

Keep those gadgets working after the power goes out

By Jeffrey R. Yago, P.E., CEM

The recent 2003 northeast electric grid failure taught the residents of many large cities what most rural residents learned years ago: Lights, air conditioners, televisions, stereos, elevators, subways, computers, refrigerators, cash registers, money machines, gas pumps, and traffic lights do not work when the power goes out. They also learned very quickly that they could not recharge all of the dead batteries in their cell phones, pagers, personal digital assistants (PDAs), video cameras, laptop computers, digital cameras, and portable phones without electricity.

This lesson was not as obvious as you might think, as an interconnected utility grid tied to many different power plants surrounds all large

cities. A failure of one power plant or a downed power line is easily bypassed or back-fed from other sources in minutes by system managers, with little or no power interruption. At least that's the way it is designed to work. Obviously, the system managers during the August 14, 2003 East coast power outage didn't get the memo.

Those of us living in smaller

towns at the end of a single power line know what to expect when the power goes out and we have flashlights, battery-powered radios, and extra supplies at the ready, since we go through this with every major storm. Many rural residents have their own generators and backup power systems and do not worry when the grid goes down. We should keep in mind that most residents of large cities live in apartments or condos in multi-tenant buildings, and having their own generator, and a roof-mounted solar array is not possible.



A solar module and an endless variety of 12-volt adapters are available to power portable electronic devices.



Nickel cadmium and nickel metal hydride batteries in custom shapes

Batteries

If you are in this situation, you may not be able to keep your major appliances operating during a power outage, but there is a way to keep all those important communication gadgets working, regardless of how long the power is out. The most obvious first step is having lots of extra batteries on hand. Newer alkaline batteries have extremely long shelf life if stored in a cool and dry location, and these are the batteries you should buy for emergency power needs even though they are more expensive. Since you may be in the dark when spare batteries are needed, I suggest selecting an easy-to-find central location in your home or apartment where you should have at least eight each of the most common battery sizes. In most cases this will be the smaller



Versatile car adapter with adjustable voltage output for 6 to 21 volts and interchangeable tips (Nesco Battery Systems)

AAA, AA, and 9-volt batteries. Flashlights and desktop radios typically use the larger C or D-size cells and really use the power, so you may want to have even more of these larger sizes at the ready.

Most of today's cell phones, pagers, and laptop computers use larger built-in special voltage batteries, which are designed to be recharged only by an AC wall outlet while remaining in the device. If we could remove these batteries, you would find large heavy plastic blocks with odd shaped electrical contacts, having voltages well beyond our old familiar round flashlight batteries. To reduce battery weight while packing more and more operating time in as small a space as possible, most electronic device manufacturers first switched to nickel cadmium hydride (NiCad) batteries, then to more expensive nickel metal hydride (NiMH) batteries which have even more power density.

All NiCad batteries have a "memory" problem when recharged. If the battery is not completely discharged prior to recharging, the recharge will bring the battery back to full, but the battery will discharge down to the new low limit when it is discharged

again and generate less operating time.

More power demanding electronic devices are turning to nickel metal hydride rechargeable batteries that hold twice the charge of an alkaline battery and can be recharged up to 500 times. NiMH self-discharge faster than NiCad batteries when not being used, but NiMH batteries do not have the memory problem of NiCad batteries. Newer battery chargers are designed to recharge both NiCad and NiMH batteries equally well, assuming you have a wall outlet and grid power.

So how can you recharge these exotic internal batteries when the electric grid is down?

During any emergency or power outage you should already have a battery powered AM/FM radio, an LED or fluorescent battery room light, and a stock of spare disposable alkaline batteries that will keep these basic devices operational for several days. But, you will also want to keep your cell phone, pager, and your PDA or laptop computer operating, so you will need a different solution for these.

Adapters

I suggest buying a low cost 12-volt car adapter for each of your electronic gadgets. Since today's more complex portable electronic devices require lots of battery power, most manufacturers offer optional low cost cables and charging adapters that will allow powering

them from a car's cigarette lighter socket. Some charging adapters include built-in circuits to convert the 12-volt DC car voltage into multiple voltages required by different electronic devices. For small electronic devices, this could be 3, 4½, 6, or 9 volts DC. However, some larger laptop computer batteries may require up to 21 volts DC, and a special higher cost adapter is needed to raise, not lower, the 12-volt car battery voltage. These more expensive 12-volt adapters include a small dial that allows you to select which output voltage your device requires, plus interchangeable output plugs which allow one device to fit almost any electronic device.

