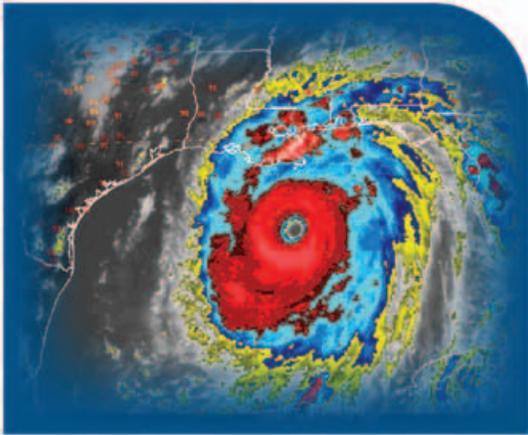




Rebuilding After Disaster: Going Green from the Ground Up



About This Guide

If you're a leader in a community that has met with disaster and must be rebuilt, this guide is for you. It's intended to show how communities—big or small—can incorporate green principles and technologies like energy efficiency and renewable energy into their rebuilding plans. The information in this guide is based on the real-life experiences of two U.S. Department of Energy (DOE) teams. One team worked with city leaders in New Orleans, Louisiana, after hurricanes Katrina and Rita in 2005, and the other assisted community leaders in Greensburg, Kansas, after a devastating tornado in 2007. Although the two communities are quite different, the teams learned common lessons and found that the reasons for going green from the ground up are compelling.

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Key Distinctions

In this guide, we focus on topics related to disaster recovery as distinct from disaster response, with the two concepts defined as follows:



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Response: Immediate action, in which core emergency services and first responders—firefighters, police officers, and emergency medical technicians—mobilize in the disaster area. Specialist rescue teams (e.g., divers) or Hazmat crews may be called in. Response focuses on rescuing people, pets, and livestock; treating injuries; dealing with any loss of life; setting up emergency shelters; restoring electricity and natural gas services; supplying clean water; and clearing streets and neighborhoods of dangerous debris.

Recovery: Ongoing action with the goal of restoring the area to its pre-disaster state or better. Recovery involves rebuilding destroyed property, putting residents back to work or creating new jobs, repairing essential infrastructure, bringing all community services back online, and attracting new industries.



Galen Buller, Ingalls, Kansas/PIX 16675

Out of Crisis, Opportunity

Galen Buller, Ingalls, Kansas/Pix 16666



Every year, communities just like yours are devastated by tornadoes, floods, hurricanes, and other natural disasters. If disaster does strike your community, the initial response will focus on immediate needs. After those are met, and some of the shock wears off, the community can begin to recover. And although discouragement and despair are natural responses to a disaster, human beings are also resilient. The residents of your community are likely to want to return quickly to the way things were. There's great comfort in familiarity, and its pull is strong.

[America has always] found the capacity to not only endure, but to prosper—to discover great opportunity in the midst of great crisis.

—President Barack Obama

But as you begin to make plans for recovery, you might want to take a step back. Try to see past the devastation for a moment. Reframe that shattered glass as a clean, new window of opportunity. You can choose to make this catastrophe into an opportunity. . . not just to return to the status quo, but to grow and change. Instead of reflexively reinstating the choices of the past, why not rebuild today to better position your community for tomorrow?

One way to do this is by rebuilding your community as a model of sustainability. This means reducing energy use, using energy more efficiently, incorporating more renewable energy, and much more.

That's what Greensburg did. It's also happening in parts of New Orleans.

And it's what this guide is all about. The pages that follow explain how we're using green terminology and outline the benefits of rebuilding sustainably. Next, we present a step-by-step process for green disaster recovery (or simply "green recovery"). The guide includes suggestions based on the lessons learned in Greensburg and New Orleans along with concrete examples from both communities. Because this guide is intended as an introduction to green recovery, it includes a number of other resources for you and your community to explore. For more details about any of the federal, state, and local organizations, programs, and associations mentioned in the text, please visit the Web sites listed in the For More Information section starting on page 18.

What Happened in Greensburg and New Orleans

On May 4, 2007, Greensburg was a declining but close-knit farming community with a population of about 1,400 in Kiowa County in south-central Kansas. That night, an EF-5 tornado—the highest level on the standard meteorological scale used to estimate wind strength—plowed through the town. With winds estimated at more than 200 mph, the tornado killed ten people and destroyed or severely damaged 90% of the community.

Hurricane Katrina struck the New Orleans area in the early morning on August 29, 2005. The storm surge breached the city's levees in multiple places, leaving 80% of the city submerged, tens of thousands of victims clinging to rooftops, and hundreds of thousands scattered to shelters around the country. Three weeks later, Hurricane Rita reflooded much of the area. The devastation to the Gulf Coast by these two hurricanes has been called the greatest disaster in our nation's history. More than 1,800 people are believed to have lost their lives, and damages have exceeded \$81 billion (NOLA.com 2008).

Why Go Green from the Ground Up?

First, let's clarify what we mean by green. It's easy to get hung up on defining terms that may mean different things to different people, and you don't want your recovery efforts to stall because you can't arrive at a common definition. Even seasoned experts disagree on common explanations of all the elements embodied in the word "green". Actually, that's part of the beauty of the term . . . it encompasses so many choices. In this guide, we're aiming for simplicity and aligning with today's common parlance. So we're using the terms "green" and "going green" to encompass energy efficiency (using less energy to supply the same level of energy service) and renewable energy (energy produced from the sun, the wind, and the water, among many other sources). The terms also embody principles of



Catherine Hart, Greensburg GreenTown/PIX 16671



Catherine Hart, Greensburg GreenTown/PIX 16670

In rebuilding the Kiowa County, Kansas, courthouse—originally constructed in 1914—the community decided to salvage the original white trim along with several ornate doors from the stately and historic building.

