverter, step-up transformer, or installing an inverter with 240V output. Otherwise you will be restricted to operating the pump from generator only.

STAND ALONE SOLAR

In this situation, the water pump is powered directly from the solar panels and fills a reservoir. The water will either be gravity fed (simplest) or will require an additional pressure pump to provide final pressurization. The amount of water pumped on a daily basis is directly related to the amount of sunshine reaching the solar panels. Storage capacity for days with less sun is achieved through having a sufficiently sized water reservoir. Typically 3-5 days of normal use.

Stand alone systems all have the option to connect an external power supply (such as a generator) to provide water on days when there's no sun or wind.

STAND ALONE WIND

Similar to the above, this system has a wind generator that supplies the electrical energy to the water pump. The faster the wind is blowing, the more water is pumped.

STAND ALONE HYBRID

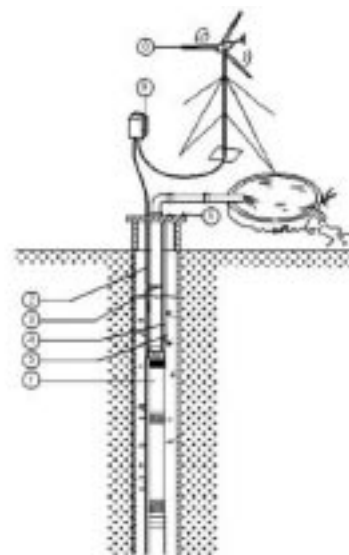
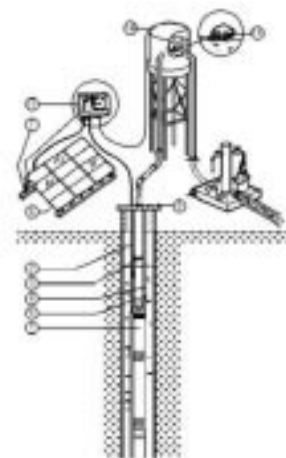
Hybrid simply means more than one energy source. A hybrid system could include solar, wind, generator or power grid. Hybrid systems typically compliment each other. For instance, there is generally more sun in the summer and wind in the winter in most areas of Western Canada. A solar and wind system will work well together to provide year-round water.

CONNECTED TO EXISTING POWER SYSTEM

If the entire property is completely off grid, the well is reasonably close to the home (under 1000') and you are intending to install an alternative energy system to provide power to the home, often the best solution will be to operate this pump off the home's electrical system.

RESERVOIR VS DIRECT PRESSURE

The SQFlex systems can either fill a reservoir or provide direct pressurization. Reservoir filling is a good solution for customers who have low refresh rate wells. Direct pressurization only works for systems that have battery storage - so the pump is able to kick in whenever required. If you have a power system installed and you have a refresh rate of 4gpm or better, we recommend installing a direct pressure system with a 50 gallon pressure tank (or larger).



Submersible Water Pumps

In the middle of nowhere, sometimes the only things you can depend on are the wind and sun. The SQFlex pump is fully operational from one or a combination of these energy sources. Easily installed, SQFlex systems are tailored to meet your specific needs - local weather conditions, water-table depth and average usage are all examined to optimize energy requirements.

THE GRUNDFOS SQFLEX PUMP

The base component of any system is the pump itself. This pump is truly revolutionary. It will operate on an extremely wide voltage range: 30-300 VDC and 90-240 VAC. It will pump water to a maximum of 600 feet of vertical head or 75 GPM maximum. There are many different versions to choose from depending on your site considerations.

3 SQF-3	3 GPM SQFlex pump, helical coil, 600' head
3 SQF-2	3 GPM SQFlex pump, helical coil, 360' head
6 SQF-2	6 GPM SQFlex pump, helical coil, 360' head
11 SQF-2	11 GPM SQFlex pump, helical coil, 300' head
25 SQF-3	25 GPM SQFlex pump, centrifugal, 45' head
25 SQF-6	25 GPM SQFlex pump, centrifugal, 90' head
40 SQF-3	40 GPM SQFlex pump, centrifugal, 30' head
75 SQF-3	75 GPM SQFlex pump, centrifugal, 45' head



CONTROLLERS

Depending on the specifics of your system, choose from one or more of the following controllers. Grundfos controllers can be daisy-chained to achieve additional functionality.

