

Louisiana TAP Request – Part II - C

A Brief Review of Renewable Generation Disaster Relief Applications for Louisiana

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Through the U.S. Department of Energy's Technical Assistance Program (TAP), the Louisiana Department of Natural Resources (DNR) asked NREL to provide an overview of four main topics, including: (1) green school programs, including financing options and opportunities; (2) utility support for energy efficiency and renewable energy, and greenhouse gas reductions; (3) renewable energy certificate trading programs and state-level renewable portfolio standards; and (4) applications of energy efficiency and renewable energy for Louisiana.

The following report summarizes NREL's research and findings on renewable generation, particularly solar photovoltaic (PV), as applied to disaster relief activities for Louisiana.

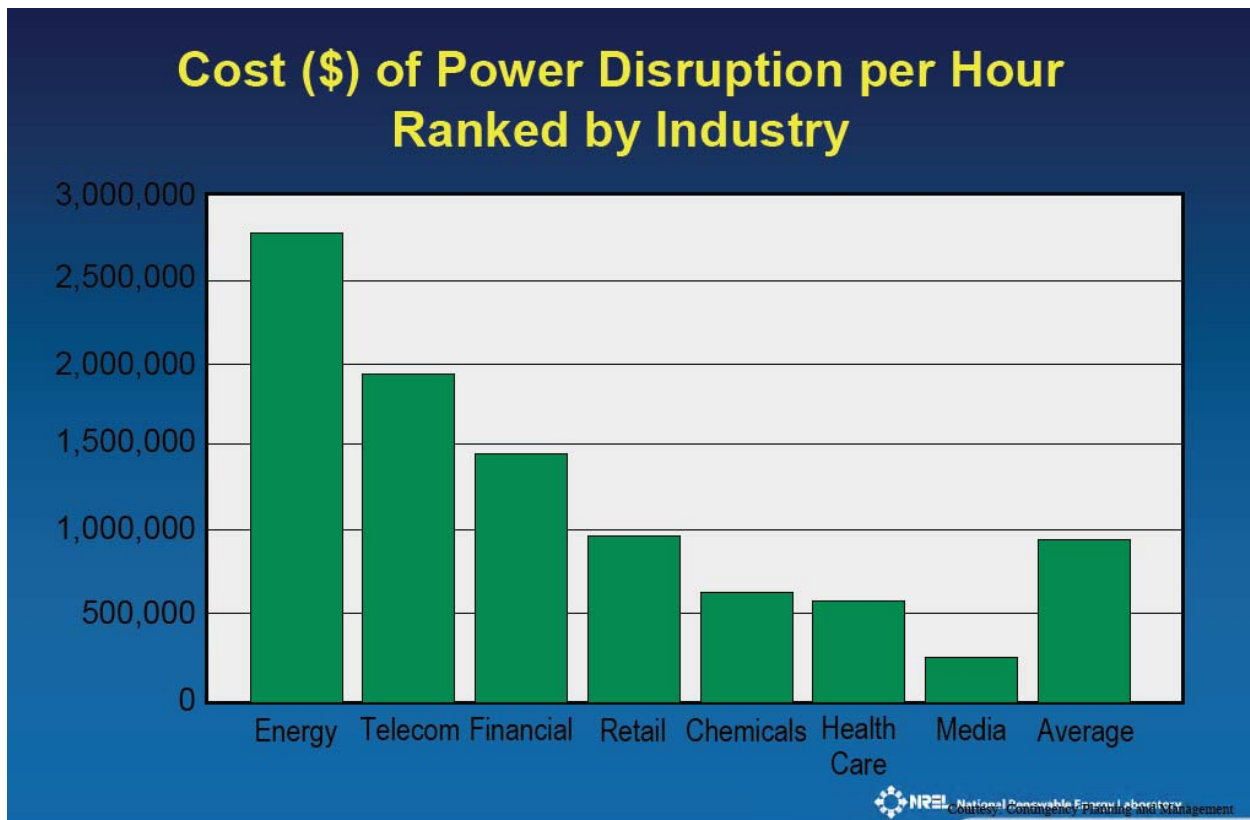
1.0 National Renewable Energy Laboratory

1.1 Energy Efficiency and Renewable Energy for Disaster Resiliency and Recovery

Carol Tombari's May 10, 2006 presentation at the Industrial Technology Energy Conference, prepared on behalf of the state energy office in Louisiana. In retrospect, Carol said that she may not have presented to the proper audience – industry didn't seem too interested in the concepts, so perhaps state government would be more responsive. Would there be a better audience for her presentation?