Why Consider Energy At All?

Because it's an integral part of our daily lives, whether we think about it or we don't. Of the energy used in the United States today, residential buildings account for 21%; commercial and public buildings for 18%; industry for 32%; and transportation for 29%. According to the Energy Information Administration (EIA 2008), this energy comes from coal (22%), natural gas (19%), domestic crude oil (12%), imported petroleum (27%), various other imports (6%), and nuclear power (8%).

Natural gas and crude oil prices are volatile and subject to fluctuations outside our nation's control. That volatility leads to greater uncertainty in forecasting energy costs, which, in turn, can make lenders or investors reluctant to support new projects. Or, lenders may charge higher interest rates on loans for projects to cover what they perceive as higher risks.

sustainability, by which we mean simply that new development meets needs of today without compromising those of tomorrow. Resource conservation, recycling, and reuse, along with best practices for community and building design and construction that minimize negative environmental impacts, are the final pieces of the green picture.

In this guide, we focus primarily on energy considerations within a larger green and sustainable framework.

The nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased, and not impaired, in value.

—Theodore Roosevelt

Rallying Greensburg Around Green Recovery

Inevitably, questions borne of despair follow incredible devastation. Should we even rebuild here? Will enough people come back? Will we ever even have a town, a city, again? In Greensburg, just days after the storm, community leaders and members came together and decided that their town was worth rebuilding. And they had some novel ideas about how to do it.

Maybe, they said, we can rebuild to use the wind that almost destroyed us to generate electricity. Rebuild to consume less energy and water and more local food. Rebuild to give our children the best and greenest school in Kansas.

These green messages resonated with local and state leaders alike, and excitement began to build about rebuilding Greensburg to truly embody its name. One by one, the townspeople embraced the green initiative.

Rebuilding as a model green community became the cornerstone of the town's new master plan and the economic development vision of the townspeople.

Today, the headline on the City of Greensburg Web site says it all:

Greensburg: Better, Stronger, Greener!



Lynn Billman, NREL/PIX 16650

The county courthouse renovation in Greensburg captures much of the structure's original design and beauty but incorporates new energy efficiency strategies including daylighting (using the existing window openings) and high-performance lighting and controls. The building also uses pipes beneath the ground to capture geothermal energy, lowering the cost of heating and cooling.

Green Choices, Community Benefits

Making green choices during disaster recovery has a number of benefits:

Lower energy bills. The large-scale rebuilding effort following a disaster is an ideal time to require or encourage high energy efficiency standards for all new and remodeled buildings. Constructing energy-efficient buildings from the ground up is much cheaper than retrofitting or upgrading down the road.

*Our choices at all levels—individual, community, corporate and government—
affect nature. And they affect us.*

—David Suzuki

Cleaner energy sources. If the disaster affected your local utility, this might be the perfect time to change the electricity mix to incorporate more renewable energy sources such as wind and solar. You might be able to negotiate a new type of power purchase agreement with the local utility, or you might build your own generation facilities to bring more renewables online.

A cleaner environment. Using energy produced from renewable sources softens your impact on the planet. Clean, renewable energy reduces the carbon emissions that contribute to global warming and significantly lowers emissions of other regulated pollutants (like sulfur dioxide and oxides of nitrogen). In addition, generating electricity from renewables can save large amounts of water—an increasingly precious commodity.

More robust economic development. When you make the commitment to greener choices in all sectors of your community, economic opportunities can follow. Green recovery can set a new focal point for economic development, place emphasis on new green-collar jobs, and improve your community's image, which in turn, can attract businesses and residents.

A renewed sense of hope. Joining other communities that are embracing different ways of building, greener community master plans, and new renewable energy sources can help create a vision of hope for your citizens and business owners. Most importantly, coming together to go green will help you recapture the values and sense of common identity that gave your community cohesiveness before the disaster.

Green communities are easier than ever to achieve. Great strides have been made in ways to reduce the amount of energy used in homes and businesses. More and more communities are successfully generating electricity from the sun and the wind. Alternative transportation technologies are accelerating in the marketplace, and hybrid electric vehicles are now readily available in most vehicle categories. Interest in alternative fuels like biodiesel and other biofuels is high. Once-abstract concepts have progressed to concrete, real-world options that are available now.



Photo courtesy of the City of Greensburg/PIX 16667

Vehicles fueled with alternatives to petroleum are on the road today, and automakers continue to pioneer new offerings each year.



Invenergy, LLC / PIX16042

Warren Greitz / PIX10598

The wind and solar power technologies that are readily available on today's market can make a significant contribution to your community's energy needs.

Crafting a Green Recovery Plan

So how do you get started? If your community already has a master development plan, an energy plan, or an energy policy, you have a head start. You can begin the green rebuilding efforts by revisiting and updating your existing plan. You're likely to find that some green projects are now possible simply because you must rebuild. If your community doesn't have any sort of master plan, take this opportunity to create one. The goal should be to develop a single, unified plan that avoids redundancy and overlap.

.....
Success always comes when preparation meets opportunity.

—Henry Hartman
.....

