What to Expect From Your RE Dealer

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Every renewable energy (RE) system begins its working life as a pile of equipment. Preparation, planning, and proper installation are all essential if the system is to be a success. You can do it yourself or you can get help from an installing dealer. Here is what to expect from your dealer. And here is what you may miss if you decide to do it yourself.

It's often said that good advice deserves to be repeated. This article was first published in 1997, in *HP61.* We're publishing it again because this needs to be said again.

Load Analysis

Every renewable energy system should begin with a complete, accurate, and thorough analysis of the appliances to be used in the system. If the load analysis is not properly done, the system is bound to disappoint its users. If the system's energy consumption is estimated too low, power shortages and dead batteries will soon follow. If the estimate is too high, the user will be wasting money on unneeded equipment.

Who does this load analysis—the system's user or the person who sells the RE equipment? In most cases, both contribute information. The user lists and gathers data about each appliance (don't leave out even the smallest one, and don't forget to plan for future appliances). How much and what type of electrical energy does the appliance consume? How long will the appliance run? The dealer usually enters the appliance data into a computer and generates an estimate of daily energy consumption. A good dealer will also recommend appliance changes to reduce the system's energy use.

The golden rule is: Every buck spent on an efficient appliance saves three to five bucks in system components. A good dealer knows this and will suggest replacing inefficient appliances (such as incandescent lighting and self-defrosting refrigerators that spit ice cubes out the door) with the most efficient types available. Listen to your dealer. He's not trying to sell you an expensive refrigerator. He's trying to save you three to five times the cost of that fridge in solar-electric modules, controls, batteries, wiring, and inverters.

Sad to say, many systems are purchased without ever doing a load analysis. Anyone who does this is wasting money, and is apt to be disappointed with the system. A good renewable energy system dealer will insist that a load analysis be done before selling you a system. If you haven't done the analysis, your dealer will nag you into it, or visit you and do the analysis with you. The dealer deserves to be paid for this generously because he or she is really doing your homework.

A Budget Is Not a Load Analysis

Don't buy a packaged system just because it's within your preferred budget. Do the load analysis, and if the system needed to power these loads is too expensive, modify the loads. Replace inefficient appliances, and, if need be, eliminate appliances until the system is affordable.

It is not unusual to go through the load analysis and system design phases three or four times before the right system is found. A properly designed system costs what the user can afford to spend on the system, and the load analysis details the energy consumption of each appliance.

If you don't know how to do a load analysis, see Ben Root's article in *HP58,* page 38. If you are hiring a dealer to do the load analysis, make sure all the criteria shown in Ben's article are taken into account.

Site Survey

A site survey is an analysis of a specific location for its renewable energy potential. Every place is different, but your system is going to be installed in a specific location. You need to determine what types and amounts of energy are available to you. Site surveys vary from simple to complicated. Let's first look at surveying a site for photovoltaic potential.

Sunlight is the fuel used by PV modules to make electricity. The PV array needs to be located where it will receive the maximum amount of sunlight. With seasonal variations in the sun's declination, daily constant changes in the sun's azimuth, and possible shading from hills, trees, and buildings, finding the best spot for the PV array can be difficult. What is needed here is an instrument such as the Solar Pathfinder.

The Solar Pathfinder makes it easy to find the best spot, producing a sun chart of your site's solar insolation potential. If your dealer shows up to survey your solar site without a Solar Pathfinder or similar instrument, fire him or her. If you are doing your own site survey for PV, borrow, rent, or buy a Solar Pathfinder and learn to use it. See *HP57* and *HP21* for specific information on solar site surveys.

Wind is a difficult resource to survey. You can see the sun and falling water; wind is more elusive. We used to suggest that people spend a year with expensive data logging equipment, measuring their site's wind potential. But this isn't really necessary.

Instead, talk with oldtimers in your area, check out the vegetation for "flagging" (more growth on the downwind side), and look into local recorded wind data. Another approach is to install a small generator at the exact place and at the same height as the proposed big generator. Monitor the small genny's performance for a period of a year or so and use this information to estimate the performance of larger gennys. See Rudy and Jill Ruterbusch's article in *HP80* for an example of this approach.

While experienced wind dealers don't know your site's measured wind potential, they can make a very accurate guess. They can also help you find a suitable location for the tower, and encourage you to make it as high as possible. See *HP40* and *HP41* for specifics on wind site analysis.

Hydro is the easiest renewable energy source to survey. Surveying for hydro can be done either by the system owner or by the dealer. All that counts is accurate head and flow measurements and some historical data on the seasonal output of the water source. See *HP21* for hydro siting information.

Many installing dealers combine the load analysis and site survey into one trip to their customer's site. In addition to working on the load analysis and siting the RE equipment, the dealer also gleans more vital information such as wiring lengths and battery location. From the site survey, the dealer can estimate how much RE potential is present. This RE potential coupled with the load analysis is all the information needed to proceed to the next stage—system design.

