7317 Jack Newell Boulevard North
Fort Worth, Texas 76118
(817) 595-4969 (800) 886-4683 (817) 595-1290 (Fax)

Frequently Asked Questions about Exeltech PV AC Modules

Updated: Tuesday, April 21, 2008

Terminology:

"Grid" (a.k.a. "the grid", "commercial power grid", power lines, and others)
Power distribution lines energized by utility companies for delivery of electric power to utility company customers. Power sources used commonly include coal, nuclear, hydroelectric, natural gas, and others.

Grid tie inverter
An inverter designed to connect to the commercial power grid and feed power back into the grid. A grid-tie inverter must be connected to the grid in order to function. Safety regulations require a grid-tie inverter to cease operating in the event of a power failure on the commercial power grid. The most common energy source for a residential grid-tie inverter are "solar modules" that make electricity from sunlight (see also "PV").

Hybrid ("intentional island") inverter system
A hybrid inverter combines features of the stand-alone inverter and the grid-tie inverter. Hybrid systems use batteries for storage, and are able to provide power for critical loads in the event of a grid power failure. Hybrid systems achieve this intentional islanding by first disconnecting from the commercial power grid (by use of a heavy-duty mechanical relay), then continuing to operate as a stand-alone inverter until the utility power is restored, at which time the hybrid inverter returns to grid-tie mode.

Inverter
An electronic device that converts direct current ("DC") into alternating current ("AC"). In this context, an inverter produces 60 Hz sine-wave electricity identical to what is produced by US domestic power companies.

Island
An "island" condition exists when an inverter continues to provide power to one or more residences or other structures. If this occurs in a grid-tie inverter, the inverter is malfunctioning. Sometimes, systems are designed to *intentionally* island (see "Hybrid system").

Stand-alone inverter
An inverter designed to operate independently of the commercial power grid. A stand-alone inverter creates its own 60 Hz reference (50 Hz for international models), and is not designed to connect to or feed power back into the commercial power grid. Mechanical relays may be used in conjunction with stand-alone inverters to allow a load to be powered from either the grid or the inverter, and have the relay change position to use the respective other power source as needed, but at no time are the stand-alone inverter and the power grid connected to each other.

String inverter
An inverter designed to connect to a high-voltage input such as provided by a series string of photovoltaic ("PV") modules. Typical string inverter systems require 250 to 600 volts input. String inverters do not have batteries, thus are unable to provide backup power in the event of a power failure.

7317 Jack Newell Boulevard North
Fort Worth, Texas 76118
(817) 595-4969 (800) 886-4683 (817) 595-1290 (Fax)

PV module (a.k.a. PV Panel, solar panel, photovoltaic panel, etc.)
PV is an abbreviation for "photovoltaic", meaning "from light". A PV module (note the lower-case 'm') is a large, flat device comprised of many "solar cells" that generate direct current ("DC") electricity from sunlight. It uses silicon and combinations of other special metals in the solar cells, that when exposed to the sun, generate an electrical current. Common PV module voltages are 12V and 24V, although other voltages are also available.

PV AC Module
A PV AC module is a special version of grid-tie inverter. Unlike conventional grid-tie inverters, which require many PV panels in series or parallel connection, PV AC modules are permanently attached to a PV panel and produce grid-ready electricity directly. DC wiring becomes an integral part of the PV AC module and is thus no longer required to be designed into the system, nor be connected through other circuits to protective or other devices. PV AC modules reduce wiring requirements in grid-tie inverter systems by up to 50% or more.

Maximum Power Point Tracking ("MPPT")
The maximum power available from a PV module varies with temperature and sunlight level. PV modules produce **more** power at cold temperatures than hot. Sunlight energy is greatest during mid-day. The Exeltech PV AC Module, using an internal microprocessor, adjusts its operating conditions to use as much of the available power as possible. As an example, think of a transmission in a car. It changes gear ratios according to the speed of travel. The maximum power point tracking feature ("MPPT") incorporated into the Exeltech PV AC Module accomplishes the same task, but does so electronically. In this manner, the Exeltech PVAC Module won't try to produce more power than is available from the PV module.

Frequently Asked Questions

How is an Exeltech PV AC Module different from a string inverter?
Exeltech PV AC Modules use the output voltage from photovoltaic panels, increases it, and converts it to a very clean sine wave acceptable to be connected to the commercial power grid. Common grid-tie inverters today are designed to use high voltage directly from the PV modules, which requires DC wiring from the PV modules, combiner boxes (to connect multiple PV modules together), conduit, and special DC safety devices. An Exeltech PV AC Module eliminates all DC wiring issues. In turn, common string inverters have only one section needed to change the high voltage DC into grid-ready AC. Exeltech PV AC Modules must first increase the lower PV module voltage (typically 12V or 24V nominal) to a higher voltage, then change this high voltage into grid-ready AC. This dual-stage design in the Exeltech PV AC Module results in a typical operating efficiency of 90-91% compared to 92-95% in string inverters. This difference is more than overcome in the lack of DC wiring in an Exeltech PV AC Module system. DC wiring in common string inverter systems is typically designed to be a compromise between loss and cost, and is often sized to lose no more than 2-5% of the total system power. This results in a total system efficiency in string inverter systems of typically 89-93%, which means Exeltech PV AC Module systems compare VERY favorably in overall efficiency to more expensive string inverters, but without the complexity.