A suggested framework for getting there—seven sequential steps—follows. As you move through the steps and consider the associated issues and examples, make a commitment to writing everything down and being as specific as possible. Aim for quantifiable goals wherever you can, but if you get stuck, set qualitative goals and move forward. The planning process should propel progress, not stymie it.

Step 1: Identify and Bring Stakeholders Together

A *stakeholder* is anyone who has an interest in your community. Stakeholders can include everyone from city leaders (either elected or appointed)—through planning and zoning commissions, economic development councils, chambers of commerce, and public building owners—to major business owners, affected and interested homeowners, education leaders and students, and nonprofits.

Depending on the size of your community, stakeholder lists can be long. But each will bring unique perspectives and diverse ideas to the table, leading to robust brainstorming sessions. Including as many stakeholders as possible from the outset—when you hold your first planning meeting—will build community buy-in for the final plan. It also ensures that representatives of various community sectors have the opportunity to air concerns that can be addressed in the planning process.



Gaining buy-in from stakeholders is an important part of any green recovery initiative.

Lynn Billman, NREL

.....
qualitative: adj. of, relating to, or involving quality or kind
quantitative: adj. of, relating to, or involving the measurement of quantity or amount.

—Merriam Webster Unabridged Dictionary
.....

At this stage of your planning, the importance of a **green champion**—someone who is passionate about the green cause—cannot be overstated. An ideal champion will be recognized and respected both in the community and within city government. Your champion must be willing to make the time to offer ideas and information, suggest opportunities, and work to inspire others to see the possibilities. The champion will also need to establish good communications and actively involve other stakeholders as much as possible.

A Few Words About Resistance

You may meet with some resistance among those individuals and business owners who want to rebuild right now. Greensburg officials recognized that the need to reestablish revenue was urgent and real, and they wondered whether they should insist on developing a new community plan before approving any construction permits. To help them decide, they visited New Orleans and other Gulf Coast cities and saw for themselves the real-life examples of the benefits of a good plan. They came home newly energized and spoke eloquently to their business leaders about the importance of waiting just a few more months so the community could “get it right.” City and business leaders then negotiated a commitment for a tight deadline from a planning firm, worked tirelessly with that firm, and developed an award-winning community plan in a remarkably short time.

If you meet with reluctance in your community, showcase Greensburg as a shining example of getting it right.

Resistance can also stem from fear of the unknown, and the antidote is to make the unknown known. This brings us to the next key point that applies to your stakeholders—the importance of education and communication.



Lynn Billman, NREL/PIX 16668

The RnE²EW vehicle is designed to take renewable energy technologies on the road. The vehicle is equipped with solar panels and a wind turbine, which produce the power needed to run everything that requires energy during an educational event like this one in Greensburg.

Educate, Communicate, Educate and Communicate Some More

The more your stakeholders know about the topics at hand, your proposed plans, and how these relate to their place in your community, the more comfortable they’ll be with new ideas and changing attitudes and behaviors. Winning community support for your green recovery plans will require you to pay deliberate attention to education and

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Learn everything you can, anytime you can, from anyone you can—there will always come a time when you will be grateful you did.

—Sarah Caldwell

.....



The World Wide Web offers a wealth of educational resources about energy efficiency and renewable energy. And most of the information, like the U.S. Department of Energy Web sites illustrated here, is free.

communication. Involving all your stakeholders will naturally enhance communication, but use your imagination and creativity to go a bit further.

Keep all your stakeholders up to date through communication venues like the city Web site, flyers distributed in public buildings and stores, articles in local newspapers, spots on local radio, regular and special public meetings, and announcements and reminders at group meetings to work on other topics. Greensburg communicated through all these venues at one time or another.

Your education efforts can be as simple as a printed fact sheet or as elaborate as a day-long seminar. To keep costs down, homebuilders' associations or professional green-building advocacy groups may be able to offer low-cost training in areas that apply to green recovery. Your residents and businesses may be interested in, for example:

- How much money they can save by reducing energy use in buildings
- What features make a building green or energy efficient
- How to improve insulation or windows during major repairs
- How to use alternative energy sources such as ground-source heat pumps (to capture and distribute geothermal energy), solar panels, solar hot water systems, and small wind turbines.

Local architects, engineers, contractors, and suppliers might find topics like these useful:

- Green building strategies, including integrated design
- Tax incentives for green building practices
- Continuing education courses for design professionals
- Green materials, local products, and regional suppliers.

Encourage your stakeholders to learn all they can about the experiences of others. The links in For More Information are a good place to start. So are Web searches for topics such as sustainable communities, green master planning, and green development—use your imagination!

Finally, take full advantage of the major role K-12 schools and students can play in educating stakeholders and changing attitudes and behaviors. When young people learn about clean energy, they're likely to bring that knowledge home wrapped in enthusiasm that will inspire their parents and grandparents. In Greensburg, the words of a teenager at a town meeting are thought to have been a tipping point toward green recovery: "Before the tornado, I was planning on going to college and never coming back to Greensburg. But now I want to come back. I want to help make this a model for other communities. I want to live here."



Lynn Billman, NREL/PIX 16292

Remember to include young people in your educational efforts. They have proven to be a powerful force for change.

Curricula are readily available to strengthen or start K-12 coursework on energy. Promote the development of classes or majors in energy or sustainability at your local university or four-year college, or certification classes for installers and maintenance workers at your community college. Such programs are expanding rapidly around the country. And if the local college already has expertise in sustainability, renewable energy, or efficient building construction, call on those experts to offer information and seminars.

