

**Renewable Energy Disaster Relief Fund Gives a Helping Hand**  
**American Solar Energy Society: Solar 2007 Conference**  
**Cleveland, OH, July 2007**

William Young  
Florida Solar Energy Center  
1679 Clearlake Road  
Cocoa, FL USA, 32922  
[young@fsec.ucf.edu](mailto:young@fsec.ucf.edu)

Robin Reinarts  
National Energy Foundation  
3676 California Ave  
Salt Lake City, UT, USA 84104  
[robin@nefl.org](mailto:robin@nefl.org)

**ABSTRACT**

In a disaster, support and utility services are damaged or destroyed leaving people without electricity, water, sanitation, and communication. Thousands of people from emergency management agencies and volunteer organizations are deployed to help after a disaster to provide life support and basic services. In this response effort, energy resources and services are lacking, making recovery efforts difficult in our high-tech world. In response to this problem, the National Energy Foundation and the Florida Solar Energy Center have formed the Renewable Energy Disaster Relief Fund (REDRF).

REDRF will collect donations from the general public, businesses, and various organizations through a variety of methods as do other disaster organizations, but with the goal of providing renewable energy resource powered equipment needed by survivors of a disaster in the United States. The funds will be used to purchase renewable energy hardware (such as PV panels and wind generators) to power necessary equipment for first response efforts after a disaster, ideally within the first 3 weeks after an event until utility services are restored. A team of trained REDRF first responders in collaboration with local disaster area organizations will a hundred different disaster related organizations providing some type of disaster relief.

Ninety-five percent of the disaster response effort is for life support and welfare. Water, food, and medical services are the first critical needs, followed by shelter. Response and recovery efforts are difficult to perform without electricity. Hospitals, fire stations, police departments, pharmacies, and grocery stores need power to provide life, health and welfare services. Power may be disrupted for hours or

deploy certified renewable powered equipment to the disaster site. The process will be guided by an advisory board composed of renewable industry, research institute, and disaster organization representatives to assure that cost effective and viable renewable resources are deployed to meet disaster survivor needs.

**1. INTRODUCTION**

Disasters are a fact of life, whether they are hurricanes, earthquakes, tornadoes or man made events. Throughout history, people have responded with compassion for other's needs in a time of despair. Early recorded humanitarian efforts were for the neglected injured in time of war. The first organizations were national efforts for a country's own soldiers. In 1863, Henry Dunant started working to establish a non-partisan international organization to provide care to the wounded and sick in time of war. The following year, the Geneva Convention Treaty was signed by 12 countries in Geneva, Switzerland creating the International Red Cross. Now there are about a hundred different disaster related organizations providing some type of disaster relief.

Ninety-five percent of the disaster response effort is for life support and welfare. Water, food, and medical services are the first critical needs, followed by shelter. Response and recovery efforts are difficult to perform without electricity. Hospitals, fire stations, police departments, pharmacies, and grocery stores need power to provide life, health and welfare services. Power may be disrupted for hours or weeks depending on the extent of the damage to the grid or building. If hardware stores, building supplies, and banks

are still standing but are not operational because of a lack of power, the recovery and rebuilding process slows even further. In addition, the economic impact of business closures is greater than it was in the past. Some people move to a shelter until their future is determined, while others will stay in their homes until the rebuilding process is started.

After a disaster, portable gasoline/diesel generators sell in great volume as the power outage drags on. In our modern age, restoring power to our home after a disaster to maintain a normal lifestyle is our greatest desire. The latest trend is to install a permanent emergency power system to power critical items when there is an outage. Most emergency power systems are gasoline/diesel generators connected to a building's power panel to power critical items, while a few generator systems are sized to power the whole building.

## 2. TIMES ARE CHANGING

Another, more sweeping change is in the making the use of renewable energy resources to power equipment. Renewable energy resources include solar, both thermal and photovoltaic technology; biodiesel and natural gas generators; wind generators; and small hydro-generators.

Photovoltaic (solar electricity) is the renewable resource most used in disasters to supply electricity. Photovoltaic power systems have been around since the 1960's and presently over 50,000 homes are powered in large part or fully by energy from the sun. Early applications were for remote homes located where utility power does not exist, such as on an island or mountain retreat as a stand-alone system. Photovoltaic (PV) power systems are sized to meet the home's energy needs and budget of the home owner. In recent years, people have been installing PV for demand side management to offset their utility consumption as grid-tied systems.