Key points from her presentation include:

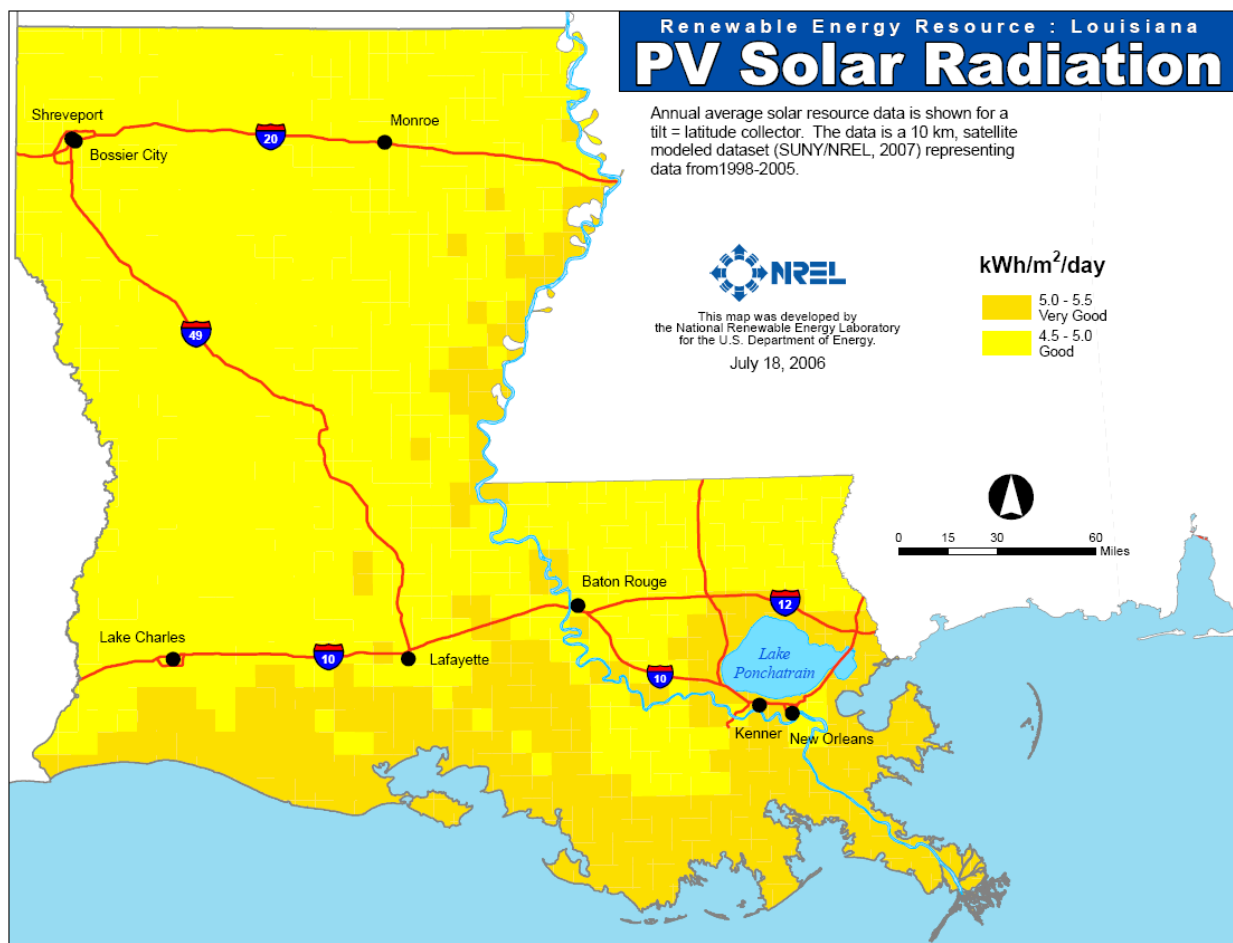
- Power outages and power quality disturbances cost the U.S. economy more than \$119 billion annually (Electric Power Research Institute, 2001)
 1. What is the value of electricity if you don't have any?