IO 100	Basic control unit, manual on and off
IO 101	Basic control unit, for generator input
CU200	Control unit, for wind and solar applications
CU200-SW	Float switch for CU-200 controller



SHURFLO SUBMERSIBLE

This pump will deliver up to 1000 gallons (3785 litres) per day from shallow wells and will pump as high as 230 feet (70 meters). This pump is housed entirely in plastic. It can be run PV direct or from a 24V battery bank. Field replaceable parts. Optional pump controller for use on PV direct applications.

SF9300	Shurflo Submersible Pump 230' max
SFPVCTRL	Shurflo 9300 Controller for 24V PV applications
SFPVCTRL200	Shurflo 9300 Controller for 12V PV applications *

* 12V operation is less efficient and more expensive.



Pressure pumps

SHURFLO PRESSURE PUMPS

This compact and economical pump can be used for general purpose water delivery or will dispense on demand using the built-in 80-100 PSI pressure demand switch. All 8000 Series positive displacement pumps are self priming.



SF8000-443-136 up to 1.75 gpm, or 1.2 gpm @ 60 PSI max - 12 VDC

Shurflo 2088 Series diaphragm pumps deliver reliable performance in high flow, moderate pressure applications. They are used in a variety of transfer and dispense-on demand applications where flow to 3.6 GPM is required.

SF2088-514-145 up to 3.6 gpm, or 1.9 gpm @ 50 PSI max - 12 VDC

SF2088-474-144 up to 3.0 gpm, or 0.75 gpm @ 50 PSI max - 24 VDC

SF2088-594-154 up to 3.3 gpm, or 1.6 gpm @ 50 PSI max - 115 VAC

SHURFLO EXTREME SERIES PUMP

The Smart Sensor 5.7 is a micro-controller based variable speed pump silently delivering over 5.5 gallons per minute and pressure up to 65 PSI. Shurflo's Smart Sensor precisely monitors your system's water pressure and adjusts the motor's speed, thus eliminating the need for a pressure switch or accumulator tank.



SF5901-0201 up to 5.7 gpm, or 1.3 gpm @ 50 PSI - 12 VDC

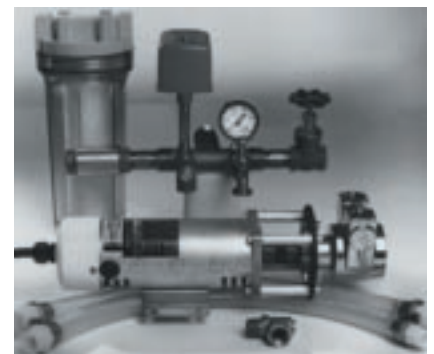
SF5901-1211 up to 5.7 gpm, or 1.3 gpm @ 50 PSI - 24 VDC

FLOWLIGHT BOOSTER PUMPS

This DC pump uses one third to one half the energy of a conventional AC pump, and eliminates the high starting surges that push inverters to the limit. This pump also consumes about half the power of the Shurflo DC pressure pumps.

It is more powerful, quieter, and much more durable than plastic RV/Marine pumps. Wearing parts are replaceable, and typically last 5 to 10 years. Overall life expectancy is 15 to 20 years. This pump does not tolerate silt or abrasives - mandatory filter on inlet required.

The Instruction manual and the Easy Installation Kit make this pump simple for anyone to install and service.



DK-2910-12 up to 3.4 gpm, or 2.7 gpm @ 65 PSI max - 12 VDC

DK-2910-24 up to 3.4 gpm, or 2.7 gpm @ 65 PSI max - 24 VDC

DK-2920-12 up to 4.5 gpm, or 4.1 gpm @ 65 PSI max - 12 VDC

DK-2920-24 up to 4.5 gpm, or 4.1 gpm @ 65 PSI max - 24 VDC

DK-2920-48 up to 4.5 gpm, or 4.1 gpm @ 65 PSI max - 48 VDC

DK-2920-115VAC up to 4.5 gpm, or 4.1 gpm @ 65 PSI max - 115 VAC

DK-DRYRUN-SW Dry Run Switch is required for warranty

DK-INSTKIT-FLOW Easy Installation Kit (pressure switch, pressure gauge, check valve, etc.)

DC CEILING FANS

Ceiling fans present a large load on smaller systems. This DC fan uses a fraction of the power required by a typical AC fan. This 42" four-blade ceiling fan is available with oak or white painted wood blades and a bright brass housing. The 3-speed reversible motor is controlled by infrared remote control and draws 1.2 amps at high speed, .75 amp at medium speed and .5 amp at low speed (12V). CSA/UL approved.