Step 2: Choose Your Leaders

At the kickoff meeting with all your stakeholders, select a small group of local leaders from diverse parts of the community. These individuals should be able to see the big picture, and their job will be to lead the overall planning. Leaders often emerge naturally based on the strengths and preferences

of the people in the room. Or positions of authority may already have been established. Either way, encourage openness and freedom of expression to make it work.

Problems can become opportunities when the right people come together.

—Robert South

Depending on your community's unique rebuilding requirements, you'll almost certainly want to break the broader leadership team into smaller working groups. Each group will have an assigned area of responsibility. This helps carve the task at hand, which will seem overwhelming, into manageable pieces. Using the working group approach also gives each aspect of green recovery the attention it deserves.

When you're rebuilding to go green from the ground up, establishing an Energy Working Group will be particularly important. Why? Because energy and efficiency choices are an intrinsic part of the rebuilding process. When you rebuild, you'll be creating structures that should stand for 40 years or longer. Power plants last for several decades, and contracts for supplying electricity often extend for many years. As you plan for green recovery, you'll be making decisions that affect, for example:

- Land use planning
- Building restoration, repair, and reconstruction, including building codes for all types of buildings (residential, business, public, and nonprofit, among others)
- Fleet and personal vehicle replacements
- Reconstruction of fueling stations
- Reconstruction of the electricity distribution system
- City ordinances that govern distributed electricity.

Energy considerations are part of virtually every project a community takes on after a disaster.

What a Quantitative Energy-Use Baseline Looks Like

Electricity

Electricity used in Greensburg is created largely from coal-based sources.

Conversion factors: In Greensburg, the utility fuel mixes are typically 1/10 wind and 9/10 coal-fired. Therefore, 1,000 kilowatt-hours (kWh) = 594.6 pounds (lb) of CO₂ emissions.

2006 electricity usage:

9,800,000 kWh = 5,827,080 lb of CO₂

Natural Gas

In Greensburg, natural gas is the primary source for heating.

Conversion factors: 1 therm of natural gas produces 11.64 lb of CO₂.

2006 natural gas usage: 650,000 therms = 7,566,000 lb of CO₂

Transportation

Most vehicles in Greensburg are powered by fossil fuel, primarily gasoline and diesel, which are major greenhouse gas contributors. Most drivers travel alone to work or school. As the amount of driving increases, so does the amount of greenhouse gases emitted. For the purposes of this exercise, estimated figures and national averages were used:

Estimated number of vehicles in Greensburg in 2006: 577

Average annual miles driven (national average): 15,000

Average fuel efficiency (national average): 20.7 mpg

Gallons of gas driven:
(15,000 x 577) / 20.7 = 418,116 gal

Conversion factor: Every gallon of gasoline burned releases 20 lb of CO₂.

2006 transportation impact:
8,360,000 lb of CO₂

Source: Adapted from City of Greensburg, Kansas + BNIM (2008), p. 95

Step 3: Visualize and Capture the Vision

A vision excites and energizes the stakeholders and makes them believe that all things are possible, so spend some time here. Brainstorm ideas and come to consensus on what you want to achieve. Building on that common identity while adopting a new community framework can be the spark that energizes a discouraged community. When enthusiasm lags, return to the vision. It will help you remember why you're doing this in the first place.

The vision is also where you can begin making the connection between the broader goal of rebuilding sustainably and the more specific objectives that feed into that goal. Greensburg's *Vision Plan Draft* is an excellent example (City of Greensburg 2007). The 12-page working draft is broken into five topic areas: Energy, Built Environment, Water, Economic Development, and Community. In each topic area, the stakeholders identified specific targets. Under Energy, for example, they envisioned the following:

- Increase efficiency of all end uses to reduce energy demand
- Meet all energy needs through renewable generation sources
- Reduce citywide carbon dioxide (CO₂) emissions.

The stakeholders then used this draft as they worked with the planning professionals to prepare their *Greensburg Comprehensive Sustainable Plan* (City of Greensburg, Kansas + BNIM 2008).

Step 4: Get the Lay of the Land

To see where you want to go, you have to understand where you are. You'll need to assess the current situation in your community, often called "establishing a baseline." In disaster recovery, this step can have several components. For example, consider what Greensburg called the built environment: Evaluate what, if any, damaged materials can be salvaged and reused. Determine how much land is actually available for rebuilding or redevelopment. Decide whether to completely rebuild portions of your infrastructure.



Daniel Wallach, Greensburg GreenTown/PIX 16669

After the tornado, Greensburg residents regretted missing the opportunity to recycle lumber and other usable materials from the tornado debris.

We are all faced with a series of great opportunities brilliantly disguised as impossible situations.

—Charles R. Swindoll

You'll also need to know how your community once used energy. Although your Energy Working Group might find this challenging, best estimates will work. You might ask your utility companies for help. Individual use is not publicly available information, but companies are often willing to supply averages for typical residences or composite figures for a business district. Ask your major industries and the largest public energy users (such as schools, hospitals, and industries) for their energy use and costs, and enlist their support for your Energy Working Group. Ask major fleet owners about the number of various types of vehicles they had before the disaster and what fuel they used, and see if they can estimate how many miles per year each drove. This step can be time consuming, so consider soliciting local high school or college students to help gather these data.