System Design

Designing a renewable energy system means using the system's energy requirements and the site's RE potential to generate a specific list of equipment. This RE equipment supplies the needed electricity within the limitations of the load analysis and site survey. Put into sentences it sounds easy, but really there is just as much art as science involved in system design.

Consider that a system designer can choose between at least eight different brands of PV modules, with each brand having at least four models. Consider that you can choose many different battery types, wind genny models, inverter kinds, control makes, and instrument types. There are literally thousands of different combinations of equipment.

Good system designers have learned through experience what works and what doesn't. They know which equipment plays well with other equipment. They know details such as what kind and size of cable/wires are required, inverter/appliance compatibility, whether a PV tracker should be used, what size pipe to use in hydros, how tall the tower should be, and how the battery should be configured.

They know your local RE environment. When you pay someone to design your system, you are buying their expertise. In almost all cases, professional help with system design pays off. Mistakes in the design phase are expensive to fix after installation.

Every system, regardless of size and without exception, should be safely designed. Overcurrent protection devices, disconnects, and proper conductor use make for a safe system. If your dealer doesn't do *NEC*® compliant systems, find a dealer who does. If you are doing the design yourself, learn the *NEC* and follow the rules. Renewable energy is real. It can burn down your home as easily as the grid.

Once the system designers have a specific list of RE equipment, they find out an essential bit of information—the system's hardware cost. At this stage, the system's customer usually chokes and says, "I can't afford that!"

Does the system's designer begin deleting PV modules and batteries to bring the system down in cost? *No!* A good system designer goes back to the load analysis. Can we do anything more efficiently? Can we do without some of the luxury appliances? The system's user and the designer work on the load estimate until the system becomes affordable.

A good designer will revise the design until it satisfies the load estimate and the customer can afford all the hardware. This is an essential give and take process. One very important result of this process is that the user is made aware of the system's capabilities. If the designer knows what he or she is doing, the customer will know what the system will power before it is installed and operational.

System Purchase

With the load estimated, the site surveyed, and the system designed, we have arrived at the first big

milestone—where you get to part with your hard earned bucks.

Now is a good time to pause. Are you comfortable with your dealer/designer? Do you trust him or her? If you have doubts, now is the time to get a second opinion. If you decide on a second opinion, pay the first dealer/designer at this point. Pay for the help in load analysis, the site survey, and the work in designing your system. This makes the design yours—you just bought it. If you decide to buy from another dealer, this essential information is still yours to use.

Most dealer/designers charge from a measly US$200 to about US$600 or more for the load analysis, site survey, and system design. Many will refund this charge if you buy the gear from them and have them install it.

If you designed your own system and are shopping around for the cheapest deal in hardware, which you intend to install yourself, you should get a second opinion. Hiring an experienced designer/installer to review your load analysis, site survey, and system design is money very well spent. Most designer/dealer/installers will do this for less than 5 percent of the money you are planning to spend for hardware. A second opinion before purchasing your first-time design can save thousands of dollars later.

It is not uncommon for installing dealers to ask you to pay for some or all of the hardware prior to installation. This allows them to use your capital to finance the job. It is not uncommon for installing dealers not to have all the equipment for your system in stock. Inventory costs money, and a little patience on your part keeps installing dealers from having to charge you more for your system. You should never have to pay for installation labor until the system is installed and working to your satisfaction.

It is not uncommon for installing dealers to refuse to install hardware that they did not sell. Installing dealers are working on very slim profit margins. Installing dealers are beset on all sides by competition from companies that offer low prices instead of quality, on-site service. If you appreciate the help that your installing dealer has given you and will give you, show it by paying enough for him or her to live on.

At this point, money changes hands. Everything must be on paper, one copy for the installing dealer and the other for the system customer. In this packet of paperwork you should have:

- A copy of the final load analysis
- A copy of the site survey complete with sun chart
- A printout of the system design
- System schematic
- All estimated RE production data
- Manufacturers' spec sheets for all components
- A copy of the hardware bill

Don't sign the check until you have all of this paperwork.

Your installing dealer will now take your check, order your gear, and prepare to return to your site for installation. This entire process may take two to six weeks, so be patient.

Shipping

At this point, those of you who are acting as your own designers and installers are getting ready to accept the equipment you have purchased from a company that doesn't install. Check every box and every item for damage before you accept shipment from the carrier. Once you've signed off and accepted the shipment, claims for damage are very difficult. If you notice any damage, refuse to accept all the damaged goods and have them returned to the shipper. Let your supplier and their carrier discuss who is to pay for the broken equipment.

If you purchased your system from an installing dealer, you can forget shipment hassles. The dealer will show up at your site with all the equipment in good condition. You have already paid the dealer to take care of any broken batteries or smashed PV modules. This is their problem, not yours.

Installation

This is the phase that really determines if you were right in deciding to install your own design, or whether you should have hired an installing dealer to help you. This is where months of planning and many dollars should become electricity.