CFAN-WHITE-12	12V 4 blade ceiling fan 42", white blades
CFAN-OAK-12	12V 4 blade ceiling fan 42", oak blades
CFAN-WHITE-24	24V 4 blade ceiling fan 42", white blades
CFAN-OAK-24	24V 4 blade ceiling fan 42", oak blades
CFAN-HANGER	Hanging kit for vaulted ceilings



SOLAR FANS

Fans are ideal solar powered loads. Solar powered fans run when they are most needed, when the sun is shining. High temperatures in the attic cause an increase in temperature in the living space and an increase in energy consumption by air conditioning equipment. Forced ventilation will circulate cooler air through the attic space and lower the temperature. They are great for greenhouses, kennels, barns and attics where AC power is not available. The solar module runs the fan at full power in full sun and at a slower speed in overcast weather. Operation is automatic. When the sun shines on the solar module, the fan begins to operate.

SOLAR ATTIC FANS

The Solar Attic Fan is a simple and environmentally sensible solution that can save you money. Powered completely by solar energy, this sleek and efficient vent is both compact and quiet. Fully operational right from the box, it installs easily, with no electrical wiring. Operating at 850 cfm, a single unit can fully vent up to 1200 square feet. Place it wherever you need improved circulation; attics, lofts, workshops, storage sheds, garages, even barns. These attic fans are available with a flush mount solar module or with a tiltable mount solar module.

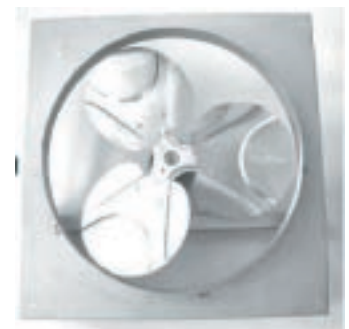


ATTICFAN-ADJ	Solar attic fan, 850 cfm, adjustable PV mount
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DC POWERED VENTURI FANS

These fans have a 3-wing blade mounted in a square steel ring frame style venturi for easy mounting. They can be operated from battery or PV direct. The 12" fan fits between 16" center studs and delivers approximately 500 CFM at 12 volts and 1200 CFM at 24 volts. The 16" fan fits between 24" center studs and delivers 750 CFM at 12 volts and 1800 CFM at 24 volts.

VENT-FAN12	DC Venturi fan, 12", 12-24 VDC
VENT-FAN16	DC Venturi fan, 16", 12-24 VDC



Backup Generators

Most off-grid power systems will require a backup generator for charging the battery bank when the renewable energy charging source is not keeping up to your loads (ie. no wind due to calm weather, no sun due to stormy weather, not enough solar power in the winter time, no microhydro because the stream dried up, etc).

There are many choices for generators: Which type of fuel (gas, propane or diesel)? Portable or stationary? What capacity is required? There are pros and cons for various types of generators. Small power systems will require at least a 3kW generator and larger systems should have at least a 5kW generator.

GASOLINE GENERATORS

The most common type of gasoline generator is the portable generator. This is also the most common generator used for small to medium sized power systems.

Pros:

- Easy to connect to a power system
- Models with a remote start option can be modified for automatic starting
- Relatively quiet operation.
- Many models to choose from.
- Purchase/Install cost is low to moderate.
- Yearly fuel cost is moderate.
- Lifetime is moderate.
- Easy to transport for service

Cons:

- Difficult to mount in a permanent location, exhaust and ventilation generally requires the unit to be operated outside.
- Not weather-proof.
- Not commonly available in capacities over 6kW.
- Small fuel tank and adding larger fuel tanks can be difficult.
- Portable generators have a high rate of theft.
- Manual choke units not suitable for remote start.

PROPANE & NATURAL GAS GENERATORS

The most common type of propane generators are the residential standby (backup grid power) and the commercial mobile (RV's, mobile emergency vehicles, etc). This is the most commonly requested generator because most off-grid homes already have a propane tank onsite. However, there are many considerations associated with installing one of these generators for an off-grid power application

Pros:

- Can be modified for automatic starting
- Moderate noise level
- Purchase cost is low.
- Residential standby models are fully weather-proof.