Or, to establish a more formal, quantitative baseline, you may want to enlist an energy analyst. After the tornado, the U.S. Department of Energy contacted Greensburg's leaders to offer assistance. DOE opened an office in Greensburg and assembled a team of experts from its National Renewable Energy Laboratory (NREL). The team helped to determine Greensburg's previous energy use baseline in quantitative terms (see sidebar for an example).

Working from your baseline, you can see what you want to do differently. In terms of energy, now's the time to learn what renewable resources are available to you. You can find extensive—and often free—data on renewable resources, such as wind, solar, geothermal, and biomass on the Web. Here are three examples of the types of information available free of charge (see For More Information for specifics):

- 3TIER, a company that provides renewable energy assessment and forecast information, has developed an online assessment tool—called FirstLook—for wind and solar resources. With a couple of mouse clicks, you can identify potential locations for wind and solar installations, along with free preliminary wind and solar data about the sites. You can also purchase a FullView Site Analysis if the free information reveals promising sites in your area.
- NREL and the Environmental Protection Agency (EPA) developed a free Biomass Power Assessment Tool to enable access to county-level biomass resource data. After you select a site and define a geographic radius or boundary, the tool reports on the estimated

annual amount of biomass available from crop residues, forest waste, wood waste, landfills, and wastewater treatment plants, among other sources.

- DOE and NREL's Alternative Fuels & Advanced Vehicles Data Center hosts a free interactive map of alternative fueling stations.

Step 5: Set Your Goals

If you don't know where you are going, you'll end up someplace else.

—Yogi Berra

Though lighthearted, Berra's quote contains an important nugget of truth. Setting goals is at the heart of the community's green recovery plan. Goals keep you on track. They keep you moving toward where you want to be, not someplace else. If you can, try to set quantitative goals. (For energy, this would be easier if you were able to quantify your energy use in Step 4.) But if that isn't possible, set qualitative



Lynn Billman, NREL/PIX 16660

The Sun Chips City Business Incubator in Greensburg is designed to offer affordable spaces for businesses getting back on their feet, as well as for new retail ventures. This building received a major funding boost from actor Leonardo DiCaprio, a well-known sustainability advocate.

goals instead. Either type of goal will help bring your community together in its understanding of energy—past, present, and future. The important thing is to set achievable goals that will allow you to move forward and experience a sense of accomplishment as a community.

You might find the following simple framework useful as you think about energy. Ask your Energy Working Group to consider how the community can:

- Reduce energy use in homes, businesses, and industrial processes
- Use more renewable energy in homes and businesses
- Decrease fossil fuel use in vehicles.

Reducing Energy Use

Simply reducing the amount of energy you use is the easiest and most cost-effective way to become more sustainable, so it makes sense to focus on this first. With buildings using 39% of the energy consumed in the United States today, green buildings can have a huge impact. The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has published guidelines for reducing energy use by as much as 30% in warehouses, small retail buildings, small office buildings, and K-12 schools.

Compared to conventional buildings, a green building minimizes use of energy, water, materials, and land. Depending on construction choices, green buildings can sometimes cost no more to build than conventional buildings. If up-front costs do prove to be higher, they are offset over time by lower energy bills. When built properly, green buildings can use 30% to 50% less energy than their traditional counterparts. And once people move in, they'll be more comfortable because they will have better control over features such as lighting and temperature.

The key to minimizing construction costs for green buildings—whether they be public buildings, schools, homes, commercial buildings, or industrial plants—is using an *integrated design or whole-building approach*. Because all design team members participate in such a design process from the outset, all disciplines can weigh in on how

design decisions will affect energy use. For example, incorporating *daylighting* (a term for illuminating the interior of a building by natural means like windows or skylights), high-performance energy-efficient windows, and good insulation strategies can reduce the size of the chiller plant, which can save a significant amount of money. During an integrated design process, architects and homebuilders routinely use energy-modeling computer programs like EnergyPlus and the Building Life-Cycle Cost Program to help predict energy usage.

Ask your Energy Working Group to work with local homeowners associations, homebuilders, business owners, and bankers to encourage energy efficiency in new construction. You might also want to consider adopting a voluntary green home building program or mandatory green building codes. The National Association of Home Builders (NAHB)

Sun Chips City Business Incubator Green Features

Located on the roof of the incubator, crystalline photovoltaic solar panels convert the sun's energy to electricity, providing about 10% of the building's total energy needs.

Most of the incubator is illuminated by natural daylight through strategic window placement, light shelves, and skylights. This allows artificial lighting to be turned off, saving both energy and money.

Water from the incubator's sinks and showers—called gray water—is collected and reused to flush toilets.

Rainwater is collected and used to supplement the gray water system.

A specialized heat pump system extracts both heat and cooling from the ground through a series of vertical well shafts.

Rain gardens and other mechanisms for storm water collection allow water to naturally return to underground reservoirs.

The walls of the incubator have very high structural capacity and feature state-of-the-art protection against high winds.



Eight of the 16 townhomes in the Prairie Pointe affordable housing development have been awarded the LEED platinum for homes rating—the first ever in Kansas.

has instituted a nationally accepted green building standard and program that can serve as a model for local efforts. And DOE's Builders Challenge Program offers benefits to homebuilders who build for exceptional energy efficiency.