How much power does the Exeltech PV AC Module produce?
Several Exeltech PV AC Modules have been designed to match PV panels up to 150 watts, 250 watts and 1000 watts. Conditions that may affect this output are weather, dirt, and other variables.

Why can the PV AC Module be line-connected and standard (stand-alone) inverters not?
PV AC Modules are designed to synchronize to the commercial utility grid. It operates in lock-step with the AC voltage. A standard inverter generates its own sine wave that is not designed to synchronize to the utility grid. Should a stand-alone inverter be connected to the power grid, it will suffer severe and expensive damage.

7317 Jack Newell Boulevard North
Fort Worth, Texas 76118
(817) 595-4969 (800) 886-4683 (817) 595-1290 (Fax)

What type of connectors will be used on the AC & DC wiring?
Exeltech has devised an incredibly simple, UL-approved connection method that allows attachment of a PV AC Module to power cable in a matter of seconds. Connection kits are supplied with each panel .

How are modules connected to the AC?
Exeltech PV AC Modules have only three circuit connections each: "line", "neutral", and "ground". These circuits connect to the identical circuits in your home wiring. Connections should be performed by a NABCEP certified solar energy installer, a licensed electrician with PV experience, or similar person.

How many modules (max) can be connected together? Why is this limited?
A maximum of 254 Exeltech PV AC Modules can be connected at one time in one system. This limitation is imposed by the number of unique "codes" each system produces.

Will this limit be increased in the future?
Possibly, but at present, 254 PV AC Modules, each producing 250 watts, represents more than 63,500 watts – a VERY sizeable system. It's unlikely a residential system will *ever* approach this size.

What kind of communications exist from the Exeltech PV AC M?
Signals from each PV AC Module are sent on the power lines using a proprietary signal exclusive to the Exeltech PV AC Module. Each Module sends the present Module wattage output, Module temperature, and Module identification code. This information will be received by a Windows® based computer and displayed on the monitor. Should a module not be performing as expected, the computer display will indicate the existence of a problem.

Will Exeltech PV AC Modules produce power during a blackout?
Not at this time. Future Exeltech products will allow current PV AC Modules to operate during a power failure or for off-grid use.

I've got solar panels already. Can I purchase Exeltech PV AC Module inverters and attach them to my existing solar panels?
No. Once again, safety regulations require that the Exeltech PV AC Module inverters be attached to the PV module (solar panel) by a UL-approved facility.

Will Exeltech PV AC Modules ever be sold separately?
No. They will not be sold separately to end-users. Exeltech PV AC Modules will be sold as individual units only to manufacturers, resellers, and others who are authorized by UL (or similar Nationally Recognized Testing Laboratory such as ETL, TUV, and others) to attach the Exeltech PV AC Modules to the rear of PV modules for resale to the general public.

How many PV AC Modules will I need to make my electric bill go to zero?
There's no easy answer to this question. It depends on your particular electrical usage, your location, and many other variables. Every Exeltech PV AC Module you install will reduce the electricity you purchase from the utility company. However, if your usage habits are such that you're careless in the electrical energy you DO use, any benefits derived from the Exeltech PV AC Modules could easily be lost in increased usage around your home.

What incentives exist to help me with the purchase of Exeltech PV AC Modules?
Many states and utilities offer substantial rebates on renewable energy equipment. You'll need to check with your local sources to see if any apply in your area. In addition, effective January 01, 2006, the US government instituted federal income tax **credits** for the purchase of renewable energy equipment. This credit is for 30% of the cost of the equipment and installation, capped at $2,000 tax credit for residential installations, and NO cap for commercial installations. Check with your CPA, accountant, or other tax professional for assistance.

7317 Jack Newell Boulevard North
Fort Worth, Texas 76118
(817) 595-4969 (800) 886-4683 (817) 595-1290 (Fax)

If I have a large renewable energy system, and I end up spinning my electric meter backwards sufficiently, will I get a refund from my power company?
This varies from one power company to another. Some WILL issue a refund to you for the excess power you generate. Most don't. Like the rebates mentioned previously, this too will require that you check with your local power company to learn what their policies are.

I live in (Minnesota, Wisconsin, Canada, etc.). Will the Exeltech PV AC module work in the cold?
Yes. In fact the AC Modules will generate a bit more power at lower temperatures, other considerations being equal. Photovoltaic modules generate electricity from light, not heat. Like most electronic devices, photovoltaic modules operate more efficiently at cooler temperatures.

Does the Exeltech PV AC Module work in cloudy weather?
That depends on how cloudy it is. Photovoltaic modules generate electricity as a direct function of light intensity. If the clouds are blocking half the light (compared to a perfectly clear day), the Exeltech AC Module electricity output will be halved as well. A really dark day may result in near-zero or even no output from the PV AC Modules.