Cons:

- Residential standby models are difficult to add an exhaust or air intake pipe, which means they need to be installed outside.
- Highest fuel cost.
- Mobile models are not weather-proof.
- High install cost due to many required modifications because they are not designed for off-grid use.
- Shortest lifetime.
- Difficulty finding LPG mechanics.

DIESEL GENERATORS

These are the most common generators for medium to large sized power systems. They are completely customizable for any application. These generators are the highest quality.

Pros:

- Most reliable fuel
- Standard auto starting function.
- Optional mufflers available to reduce noise
- Fully weather-proof as an option.
- Fuel tank can be any size.
- Lowest yearly fuel cost due to highest efficiency
- Longest lifetime.
- Diesel mechanics are easy to find.
- Can run on bio-diesel or other fuels.

Cons:

- Purchase cost is highest.
- Higher install cost.
- Objections to diesel smell.
- Generally louder than LPG generators.



Generators - Portable Gasoline

PORTABLE GENERATORS

The Honda "EU" Series generator is hands down the best small generator on the marketplace. These little workhorses will outperform much larger generators in terms of battery charging performance in a renewable energy system. They all feature a variable throttle to match engine speed to electrical load. The series is powered by reliable Honda four-stroke engines utilizing patented exhaust and muffler technology that makes these generators one of, if not the quietest, gas powered generator on the market today! These generators come with a 2 year warranty.



EU1000 & EU2000

Delivers 1000 Watts and 2000 Watts peak output. Other standard features include an automatic internal circuit protection system, 12 VDC car battery charging at 6.5 amps, battery charge cable, one lever on/off ignition and fuel control, and closable fuel tank vent. The convenient carburetor float bowl drain preserves fuel and makes transport clean and easy, the fuel tank allows about 4 hours of continuous operation at rated load, the operation is very quiet - 57 dba at rated load. These generators are too small to use as a backup for most off-grid power systems, but they can be used as a backup for a solar powered Grundfos SQFlex pump and other applications where a highly portable generator is required.



EU3000

This is the most common generator we sell for small power systems. Standard features include a low maintenance battery, hi-tech inverter circuitry providing ultra clean electrical power for sensitive electronic equipment, up to 8 hours continuous running time at full load, and convenient circuit breaker construction.



EU6500

This is the most common gasoline generator we sell for full-time power systems. This generator has a 5.5kW continuous capacity and most power systems will require 4kW for charging plus an extra 1.5kW for running loads while charging. This generator has all the same features as the EU3000, plus it has standard 120V/240V split phase output and up to 5hrs run time at full load. This is one of the few portable gasoline generator that can be setup to automatically turn on to charge your batteries when they are low. For automatic generator starting (AGS), you will need to purchase the remote start kit and have it modified by our technicians to function with your inverter AGS unit.



EU1000	Honda EU1000 Generator 1 kW, Gasoline
EU2000	Honda EU2000 Generator, 2 kW, Gasoline
EU3000	Honda EU3000 Generator, 3 kW, Gasoline, electric start
EU6500	Honda EU6500 Generator, 5.5 kW, Gasoline, electric start
GEN-HON-TACH	Digital tach/hourmeter for Honda Generators
REM-START	Wireless remote start kit for EU3000
EU6500-REM-AGS	Remote start kit for EU6500 with 10m cable
10/3-50-CABLE	50' 10/3 cable with 30A twist lock plug for EU3000



Generators - LPG/CNG



ONAN RESIDENTIAL STANDBY SERIES

These are stationary generators that operate on Propane (LPG) or Natural Gas (CNG) fuels. These generators offer quiet operation - less than 70 dB(A) at 7 m (you can easily talk to someone else standing beside the unit). These generators are designed to be used as a backup for on-grid applications. They can be modified for off-grid applications, but this is can be a complex process and requires a qualified technician.

Many remote homes already have a large propane tank that is occasionally filled by a truck. These generators can tie into that system, simplifying fuel delivery.

The warranty for these generators in an off-grid application is one year or 200 hours. This is a much shorter warranty than normal for generators because they are not designed for off-grid use.



RS12000	11kW LPG/CNG generator
RS15000	15kW LPG/CNG generator
RS20000	20kW LPG/CNG generator
RS45000	45kW LPG/CNG generator

OPTIMA-YT Starting battery for Onan generators

ONAN COMMERCIAL MOBILE SERIES

These generators are designed to be used in RV's and service trucks. These generators will need to be modified for off-grid power systems and will need to be installed on a metal frame to give you access to the bottom of the unit for maintenance.