The U.S. Green Building Council (USGBC) has been instrumental in encouraging the design of green buildings through its Leadership in Energy and Environmental Design (LEED™) Program. LEED “points” come from a wide variety of categories, so if you're pursuing LEED certification, be specific with your architect about how much energy you want to save and which certification level you want. The USGBC also recently launched a LEED for Homes rating system. Much like the system for commercial buildings, LEED for Homes assigns points to green attributes, such as recycled materials, low water use, and energy-efficient design, among others. Extensive educational materials about USGBC programs are readily available.

Public buildings serve as the “face” of your community, setting standards and expectations through their usability and aesthetic appeal. Although it's disheartening to see your city hall, public library, school, or hospital destroyed by disaster, it's also another opportunity to show leadership by setting high energy efficiency goals or green standards for your new public buildings. In Greensburg, DOE helped the town develop and pass a resolution proclaiming that all large city buildings would be built to LEED Platinum certification standards.

In New Orleans, **schools** were at the head of the class during rebuilding. Launched in 2007, the Quick Start Initiative put five schools—one in each New Orleans City Council District—on a fast track for construction while master planning continued.

In each council district, a cross-section of neighborhood groups furnished input on site selection. The design and planning of these schools helped direct the building standards of the broader School Facilities Master Plan. At the same time, the Quick Start Initiative put students into clean, modern classroom space sooner rather than later. The master plan, which includes the goal of reducing energy consumption by 30% in all new public school construction in the city, was approved in November 2008 by the Louisiana Board of Elementary and Secondary Education and the Orleans Parish School Board. As you look to rebuild your own schools, consider taking a page from the New Orleans textbook.



When construction on the 210,000-square-foot L.B. Landry High School in New Orleans is complete, energy costs for the building—which features a solar hot water system—are expected to be 30% lower than those of the school it replaced. The city is aiming at the 30% reduction target in all new public school construction.

Homes that must be rebuilt represent a valuable opportunity to save energy in your community. Homeowners can usually recoup the slightly higher monthly mortgage payments in significantly lower energy bills (see table). In fact, for more than 30 years, the expectation of energy savings has enabled homeowners to qualify for larger loans through “energy efficient mortgages.” The savings are validated by a standardized computer system that predicts energy savings and are certified by an energy rater, such as the Residential Energy Services Network (RESNET) or a similar system from DOE called the EnergySmart Home Scale.

And homes that weren't a total loss can go green too. Although retrofitting and repairs are not as cost effective as new construction, seize every green

renovation opportunity by, for example, improving levels or types of insulation, putting in energy-efficient windows, and installing efficient heating and air-conditioning equipment and appliances. Be sure to look for ENERGY STAR labeling on all equipment and appliance purchases.

Particularly in these challenging economic times, **businesses—offices, retail stores, warehouses, and so on**—are an integral part of a successful green recovery. Your business owners can choose to rebuild in ways that will garner important benefits, both now and into the future:

- Building energy efficiency into a new structure saves money over the life of the building in terms of reduced energy use and lower operations and maintenance costs.
- Communities tend to view green businesses as socially responsible “good neighbors,” a positive perception that can boost business.
- Your businesses may be able to create green-collar jobs, which not only improves the economic health of your community, but feeds into a stronger national economy as well.
- Going green may open opportunities to expand business into new areas and introduce new products.

In Greensburg, for example, the owner of the local John Deere dealership, BTI Equipment Inc., built a new dealership designed to LEED Platinum standards, using 42% less energy than required by code, and generating electricity with an Endurance 4-kilowatt wind turbine. John Deere’s corporate di-



Lynn Billman, NREL/PIX 16661

The new BTI John Deere dealership opened for business in January 2009. An important part of Greensburg’s economy, the building features tubular skylights for daylighting, radiant floor heating, an energy-efficient wall and roof system with plenty of insulation, a waste oil boiler, recycled steel support beams, and native landscaping.

vision is now urging all its dealers to build to these standards, and the company has become a member of the Commercial Building Energy Alliance, a partnership among DOE, NREL, and key leaders in retail and other businesses that identifies opportunities for and promotes energy efficiency. Based on the Greensburg model, John Deere has redirected its business plan to promote energy-efficient, green dealerships throughout North America.

And because of BTI’s positive experience in Greensburg, the company launched BTI Wind LLC in late 2008 and early 2009. BTI Wind is the North American distributor for Canada-based Endurance Wind Turbines, and the new company’s business lines include sales, installation, and maintenance. BTI Wind set up a network of 136 distributors in 32 states and 4 provinces, adding more than 100 new direct jobs and training the existing sales force in this new green technology. The company hopes to quadruple its business in the next two years.

High Energy Efficiency Saves Money Every Month (2006 US\$)^a

Cost and Savings	Base Efficiency (30%) ^b	High Efficiency (40%)	Premium Efficiency (50%)
Estimated Incremental First Cost	\$4,000	\$7,000	\$13,000
Savings on Monthly Utility Bill ^c	\$60.25	\$76.58	\$96.83
Increase in Monthly Mortgage Payment ^d	\$17.58	\$34.25	\$58.83
Net Monthly Savings	\$42.67	\$42.33	\$38.00

^aFor a typical 2,000-square-foot home built in Greensburg, Kansas, using national average costs.

^bPercent of increased efficiency over International Energy Conservation Code (IECC) 2003.

^cEvaluated relative to typical energy code (IECC 2003).

^dBased on a 30-year mortgage at 7% APR with an increase in loan value of \$4,000 for the base option; \$7,000 for the high option; and \$13,000 for the premium option.