If you are installing your own system, I can only hope that you have done your homework. We at *Home Power* have tried to help with technical information, schematics, and everything we can think of to make you well informed about renewable energy systems. What we cannot supply through *Home Power* is experience. Only time and many systems installed and working can do that.

If your system is being installed by an installing dealer, you should consider becoming his or her shadow. This person has done dozens, maybe hundreds, of these systems. The installing dealer is a wealth of information and will explain every wire and every device, if you have sense enough to ask.

The installing dealer should show the user how to do battery watering and any other routinely required maintenance. The dealer should also explain how to operate the system's controls, how to use the inverter, and how to understand the information displayed by the system's instruments.

Most installing dealers will let you work with them. Most dealers would rather have you dig the wiring trenches or wind machine tower foundation holes. You can also save money by building the power shed to house the PVs, batteries, and inverter. Sweat equity pays off here. Installing dealers are highly skilled and mostly very busy. You can pay them to dig trenches at about US$50 an hour, or you can do it yourself.

As I mentioned above, most installing dealers will not install hardware that they did not sell. Please don't shop around for a cheap deal on RE equipment and then ask your local dealer to install the system. If you want installation, pick a dealer and involve him or her from the very beginning. Installing dealers must both sell the hardware and install it if they are going to make a living. Respect this, and your local dealer will be a terrific resource.

At this critical installation phase, the self-installer should consider every cable, wire, connector, overcurrent device, and disconnect in the system. Is it designed properly? There is no such thing as an unimportant connection. Every wire and connector must be done right.

For example, it takes a US$300 crimper the size of pruning shears to properly attach the connector to a #4/0 copper cable. It takes a set of punches costing over US$200 to make holes in electrical boxes. It takes a conduit bender to make bends in EMT conduit. While the bender is cheap, it's easy to waste US$200 worth of conduit learning how to use it. Installing dealers have all these tools and know how to use them.

Passing Electrical Inspection

Many installing dealers are also state-certified electrical contractors. Those who are not, hire an electrical contractor to oversee their work and show up for the electrical inspection. Chances are that your installing dealer has met with the local electrical inspectors before, and knows what they are looking for. If the system is done to local specs, there will be no problems.

If you installed your system yourself, expect critical examination by your electrical inspector. Don't be offended or angry—the inspector really has your best interests at heart. He knows that this is the first system you have done. He is merely safeguarding your home and family. If the electrical inspector finds problems, listen to him. Make any changes he requires regardless of what they cost. If there are substantial changes at this stage of the process, you have only yourself to blame—you did not do your homework.

Dealer Support

Your installing dealer should support you. If any component fails while under warranty, the dealer should remove it from your system and seek warranty repair on your behalf. When the component is repaired or replaced, the dealer should reinstall it in your system at no charge to you. You should be able to call your dealer and ask questions about your system's operation. If you are not getting this type of service from your dealer, change dealers.

If you designed and installed your own system, you have little recourse to service. If things go wrong or don't work when installed, calling the catalog business that sold you the hardware may not do much good.

Troubleshooting a botched installation requires an on-site visit by a sharp technician. Many mail order companies are not equipped to spend hours on the phone with you trying to figure out what is miswired or improperly applied. If you are going to install your own system, you should learn enough not to need outside technical support.

System Buyers, Treat Your Installing Dealer Right!

Your installing dealer is your best avenue for getting a system that works well at a reasonable price. Full-service installing dealers cannot compete with discount mail order firms. Don't ask them to. Instead of a cheap deal, the installing dealer offers you expert personal service.

Please realize that your installing dealer has overhead and expenses. It is not uncommon for them to wear out pickup trucks like you wear out toothbrushes. Expect your dealer to charge you mileage, and understand that they must do this in order to stay in business. If this personalized service is worth the approximately 15 percent extra that the system's hardware will cost when designed by, purchased from, and installed by professionals, then your dealer is your man. If not—grab the phone and you're on your own.

Installing Dealers, Treat Your Customers Right!

This article details your responsibilities to your customer. If you are not providing this level of service, you are in the wrong business. Have patience with non-technical customers who call in the middle of the night saying their batteries are broken because their voltage went down at sunset. Not everyone is a tech weenie, and most customers will need considerable schooling

from you before they understand how their systems work. This is your job. Your customers are part of your family—treat them as such.

Still Want to Design & Install Your Own System?
I don't mean to discourage you. In fact, we do our level best here at *Home Power* to give you all the information you need. But you must do your homework. Take a hard, honest look at your abilities and available time. Failing in this leads to expensive, barely working systems that are often safety hazards.

Renewable energy is not rocket science. You can construct systems properly and safely if you take the time to learn everything thoroughly. Be prepared to buy or rent some expensive tools as mentioned earlier. Be prepared to make mistakes and pay for those mistakes. While the information in *Home Power* is as complete and thorough as we can make it, it is not a substitute for on-the-job experience.

Access
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