Now, the trend is for utility interactive systems to reduce their utility energy usage, as well as having battery backup for power outages. Some people are installing PV systems to power critical items in their utility powered home as an emergency power system as you would do with an emergency generator. What is being developed now is the ultimate solution; a disaster resistant zero energy home. Mitigating your energy needs is more productive than responding with thousands of portable emergency systems. What do we do until every home has at least some access to renewable energy sources?

## 3. FIRST RESPONSE

Until everyone has a disaster resistant zero energy home, first responders will still need electricity to do their jobs

after a disaster. Various disaster organizations will continue to respond with thousands of volunteers, working to provide clean water, hot food, and medical services. Until the local utility has completed restoring power to local residents affected by the disaster, the disaster volunteers will need portable electricity sources to complete their jobs effectively.

Generators will still make sense for certain applications due to the size of the load, as in hospitals. However, in many cases portable PV powered equipment will meet the survivor's needs in those critical first days. PV equipment that can be used in conjunction with first response efforts to establish basic electrical services and satisfy critical needs until utility services are restored can be obtained and deployed. Fast and deliberate deployment of equipment is needed in response to a disaster; therefore, ready-to-use systems designed for individual applications are most effective. These resources can be specified as individual equipment related to a function or application and are defined in Table 1.

### TABLE 1. EQUIPMENT APPLICATIONS.

Flashlights  
Portable FM/AM weather radios  
Security area lighting  
Battery chargers  
Water purifiers  
Victim detection equipment  
Portable life support medical equipment  
Sensors and instrumentation  
System monitoring equipment  
Pipeline leak detection  
Temporary warning signals and signs  
Small module chargers  
Portable pack generators  
Mobile trailer generators  
Portable pumping stations  
Hand-held radio transceivers  
Portable radio repeaters  
Vaccine refrigerators  
Coolers  
Portable backup power  
Facility surveillance

Listed in table 1 are various applications that are presently available that can operate from PV power systems. Generally, photovoltaics generate electricity in various amounts to power anything that uses electricity. There are many consumer items already on the market to meet personal energy needs that use PV that are viable for disaster applications. Backpackers and campers already use many of these devices, which can be obtained from outdoor and recreational supply stores. PV is a viable source of

electrical power for certain disaster relief applications such as low power needs and long term usage. Electrical energy needs can vary from two watts to charge the small batteries in a flashlight to 1,000 watts to power a saw. This equipment can be classified as a hand-held consumer device, a portable device when installed in a carrying case, as well as a mobile unit when mounted on a trailer.



Fig 1. Supplied to Homestead, Florida

#### 4. HISTORY

Over the years, several solar organizations and individuals have donated or loaned various solar equipment to survivors of a disasters. The first recorded use of PV being deployed in a disaster was in 1989 with Hurricane Hugo, where a PV retailer donated several 20 watt modules to power lights at a tent camp in the Bahamas. In 1992, Kyocera donated 500 solar lanterns to survivors of Hurricane Andrew living in tent camps in Homestead, Florida (figure 1). The Rotary Club donated several hundred solar ovens for the victims of the tsunami in Bonanand.



Fig 2. Distribution Center at Biloxi, Miss. Recently, in response to Hurricane Katrina, New Life Evangelistic Center of New Jersey built 10 small PV

systems, transported them to Mississippi and donated them to relief supply distribution centers (figure 2). The National Renewable Energy Laboratory loaned their PV emergency trailer to a person with special medical needs in Pearlington, Mississippi (figure 3). At the same time, the Florida Solar Energy Center loaned their PV emergency trailer to power a temporary emergency radio station in Kiln, Mississippi. There have been over 40 recorded instances of different PV equipment being deployed in response to a disaster.



Fig 3. Special needs at Pearlington, Miss.

#### 5. THE PROGRAM

Provision of shelter, food and health services has been provided successfully for years by the Red Cross and many other volunteer organizations. This program will follow the same successful approach of these organizations. The National Energy Foundation and the Florida Solar Energy Center have formed the Renewable Energy Disaster Relief Fund (REDRF) to provide renewable energy resources (such as photovoltaics) to power equipment needed by survivors of a disaster in the United States. This organization will structure and organize disaster energy response efforts to provide a broader and more far reaching effort than in the past to supply critical power using renewable energy resources to survivors in the disaster area immediately after the event. The first three days are critical for life support as the local emergency management agency assesses the damage and determines needed support. The fund will deploy equipment to the disaster site within the first two weeks to meet their needs where there is no utility power.