- Safeguarding our energy infrastructure:
 1. Decrease domestic energy use through energy efficiency
 - Austin, TX – “conservation power plant”
 - Vermont – energy efficiency utility (for the state as a whole)
 2. Reduce our dependence on imported fuels
 - Hybrids, reduce vehicle miles traveled and improved planning of trips, fleets
 3. Maintain, protect and upgrade our existing infrastructure
 4. Deploy smart, resilient systems
 - Smart grids, distributed systems
 5. Diversify our generation options
 6. Increase our use of distributed generation
 - Reduced congestion, overloading and energy losses in transmission lines,
 - Better power reliability and quality; increased grid reliability
 - Increased resiliency and flexibility
 - Renewable power sources can reduce fuel distribution complexity as well as dependency on imported fuels
- Four phases of disasters and EE RE technologies that can be used
 1. Prevention - PV can provide remote power to monitor and detect potential problems (e.g. pipeline leaks)
 2. Mitigation
 - Highly energy efficient buildings tend to be disaster resistant and self-sustaining.
 - PV can provide uninterruptible power (UPS) and can be disaster resilient
 3. Response
 - PV is a fantastic source of emergency power – the clear weather after a storm provides for immediate power distribution
 - Deploy on schools, as community emergency shelters
 - It is small and portable and can be used as a power source for mobile response and recovery
 - Louisiana has good solar resources (see map below)
 4. Recovery
 - PV can provide excellent back-up power
 - PV could be particularly important for supporting infrastructure
 - Traffic control and warnings
 - Strategically located gas stations
 - PV can also help get fossil fuel systems and infrastructure back on-line
 - Field production monitoring
 - Pipeline control and monitoring
 - Pipeline power

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An expanded collection of resource maps is included in a Louisiana Renewable Resource document, separate from this document.

1.2 NREL report on energy secure schools

Published in January 2006, this NREL report examines the use of photovoltaic systems to create "energy secure schools". Such systems can convert schools to emergency centers if there are disruptions to either the electricity grid or natural gas pipelines. At the same time, these PV systems can lower utility bills at schools on an on-going basis. The report examines various energy secure school options. See <http://www.nrel.gov/docs/fy06osti/38435.pdf>

1.3 NREL report on reducing the risk of insurance loss with renewables

A report from NREL (1997) on how passive solar building design and photovoltaic power systems can serve an important role in speeding recovery time and limiting the consequences of the initial impact of climatic disasters. The information is still relevant today.

<http://www.nrel.gov/docs/legosti/fy97/22820.pdf>

2.0 Lawrence Berkeley National Laboratory

Lawrence Berkeley National Laboratory (LBNL) is focusing their research on climate change and the insurance industry. In many of their reports and activities, they identify energy efficiency as one way to reduce an individual's contribution to climate change, but also as a way to be better prepared for natural disasters and to reduce insurance claims. Below a few activities and reports from LBNL are highlighted.

2.1 LBNL Activities

<http://eetd.lbl.gov/insurance/>

Climate change can have adverse impacts on insurance affordability and availability, potentially slowing the growth of the industry and shifting more of the burden to governments and individuals. Most forms of insurance are vulnerable, including property, liability, health, and life. It is incumbent on insurers, their regulators, and the policy community to develop a better grasp of the physical and business risks. Insurers are well positioned to participate in public-private initiatives to monitor loss trends, improve catastrophe modeling, address the causes of climate change, and prepare for and adapt to the impacts.

This website includes LBNL activities and Insurance Industry activities and links.

<http://eetd.lbl.gov/insurance-research/cifram.html> (*direct quote from LBNL website*)

Since 1994, we have pioneered activities that enhance understanding of the global insurance industry's exposures to climate change and proactive strategies for responding to the risk. Our work has included forging new linkages between the energy and insurance communities by cultivating measures that simultaneously lower energy bills and yield traditional insurance loss-prevention benefits like the reduced risk of property, health, or liability claims. Some strategies have insurance value in terms of improved indoor and urban air quality, while others offer the added benefit of reducing energy-related pollution. These "no-regrets" measures stand to financially benefit insurance companies and their customers in the near term, irrespective of the environmental dividend that may also result in the long run.