Local industries are likely to use significant amounts of energy, not just in the buildings that house their operations, but in the industrial processes themselves. Many leaders in manufacturing industries have adopted best business practices and new technologies to reduce their energy costs, including combined heat and power systems. Encourage your plant managers and owners to seize the opportunity for improvements instead of rebuilding their businesses just as they were. DOE has excellent programs for energy audits, best practices in energy management, and new energy-saving technologies for small and large industrial plants.

Increasing Renewable Energy Use in Your Community

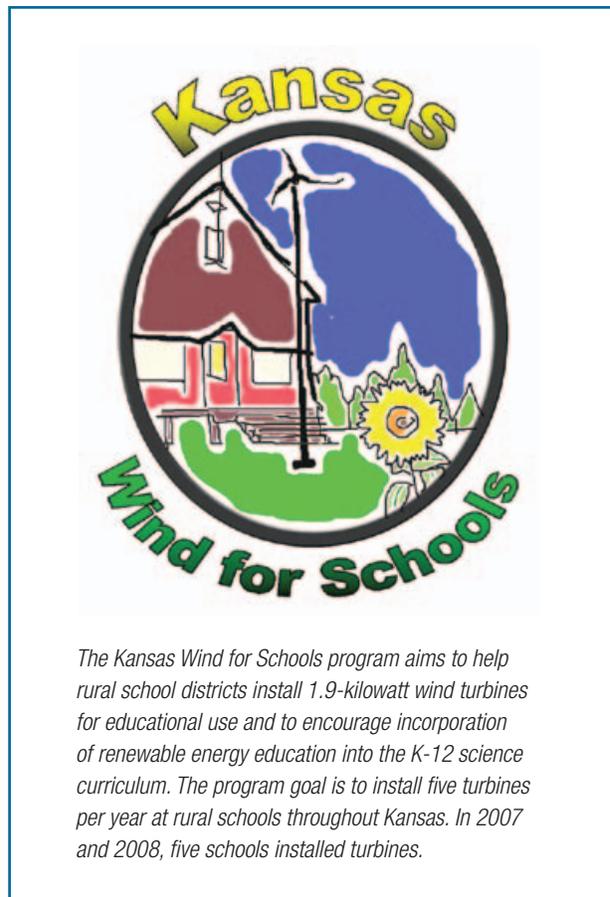
Your community is probably served by one or more utilities or rural electric cooperatives. Encourage leaders at these utilities and cooperatives to be partners in your new energy plan. They can help you understand how you can increase the amount of renewable resources in the electricity choices available to your community. Energy efficiency and renewable energy may help reduce loads on municipal systems, reducing or helping stabilize costs. You might need to enter into a short-term energy agreement while you consider longer term options. A disaster offers the opportunity to reexamine old relationships and forge new ones.

Municipal utilities can renegotiate electricity supply contracts, improve the generation mix to include more renewables, or purchase renewable energy credits (RECs) for the community. RECs are tradable environmental commodities in the United States. Although the particulars vary from state to state, RECs generally prove that 1 megawatt-hour (MWh) of electricity was generated from an eligible renewable energy resource.

New renewable energy sources, ranging from a single wind turbine to a field of solar panels, could be brought online to augment your electricity supply. The financial viability of such “distributed energy” projects will depend on your community’s proximity to transmission lines, the utility with which you establish a power purchase agreement, and financial incentives available in your location from the local utility or from state and federal government agencies.

Major energy users in your community, or individual homeowners and businesses, might be good candidates for installing a solar or wind system. For individual homes, buildings, or collections of buildings, other renewable energy systems or technologies—such as ground-source heat pumps or burners and boilers that use wood pellets or other biomass sources—might prove cost effective. “District” heating and cooling systems use one heating and cooling plant (renewable or conventional) for several buildings. Such systems have been saving energy and money for decades in areas like college campuses and downtown districts. DOE has a Wind for Schools Program that can help schools install a small wind turbine under its Wind Powering America Program.

You may already have regulations in place to allow solar panels and wind turbines in your community. These regulations might include a solar and/or wind ordinance that describes how individuals can safely install such systems; an interconnection agreement that describes how these systems can be safely connected to the utility grid; and a net metering or net



billing policy that describes how the independent power generator will be reimbursed for the electricity produced. If you don't have these documents in place, look for examples that have been successfully adopted in other cities. Or, if you established such guidelines years ago, consider reviewing newer examples and updating your guidelines. The renewable energy field is expanding rapidly, and policy innovations occur every year.

Diminishing the Use of Fossil Fuels

As you make your rebuilding plans, look for ways to reduce driving in your community. Increase the appeal of walking and biking by, for example, relocating key community functions or adding trails or bike lanes. Encourage residents to use public transportation more often through incentives, or consider adding public transportation if your community didn't have it before the disaster. Electric trolleys and shuttle buses are on the market today, and in some cases, such vehicles can even add to the "character" of your community.

Encourage residents and fleet owners to replace damaged and destroyed vehicles with vehicles that use lower amounts of fossil fuels—like gasoline/electric hybrids, small electric vehicles for short distances, and flex-fuel vehicles that run on either gasoline or E-85 (a mixture of 85% ethanol and 15% gasoline). Many vehicle models on today's market are flex-fuel ready, and sometimes drivers don't even know that they own one. Compressed natural gas is another environmentally friendly alternative fuel choice, typically for fleet vehicles that are refueled at a central location.

Designate a community leader or group to work with entities in the community that own fleets and fuel supply companies. Combining purchasing power can influence both the price of vehicles and what alternative fuels local suppliers are willing to provide.