The warranty for these generators in an off-grid application is two years or 2000 hours.

CMQG-3600-LP	Onan 3.6 kW LPG/CNG generator
CMQG-5500-LP	Onan 5.5 kW, LPG/CNG generator
CMQG-6500-LP	Onan 6.5 kW, LPG/CNG generator
CMQG-EXHAUST	22" talipipe kit for above generators
CMQG-MOUNT	Custom mounting system for above generators.



Generators - Stationary Diesel

DIESEL JUICE SERIES

These are the highest quality, most efficient, and longest lifetime generators we sell. If you are looking for a quality generator, look no further. EA has dozens of these units installed. Some run only a few hrs a year, others run 24 hours per day providing prime power at remote sites.

The Yanmar generators come standard as an open frame generator without an enclosure and are designed to be installed inside a shed with proper ventilation. The exhaust is piped to the outside. For enclosed sheds, louvered vents are installed to vent excess heat. Alternatively, you can get this generator with a weather-proof enclosure and install it on a concrete pad. Diesel generators are louder, so if noise is a concern, you can purchase a hospital-grade muffler to significantly reduce the sound.



Common Features:

- Low oil pressure / high temperature safety shutdown.
- Continuous duty rated.
- Steel-base frame, rubber mounts.
- Fuel Transfer pump.
- Fuel filter - air/water separator & fuel filter element.
- Standard exhaust silencer.
- Engine panel with hour-meter, indicator lights, and key switch.
- Intake air heater cold starting aid - glow plugs.
- Self-regulating AC generator (Stamford).
- 12-pole alternator allows for single, split and three phase output, field reconfigurable.
- EPA certified.
- Warranty - 2 years or 2,000 hours (whichever comes first).
- Each unit is factory broken in and tested, ready for immediate use.
- Easily interfaces to any auto-start module.



Sizes:

Available in the following capacities:

- Yanmar powered: 6, 7.5, 10, 13, 18, 23, 34, 42 kW. 13 kW is the most popular size.
- John Deere powered: 50, 70, 100, 150, 200, 250, 275 kW

OPTIMA-YT	Starting battery for Yanmar generators.
YM-SILENCER	Hospital-grade Silencer for Yanmar generators.
TK-570	570L fuel tank.
TK-2250	2250L fuel tank.
LOUVER-AUTO	Automatic louvered vent for proper shed ventilation.
XW-AGS	Automatic generator start module for Xantrex inverters.
GSCM	Generic Generator Start Control Module to work with any system.

Refrigeration - SunFrost

Often the largest electrical load on your energy system, improving refrigeration conditions in your home could mean major energy savings. Energy is most needed for refrigeration when the sun is shining.

The most significant gains can be made when using an energy efficient refrigerator. The number of additional solar panels it takes to power a conventional fridge makes the extra cost of the energy efficient fridge or freezer feasible.

SUNFROST

SunFrost refrigerators are extremely energy efficient. SunFrost refrigerators keep food fresh longer by maintaining a high humidity, which helps prevent freezer burn and wilting caused by water loss in foods. In a conventional unit, water from food is transformed into ice on the cooling coils. The mainstream approach to this has been to create an energy wasting defrost cycle and the use of heating elements inside the cooling section.

The SunFrost refrigerator employs an array of design innovations to achieve its exceptionally low energy consumption. The cooling system is on top of the refrigerator which allows the condenser to run cooler. The insulation is 2.5 to 4.5 inches (6.4 to 11.4 cm) of polyurethane foam with no metal supports to act as thermal bridges. The smaller compressor not only uses less energy but is significantly quieter than conventional fridges.

These units are available by special order. Each unit is custom-built for you according to your specifications. Options available include custom colored doors, base cabinet, wooden veneer or unfinished so that you can customize it to your kitchen decor. Available in 12 or 24 VDC or 120 VAC. Time of delivery will vary according to the workload at the factory.