Consultations with insurance industry members help guide our work. New projects and partnership opportunities are continuously under development. Among the specific "tools" we have successfully helped insurers recognize and utilize are:

- Information and Education
- Financial Incentives (via premium credits)
- Specialized Policies and Products
- Direct Insurer Investment to Promote Energy Efficiency
- Value-Added Customer Services
- Efficiency Codes and Standards
- Research & Development
- In-House Energy Management
- LBNL – insurance and climate change

2.1 LBNL Reports

Synergisms between climate change mitigation and adaptation: an insurance perspective

<http://eetd.lbl.gov/EMills/PUBS/PDF/MITI-Mills-2007.pdf>

As the world's largest industry, the insurance sector is both an aggregator of the impacts of climate change and a market actor able to play a material role in decreasing the vulnerability of human and natural systems. This article reviews the implications of climate change for insurers and provides specific examples of insurance-relevant synergisms between adaptation and mitigation in the buildings and energy sectors, agriculture, forestry, and land use. Although insurance is far from a "silver bullet" in addressing climate change, it offers significant capacity and ability to understand, manage, and spread risks associated with weather-related events, more so today in industrialized countries but increasingly so in developing countries and economies in transition. Certain measures that integrate climate change mitigation and adaptation also bolster insurers' solvency and profitability, thereby increasing their appeal. Promising strategies involve innovative products and systems for delivering insurance and the use of new technologies and practices that both reduce vulnerability to disaster-related losses and support sustainable development. However, climate change promises to erode the insurability of many risks, and insurance responses can be more reactive than proactive, resulting in compromised insurance affordability and/or availability. Public-private partnerships involving insurers and entities such as the international relief community offer considerable potential, but have not been adequately explored.

From Risk to Opportunity: How Insurers Can Proactively and Profitably Manage Climate Change

http://www.ceres.org/pub/docs/Ceres_Insurance_Climate_%20Report_082206.pdf

Rising weather-related losses are causing adverse impacts on insurance affordability and availability. In Florida and Louisiana alone, more than 600,000 homeowners' property policies have been cancelled or not renewed in the past year. However, insurers have a huge opportunity today to develop creative loss-prevention solutions and products that will reduce climate-related losses for consumers, governments and insurers, as well as the emissions causing global warming. This report shows encouraging progress from insurers in this regard, although much greater efforts are required in the future in order to achieve these goals.

A vanguard of insurers have begun to take concrete actions that generate well earned profits while maintaining insurability and protecting their customers from extreme weather related losses, as well as reducing greenhouse gas emissions. Many of these strategies are already in practice, providing benefits and savings for insurers and their customers. We identified 190 real-world examples, provided by 104 insurers, brokers, and insurance organizations from 16 countries employing one or more of these methods. More than half of the examples come from U.S. companies.

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3.0 Oak Ridge National Laboratory

Oak Ridge National Laboratory does direct laboratory testing that simulate flood conditions and identify materials, systems and procedures that can best prevent damage from flooding.

Field Testing of Energy-Efficient Flood-Damage-Resistant Residential Envelope Systems Summary Report

http://www.ornl.gov/sci/res_buildings/FEMA-attachments/FEMA%20HUD%20Field%20Testing%20Summary%20Report%20June%2004.pdf

This detailed report from ORNL explained results from testing on specific building materials and systems to determine the ability to withstand flooding conditions and be refurbished to pre-flood condition. It also examined various procedures, including cleaning and sanitizing (e.g. punching holes in walls for drainage – which is not recommended).

As part of this effort, Oak Ridge has collaborated with Tuskegee University in Alabama in the past on flooding issues and building materials. Although the program is no longer active, the joint presentation on "Rebuilding a Flood Damaged Home" may be of value.

Rebuilding a Flood Damaged Home

<http://www.adeca.alabama.gov/C3/RAH/Document%20Library/ADECA%20Training%20Flood%20Damage%20Home%20Reconstruction%204%2025%2006.pdf>

4.0 Partnership for Advancing Technology in Housing

4.1 PATH Overview

<http://www.pathnet.org/index.asp>

The Partnership for Advancing Technology in Housing (PATH) is dedicated to accelerating the development and use of technologies that radically improve the quality, durability, energy efficiency, environmental performance, and affordability of America's housing.

PATH is a voluntary partnership between leaders of the homebuilding, product manufacturing, insurance, and financial industries and representatives of Federal agencies concerned with housing. Working together, PATH partners improve new and existing homes and strengthen the technology infrastructure of the United States.