Since you may not want to idle your car for hours or risk a dead car battery just to recharge a cell phone, there are some really great new low cost products that will solve this charging problem without the need to connect to either a wall outlet or car battery.

Solar battery module

After you have selected which devices you need to keep operating, and you have purchased a 12-volt car adapter for each, you will need to



Larger 10-watt solar module and 12-volt car adapter to power laptop computer

purchase a solar battery charging module. Unlike the larger solar modules that you see along the highways to power signs and warning lights, these smaller solar modules are designed to be connected directly to the battery to be charged. Any required fuse or reverse current flow protection is built in, so all you need is a 12-volt female adapter which will accept the different car adapter plugs connected to your electronic devices. This allows using a single solar module to recharge all of your electronic gadgets that have a car adapter, and its small size can easily be stored in a briefcase, glove compartment, or utility drawer.

Since a cigarette lighter socket is a stan-

<u>Car Charger Products</u>	<u>Supplier</u>	<u>Web Address</u>
iSun Sport and Power Pack	ICP Global Technologies 514-270-5770	www.icpglobal.com
Solar Power Pak	Solar World Colorado Springs 800-246-7012	www.solar-world.com
Diogenes	Sundance Solar Warner, NV 603-456-2020	www.sundancesolar.com
PortaFlex and Accumanager 20	Creative Energy Technology 518-278-1428	www.cetsolar.com
#SPA	C. Crane Company 800-522-8863	www.ccrane.com
Solar Port and Solaris 25	Solar-dyne Corporation Portland, OR 503-830-8739	www.solar-dyne.com
Smart Laptop Adapter by Nesco Battery Systems	CompUSA computer stores	www.compusa.com
<u>12-volt Adapters and Device Connectors</u>		
#270-1561 #980-0692 #273-1827 #273-1817	Radio Shack stores	www.radioshack.com



Inexpensive 2-watt solar module and 12-volt car adapter will recharge most small electronic devices.

standard physical size and voltage for all vehicles, you do not need a separate charger for each device and vehicle. Do not purchase a solar module smaller than 2-watt output, as it will take longer than a single afternoon to recharge all but the smallest battery sizes. For large laptop computer batteries, I recommend a 10-watt solar module, which will provide approximately 1 amp of charge current. Remember

that disposable alkaline batteries may have a very long life, but they cannot be recharged, so keep them separate from your rechargeable batteries and never connect them to any charger. Any battery you plan to recharge must be clearly labeled as “rechargeable.” For any device that uses disposable batteries, you may want to replace them with rechargeable batteries and buy one of the desktop chargers that can recharge multiple batteries at the same time.

Solar chargers

I purchased the fold-up solar module and all of the adapter cables described in this article at a local Radio Shack store for under \$50. If you need a more professionally assembled system, there are several excellent solar battery charger kits

available that include everything in a compact fold up case.

Some solar chargers are similar to a typical desktop charger stand that holds multiple AAA, AA, C, and D-size rechargeable batteries, but this assumes they can be removed from the electronic device for recharging. The solar module is placed in a window facing the sun and connects to this charging station by a short cable. Some manufacturers offer a complete emergency power kit that includes a rechargeable light, fold-up solar module, and all required special adapters to fit most cell phones and laptop computers in an easy-to-store carry bag.

Uni-Solar makes solar modules in various sizes that have a flexible backing material that is almost unbreakable. I strongly recommend these flexible or hinged fold up modules for camping or mobile applications. The table lists some suppliers to help your battery charging needs.

(Jeff Yago's latest text titled, *Achieving Energy Independence—One Step At A Time*, provides a very good introduction to battery-based power systems. It is available from the *Backwoods Home Magazine* Bookstore or by calling 804-457-9566.

The solar equipment described in this article is available from Dunimis Technology Inc. at www.pvforyou.com or by calling 804-457-9566.) Δ