How long will my PV AC Module system last?
Each Exeltech PV AC Module is designed to function for at least 20 years. Barring unforeseen circumstances such as lightning or other storm damage, or exposure to an environment beyond design limits, your Exeltech PV AC Module should continue to perform for the life of the photovoltaic module to which it's attached. Quality photovoltaic modules carry a 20-year performance warranty. As long as the photovoltaic module remains intact (no damage from hail, wind, etc.), it too should produce power for at least 20 years. Some 30-year old photovoltaic panels have been found to produce nearly 100% of their rated output, even after three decades in the sun.

What about breakage? Aren't most photovoltaic modules made with glass?
Photovoltaic modules using glass are very durable, and are designed to withstand the impact from hailstones, typically up to one inch in diameter. If the glass ever DOES get broken, it cannot be repaired. The entire assembly (photovoltaic module and its attached Exeltech PV AC Module) must be replaced as a unit. When you install Exeltech PV AC Module assemblies, ensure you update your property and casualty insurance to include the new equipment.

Is it legal to run my electric meter backwards?
In most areas, yes. Since we don't have access to information about every utility, you'll need to check this with your power company before installing your system.

What happens if my Exeltech PV AC Modules generate more power than we use?
First, this is a good sign. It means either you have a very large system, or are very conservative in the amount of electricity you consume – and perhaps both. In either case, very few utilities will write you a check for excess electricity. Most won't. If you're among the lucky ones, you could end up actually making money from your solar-generated power. If your utility company doesn't pay for excess, they may simply use your new reading as a basis for billing for the next month. If you're among the latter group, you'll have given your excess electricity to the power company for free. How your power company handles this situation is something you'll learn when you contact your utility company prior to installing your Exeltech PV AC Module system.

Do Exeltech PV AC Modules make hot water too?
No. They only generate electricity. If you want solar hot water, you'll need to contact a licensed and qualified solar hot water contractor in your area. Not all solar electric contractors are qualified to install hot water systems, nor are solar hot water contractors necessarily qualified to install electrical systems. You'll need to verify this with your solar contractor, as some of them are qualified to perform work in both areas.

7317 Jack Newell Boulevard North
Fort Worth, Texas 76118
(817) 595-4969 (800) 886-4683 (817) 595-1290 (Fax)

Who will install my Exeltech PV AC Module system?
For now, a licensed solar energy contractor should install your equipment. As an added point of assurance of quality, try to hire only a NABCEP Certified Solar Contractor. NABCEP (North American Board of Certified Energy Practitioners) conducts courses and certification programs that help ensure your contractor is both experienced and knowledgeable. Exeltech products now under development are being designed in a manner that will allow installation to be done by any electrician.

What laws and regulations apply to the installation of an Exeltech PV AC Module system?
Although this varies from one jurisdiction to another, photovoltaic systems are generally subject to the same electrical, building, and fire safety codes that govern the installation of electrical wiring and equipment in residential, commercial and industrial buildings. In the United States, the National Electric Code (NEC) is the accepted standard in most areas, and its guidelines should be followed in designing and installing PV systems.

Will I need a building permit to install my Exeltech PV AC Module system?
In most cases, yes. You'll need to contact your local government building and zoning department about this. For a system to pass inspection, it will, in all likelihood, be required to be installed by and/or signed off by an appropriately licensed electrical contractor. (See reference to "NABCEP" above.)

Will my insurance cover my system?
Properly installed and inspected PV systems are covered by most insurance in the same manner as any other electrical equipment installed on the insured property. You should consult with your insurance agent or company to determine the limits of your coverage prior to commencing installation of your Exeltech PV AC Module system. In some cases, it may be necessary to purchase a "rider" for your policy to cover solar equipment. Also, it's important to select components with appropriate safety approvals from agencies such as Underwriters Laboratories (UL), ETL, TUV, or other recognized safety assessment organizations to ensure availability of insurance coverage. Systems and/or equipment lacking the appropriate safety certifications are usually not approved by local electrical inspectors. All Exeltech PV AC Modules, as well as the photovoltaic modules to which they're attached, carry UL or similarly recognized safety certifications.

If several Exeltech PV AC Modules are connected together, and the utility power fails, won't each Module think there's grid AC power coming from the other PV AC Modules, and thus continue to operate?
No. Though it might appear several Exeltech PV AC Modules connected together would generate a 60 Hz sine wave, which in turn would keep the other inverters active in the event the commercial utility power failed, this isn't the case. The micro-controller (a special computer chip) inside each PV AC Module senses when the commercial utility power fails and causes the PV AC Module to cease producing power. Safety regulations tested by Underwriters Laboratories, ETL, and other recognized testing services require that a grid-tied inverter stop producing power in a very specific and short period of time following the loss of the utility. Exeltech PV AC Modules achieve this in a fraction of the required time, even when multiple Exeltech PV AC Modules are connected together.

Revised April 21, 2008