HUD's Office of Policy Development and Research (PD&R) coordinates all PATH activities. PD&R manages PATH's budget, strategy, and daily operations. Staff in PD&R's Affordable Housing Research and Technology Division have expertise in various construction systems, housing issues, and technology policies.

Because PATH involves many participants from diverse parts of the home building community, PATH seeks guidance from the Industry Committee and other Federal agencies. PATH also works with industry partners to advance housing technology.

PATH promotes innovation through three key strategies:

- Identify and reduce barriers that impede innovation, including regulatory barriers. PATH analyzes and prioritizes existing barriers to provide recommendations for overcoming them.
- Disseminate information to speed the development and adoption of advanced building technologies. To encourage broader diffusion of innovations, PATH provides unbiased, easily accessible information to consumers, builders and manufacturers.
- Advance housing technology research and foster development of new technology. PATH research focuses on the innovation process and aims to institutionalize sustained investments in housing with public and private funding.

4.2 PATH recommendations for dealing with natural disasters

Natural disaster resistance

<http://www.pathnet.org/sp.asp?id=1237>

This overview website highlights decisions that homeowners have to make when constructing or retrofitting a home to make it disaster resistant.

Disaster Resistant Technologies

<http://www.pathnet.org/sp.asp?id=23519>

Several specific technologies are more disaster resistant than others – the technologies listed on this website provide homeowners with ideas about how to make their house more resilient towards natural disasters.

Recovering from a flood

<http://www.pathnet.org/sp.asp?id=12574>

This website covers guidance for how to reconstruct using flood resistance materials:

- Homeowners
- Reconstruction professionals (including details of various aspects of external, internal components of buildings)

And also cites references, including one that was referenced several other places:

American Red Cross Guide – Repairing Your Flooded Home

http://www.redcross.org/static/file_cont333_lang0_150.pdf

Hurricane retrofit strategies

<http://www.pathnet.org/sp.asp?id=16371>

This website explains specific materials and ways to protect your home from hurricanes. PATH prepared 5 technical briefs to guide do-it-yourself homeowners to repair damaged homes in the Gulf States. Specific strategies that protect against hurricanes that are explained, include shutters or impact resistant glazing, securing roof sheathing to trusses, reinforcing garage doors, strengthening exterior doors, and reinforcing gable roof trussing. Other recommendations are included.

5.0 Florida Solar Energy Center

The Florida Solar Energy Center (FSEC) was created by the Florida Legislature in 1975 to serve as the state's energy research institute. The main responsibilities of the center are to conduct research, test and certify solar systems and develop education programs. As a result of Hurricane Andrew in 1992, FSEC has been actively engaged in the use of photovoltaics in emergency and disaster relief situations supported by a number of organizations including NREL. FSEC carries out the following activities in this area;

- Studying the energy needs of disaster relief organizations
- Evaluating and testing PV equipment for use after disasters
- Conducting workshops
- Providing technical support to various disaster relief and emergency management organizations and the solar industry
- Designing demonstration projects
- Loaning PV equipment for use after disasters

http://www.fsec.ucf.edu/en/consumer/solar_electricity/index.htm

5.1 Photovoltaic Applications for Disaster Relief

FSEC published the 3rd edition of this report in February 2006. The document "focuses on photovoltaic technology and its applications to disaster relief efforts and terrorism. In addition, the report discusses the need for electrical power priorities for those needs following disasters and the use of power during response, recovery, and mitigation".

NREL will mail hard copies of this report to the Louisiana DNR.

5.2 Hurricane Katrina: Solar Applications

FSEC's Bill Young traveled to Mississippi after Hurricane Katrina to assess the degree to which PV systems were being used in response to the disaster. The PowerPoint presentation chronicles his trip and highlights the deployment of PV applications.

http://www.energyfordisasters.org/Katrina_Applications.pdf

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6.0 Chicago Solar Partnership

Chicago Solar Partnership

<http://www.chicagosolarpartnership.org/>

6.1 Solar PV on Chicago's 911 Call Center

http://www.chicagosolarpartnership.org/index.php?src=directory&srctype=display&id=177&view=pvsites_detail

The Chicago Office of Emergency Management and Communications (OEMC) is the City of Chicago's hub for routing some five million annual 911 emergency calls to thousands of police and fire units, as well as being the primary contact agency for communications with the U.S.