RF19-AC	Sunfrost RF19 Fridge/Freezer - AC
RF19-DC	Sunfrost RF19 Fridge/Freezer - DC
R19-AC	Sunfrost R19 Refrigerator only - AC
R19-DC	Sunfrost R19 Refrigerator only - DC
F19-AC	Sunfrost F19 Freezer only - AC
F19-DC	Sunfrost F19 Freezer only - DC
RF16-AC	Sunfrost RF16 Fridge/Freezer - AC
RF16-DC	Sunfrost RF16 Fridge/Freezer - DC
RF12-AC	Sunfrost RF12 Fridge/Freezer - AC
RF12-DC	Sunfrost RF12 Fridge/Freezer - DC
R10-AC	Sunfrost R10 Refrigerator only - AC
R10-DC	Sunfrost R10 Refrigerator only - DC
F10-AC	Sunfrost F10 Freezer only - AC
F10-DC	Sunfrost F10 Freezer only - DC
R4-AC	Sunfrost R4 Refrigerator only - AC
R4-DC	Sunfrost R4 Refrigerator only - DC
SF-CAB13	Base Cabinet 13" option.





Refrigeration - SunDanzer

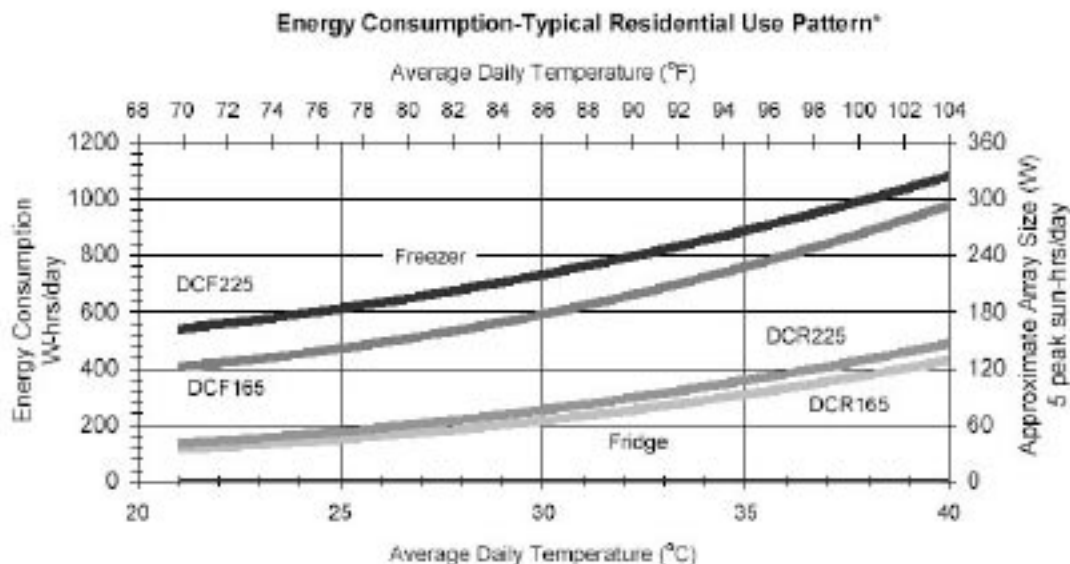
Save on costs with SunDanzer DC refrigerators and freezers. These high efficiency refrigerators and freezers have exceptionally low energy consumption requiring smaller, less expensive power systems.

High quality construction provides excellent reliability and long life. Super-insulated cabinets feature 11cm of polyurethane insulation with powder-coated galvanized steel exterior and aluminum interior. A zero maintenance, brushless, thermostatically controlled DC compressor operates on 12 or 24 Volts. A patented low-frost system reduces frost and moisture build-up for low maintenance. These chest-style refrigerators and freezers are easy to clean using the drain hole at the bottom of the unit.

With thick insulation and a refrigeration system optimized for solar, SunDanzer refrigerators and freezers provide outstanding economical and reliable operation. Low energy consumption is the key that allows SunDanzer refrigerators and freezers to be cost effectively powered from solar, wind, fuel cells or batteries. This technology allows refrigeration in remote locations where it was previously unavailable or prohibitively expensive.



- DCR165** SunDanzer 12/24 VDC refrigerator, 5.8 cu ft capacity (165 L)
- DCR225** SunDanzer 12/24 VDC refrigerator, 8.0 cu ft capacity (225 L)
- DCF165** SunDanzer 12/24 VDC freezer, 5.8 cu ft capacity (165 L)
- DCF225** SunDanzer 12/24 VDC freezer, 8.0 cu ft capacity (225 L)



Compost Toilets



Compost toilet units convert human waste into compost that is usable in gardens, lawns, etc. A correctly installed and operated unit will have no odour. There are both electric and non-electric versions available. Due to the high energy consumption of the heater element, the electric versions are not suitable for most off grid installations. If you have a microhydro system, this is an ideal dump load.