The National Energy Foundation is a national nonprofit organization dedication to providing energy education to the general public headquartered Salt Lake City, Utah. The Florida Solar Energy Center is a research institute of the state of Florida administered by University of Central Florida headquartered Cocoa, Florida.

This fund will collect donations from the general public, businesses, and various organizations through a variety of methods as do other disaster organizations. The fund can receive donations through checks and credit cards through the mail and the fund's on-line internet web site at [www.REDRF.org](http://www.REDRF.org). The capital will be used to purchase renewable energy hardware to power necessary equipment for services needed for first response efforts after a disaster, ideally within the first weeks after an event. Funds will also be used to certify equipment, market the program, transport equipment to site, transport deployment teams and educate users with minimal overhead. A team of trained REDRF first responders will collaborate with local relief organizations to deploy certified renewable powered equipment to the disaster site. The equipment will be donated to the survivors through local relief organizations for use in recovery as they evaluate their circumstances and determine their future.

The process will be guided by an advisory board composed of renewable industry, research institute, and disaster organization representatives to assure that cost effective and viable renewable resources are deployed to meet disaster survivor needs. The advisory board will serve without salary. National Energy Foundation will administer the fund and operate the website. Equipment specification and evaluations will be completed by FSEC, NREL and SNL as necessary. The fund will partner with the American Red Cross, Volunteer Organizations Active in Disasters (VOAD), Rotary clubs, the Salvation Army, and other organizations already involved with disaster response. As these organizations respond to a disaster, REDRF will coordinate with them to provide renewable resources to meet the energy needs of the survivors and those of the volunteers. A Memorandum of Understanding is being developed with each partner organization and equipment supplier. Efforts have begun in Florida, with the work being done by the Florida Solar Energy Center, and will expand as the program matures to an international effort.

## 6. THE NEXT STEP

In the future, REDRF may extend into an international program and partner with international organizations to respond to disasters around the world. As these organizations become familiar with renewable energy resources, the fund will assist them in implementing renewable resources into their organization's programs. The ultimate solution is that everyone obtain a disaster resistant zero energy home that is not destroyed and rendered powerless by disasters.

## 7. CONCLUSION

Providing disaster relief with renewable energy sources is not a new idea, as various concerned citizens and organizations have already loaned and donated PV powered equipment to survivors of various disasters over the past two decades. What is new is the formal, organized approach to provision of this necessary service. A larger number of more effective renewable resources will be provided in an organized manner to the people that really need it at no cost to them in a time of need. The buy-in of major organizations to this program should ensure its success. The giving hearts of the people should keep the program growing. The usefulness of the program will be determined by a growing demand for its services by more disaster organizations participating in the program. Ultimately, we hope that users of the equipment provided by REDRF in disasters will incorporate PV and other renewables into their normal lives.

## 8. REFERENCES

- (1) Young, Jr, William, Photovoltaic Applications for Disaster Relief, FSEC-CR-849-95, Florida Solar Energy Center, Cocoa, FL, USA, March. 2001.
- (2) Young, Jr. William, History of Applying Photovoltaics to Disaster Relief, FSEC-CR-934-97, Florida Solar Energy Center, Cocoa, FL, USA, Jan 1997.
- (3) Young, Jr. William, Ventre, Gerard, and Thomas, Micheal, Needs Assessment for Applying Photovoltaics to Disaster Relief, FSEC-CR-935-97, Florida Solar Energy Center, FL, USA, July, 1997.
- (4) Hoff, T.E., C. Herig, and L. Gellettee, Distributed PV's Contribution to American's Energy Security: Tax Revenue Protection for the Federal Government, Interim NREL Report, 2002
- (5) Becker, William, R. Stauffer, Rebuilding for the Future: A Guide to Sustainable Redevelopment for Disaster-Affected Communities, U.S. Department of Energy, September 1994
- (6) Deering, Ann, John, Thornton, Solar Solutions for Natural Disasters, Risk Management, February 2000
- (7) Young, Jr. William, Photovoltaics: Disaster and Energy Security Applications, World Renewable Energy Congress VIII, Denver, Colorado, FSEC-PF-373-03, Florida Solar Energy Center, August 2004
- (8) Young, Jr. William, Photovoltaic Use In A Disaster: Mitigation Verses Response, World Renewable Energy Congress IX, Florence, Italy, FSEC-PF-390-06, Florida Solar Energy Center, August 2006
- (9) Young, Jr. William, Disasters: Photovoltaics for Special Needs, Solar World Congress 2005, International Solar Energy Society, Orlando, Florida, FSEC-PF-384-04, Florida Solar Energy Center, August 2005.