The OEMC has a 10-kilowatt solar electric photovoltaic (PV) backup system in addition to the 38-kilowatt system installed by Spire Solar Chicago in early 2002. A commercial battery system donated by ComEd stores the backup power supply, providing additional energy reliability to this load-critical application.

The uninterruptible power supply will feed energy for lighting of the Joint Operations Center (JOC) housed within the OEMC. The 10-kilowatt photovoltaic system produces enough electricity to power the equivalent of 1-2 homes. It will keep the standby batteries charged, while providing pollution-free, renewable electricity year round.

6.2 Chicago – Solar Means Security: How Safe is Your Community Workshop

<http://www.chicagosolarpartnership.org/index.php?src=news&submenu=About&refno=1&category=News>

The one day event was held at the Harold Washington Social Security Administration building in Chicago. The Chicago Solar Partnership, along with the US DOE Midwest Regional Office, City of Chicago, IBEW, ComED, Spire Solar Chicago, and the Illinois Solar Energy Association presented the first conference of its kind in the nation. Attendees from five states, surrounding municipalities, the British Columbia and Chile came to learn how solar energy systems can be effectively integrated into emergency response planning. Speakers from across the nation addressed topics including solar powering mission critical facilities and 911 centers, solar powered traffic and transportation controls and communications, solar thermal applications for emergency shelters, solar distributed generation and grid security and net metering and interconnection considerations. Expert participants that could be helpful to Louisiana and New Orleans include:

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Other experts that provided information include: Mark Burger, President, ISEA and Sales Manager, Spire Corporation; Bill Kosik, Managing Principal, EYP Mission Critical Facilities; Matthew Watson, Vice President Corporate Development, Carmanah Technologies, Inc.; Valerie Rauluk, Principal, Venture Catalyst Inc.; Russ Reed, Vice President Manufacturing and Business Development, Solargenix; Rich Griswold, Midwest Sales Manager, Kyocera Solar Inc.; Tom Leyden, Vice President, PowerLight Corporation; and Jigar Shah, CEO, Sun Edison Inc. Gary Nowakowski, Team Lead, Technology, US DOE Midwest Regional Office, moderated the session and led the discussion.

7.0 Summary Chart of Emergency Equipment Requiring Electricity

Emergency Support Functions

Need	ESF1 - Transportations	ESF2 - Communications	ESF3 - Public Works & Engineering	ESF4 - Fire Fighting	ESF5 - Information & Planning	ESF6 - Mass Care	ESF7 - Resource Support	ESF8 - Health & Medical Services	ESF9 - Search & Rescue	ESF10 - Hazardous Materials	ESF11 - Food & Water	ESF12 - Energy	ESF13 - Military Support	ESF14 - Public Information	ESF15 - Volunteers & Donations	ESF16 - Law Enforcement & Security	ESF17 - Animal Issues
Call boxes	X	X															X
Flashing arrow board	X		X														
Flashing warning signals	X		X														
Folding man packs		X	X	X	X	X	X	X	X		X	X				X	
Hand-held radios		X	X	X	X	X	X	X	X	X				X	X	X	X
Highway advisory radio	X	X	X														
Medical equipment				X	X	X	X	X									
Message signs	X		X														
Personnel lights				X	X	X	X	X					X			X	
Photovoltaic generators		X	X	X	X	X	X	X			X	X				X	X
Portable cellular phones		X	X	X		X	X	X	X					X		X	
Portable AM/FM radios		X		X	X									X			
Portable pumping stations			X	X				X									
Radio base stations		X	X					X								X	
Refrigerators					X	X	X			X							
Sampling/monitoring/detection/equip.				X			X	X	X								
Security lighting			X		X	X	X		X	X			X		X	X	X
Small battery chargers		X	X	X	X	X	X	X			X				X	X	
Small generators		X	X	X	X	X	X	X			X	X			X	X	
Street lighting	X		X													X	
Traffic signals	X		X														
UPS/Backup power		X	X		X	X	X	X	X	X	X	X				X	
Victim detection equipment				X				X									
Water purification			X		X	X	X			X							X

Essential Equipment Requiring Electricity

Source: Photovoltaic Applications for Disaster Relief. 3rd Edition. February 2006. University of Central Florida. Florida Solar Energy Center