A 24 page full color brochure is available for the entire Sun-Mar line. Please call for your free copy.

EXCEL

Long considered the standard in compost toilet performance, this is the most popular self-contained model for residential use. Completely re-designed in 1998. This unit is specifically designed to operate without the use of electricity. Odorless operation is achieved by a 4" vent mounted at the top rear of the unit which acts like a chimney. For best operation, this vent should be as near vertical as possible. An optional 12 V fan is a good idea if you expect heavy use or are in a location that is subject to downdrafts. There is a 1" drain at the rear of the unit which should be connected to a pipe that drains into an approved septic field. Rated for 2 to 3 users continuous, 5 to 7 users part time.



SM-EXCEL AC/DC Sun-Mar Excel Compost Toilet with heater element

SM-EXCEL-NE Sun-Mar Excel Compost Toilet - Non electric model

CENTREX

Designed to be mounted below the floor, these units allow for more discreet installation. Up to 3 low-flush fixtures can be installed in various locations in your dwelling and all feed into the central composting unit. Designed for 4 to 7 users full time, 8 to 10 users part time. Non-electric units have an empty heater base that can be connected to an alternative source of heat such as hot water or dump load.

CENTREX-1000	Centrex 1000 electric, front vented
CENTREX-1000 NE	Centrex 1000 non-electric, front vented
CENTREX-2000	Centrex 2000 electric, front vented
CENTREX-2000 NE	Centrex 2000 non-electric, front vented
CENTREX-2000 A/F	Centrex 2000 electric, for use with dry toilet.
CENTREX-2000 A/F NE	Centrex 2000 non-electric, for use with dry toilet
CENTREX-3000	Centrex 3000 electric, front vented
CENTREX-3000 NE	Centrex 3000 non-electric, front vented
CENTREX-3000 A/F	Centrex 3000 electric, for use with dry toilet
CENTREX-3000 A/F NE	Centrex 3000 non-electric, for use with dry toilet
TOI-2010	Sun-Mar China Small bowl foot flush toilet
TOI-510+	Sun-Mar China Large bowl, foot flush toilet
TOI-DRY	Sun-Mar Dry Toilet with seat and hardware



Shipping and Ordering

ORDERING:

- You may order by telephone, fax, email, online or letter post.
- Please always provide a telephone or radiophone number where you can be reached.
- We will contact you to confirm receipt of your order, to provide a projected delivery date, and discuss options.
- Please let us know your required delivery (or pick up) date. We carry an extensive inventory, and try to stock the most popular items at all times. Since this is not always possible, we appreciate reasonable lead times for delivery.
- Freight charges are extra.

PAYMENT:

- We prefer payment by Interac, cheque or money order.
- For payments being made by Visa or MasterCard, a surcharge may be added to the invoice total to reimburse us for the fees charged by the credit card companies.

SHIPPING:

- Please advise us if you have any shipping preferences.
- We recommend shipment by Canada Post for shipments weighing less than 30 kg (66 pounds). The service is reliable and economical. Xpresspost service will be faster.
- A courier service of your choice is also an option.
- Larger shipments are made by truck transport. We have negotiated excellent volume rates with several trucking companies, allowing us to ship products to almost any location.
- If the final delivery point is to an inaccessible point, delivery will be to the nearest freight depot.
- If you live in an obscure place, please let us know the local secrets of getting freight to you. The name and number of a local shipping company is always appreciated.

TAXES:

- All system components (except for batteries) are exempt from PST if purchased as part of a system , and all purchased at the same time. This includes generators.
- Any components that are not specific to an alternative energy system that are purchased at a later date are subject to PST.
- PST plus an Enviro levy of \$5.00 each must be charged on battery sales within British Columbia.

RETURN POLICY:

- Our goal is 100% satisfaction. Within two weeks of purchase, any purchase (except special order items) may be returned for exchange or credit.
- Before making the return, please contact us for a Return Materials Authorization (RMA) number.
- All returns must be in new, unused condition, and in their original packaging.
- Please ship returns freight and insurance prepaid by you

REPAIR SERVICE:

- The products we sell are covered by the warranties provided by the manufacturers.
- In the rare event that your equipment requires repair service (warranty or non-warranty), you have the option of obtaining service from Energy Alternatives or direct from the manufacturer.
- Please contact us for diagnosis and options regarding temporary equipment if your needs are critical.
- Terms of the warranties are in the instruction manuals, or are available from the manufacturers.