Step 6: Find the Funds

Financing is another area that will benefit from a strong working group. Your Financial Working Group will need to take time to investigate both the disaster-related and the green financial opportunities in your location and situation. Funding may be available from a variety of sources, including

payouts from insurance companies and grants and loans from federal or state agencies. At the federal level, for example, the U.S. Department of Housing and Urban Development (HUD), the Federal Emergency Management Agency (FEMA), the U.S. Small Business Administration (SBA), and the U.S. Department of Agriculture (USDA) often make funds available after a disaster.

Small communities served by the USDA—typically 50,000 or fewer residents—have additional opportunities. The USDA's regular grant and loan programs will often cover the cost of energy-efficient features. For projects that can wait a year or so, the agency has competitive grant and loan programs specifically designed to fund energy efficiency and renewable energy projects.

When you work with disaster-assistance agencies at any level, be vocal about your wishes to rebuild differently to save energy, use lower amounts of fossil fuels, or become greener. Agency rules differ greatly. One agency might have to adhere to rigid rules about reimbursements. Another might have some flexibility. If the officials you're dealing with aren't tapped into the benefits of energy planning and energy choices, this is your opportunity to educate them. Knowing what you want and being insistent about it may open some doors.

.....
If opportunity doesn't knock, build a door.
—Milton Berle
.....

In Greensburg, the DOE/NREL team helped not only to develop renewable energy and energy-efficient business strategies, but also to assemble financing and ownership options for producing or procuring renewable energy technologies.

Going Green from the Top Down

With today's increased focus on all things green at our highest levels of leadership, opportunities abound for projects that save energy, use renewable energy, or promote green or sustainable development. When President Obama signed the American Recovery and Reinvestment Act (ARRA) into law on February 17, 2009, for example, financing mechanisms for energy efficiency and renewable energy

expanded significantly (EERE Network News 2009; Recovery.gov 2009). Some of these funds are available for a limited time, generally through state offices. ARRA and other federal financing options include:

- Energy-Efficient Community Development Block Grants
- Clean Renewable Energy Bonds (CREBs)
- State assistance on building codes (BCAP 2009)
- New Market Tax Credits (U.S. Department of the Treasury 2009).

Tax incentives, both credits and deductions, are available to promote energy efficiency and renewable energy not only at the federal level, but also in almost every state. The Database of State Incentives for Renewables & Efficiency (DSIRE) maintains a reliable, up-to-date list of financial incentives.

Utility companies also offer such incentives, and energy service companies can be important partners in your green recovery. These companies typically supply the up-front capital for energy-saving improvements, often on retrofits or repairs but sometimes on new construction. They take the financial savings from lower energy costs until they are paid back—then it's your turn to reap the benefits. Some companies have begun applying the same concepts to energy-producing projects, such as fronting the costs for a wind turbine or photovoltaic system.

Financial Help on Many Fronts

Nonprofits, volunteer organizations, and other individuals and organizations are likely to donate money, materials, and helping hands. Some organizations may be interested in donating or discounting professional services. Or they may provide volunteers for planning, project design, cost estimating, or project implementation or construction. You might want to approach, for example:

- Local universities, colleges, and community colleges



President Barack Obama signs ARRA—which includes diverse and robust investments for green projects of all types—at the Denver Museum of Nature and Science in February 2009. Before signing the bill into law, he toured the museum's installation of 465 rooftop solar panels.

- Nonprofit builders like Habitat for Humanity, Mennonite Housing, and others
- Nonprofit faith-based organizations; service organizations (such as the Rotary, Lions Clubs, Boy Scouts, and Girl Scouts, among others); and homeowners associations

Tax Incentives and Programs Encourage Green Jobs

In 2008 the Louisiana Legislature passed one of the most aggressive solar and wind tax credits in the country. As a result of this 50% tax credit, the Louisiana Community and Technical College System developed a solar installer training course to increase the number of certified solar installers in the state. This program has succeeded in training dozens of solar installers, ensuring quality installations. Also, in response to the rebuilding needs in New Orleans and a program to help low-income homeowners make their homes more energy efficient, the local utility, Entergy New Orleans, worked with Delgado Community College to develop courses to train home energy auditors, helping to develop a local green economy.

- Professional trade organizations
- Personal or corporate foundations
- State and national nongovernmental advocacy organizations for renewable energy, energy efficiency, and green or sustainable development.

To accomplish great things, we must not only act, but also dream; not only plan, but also believe.

—Anatole France

Step 7: Write the Plan

By now, you should have enough information to write a draft green recovery plan. This step can seem a bit daunting, but if you’ve been writing everything down along the way, your plan should come together relatively easily. Assign a single individual to pull all the information into a draft. Encourage the writer not to agonize over every word; the draft will be distributed to stakeholders for review and comment, and moving forward is more important than grammatical perfection. As the saying goes, “A good plan today is better than a perfect plan tomorrow.” This is particularly applicable to green disaster recovery.

When you distribute the draft to your stakeholders, set a firm deadline for comments and stick to it. You want to strike a balance between making sure that everyone has input and respecting the urgency of the recovery process. You may need to go through several iterations of your planning document until you either reach consensus or strike compromises that everyone can support. And once you have a plan, you might want to take a few moments and simply acknowledge the achievement. Your community has pulled together and crafted a good plan on which its future rests, and that sense of accomplishment can propel you through the plan’s implementation. When you hit the inevitable bump in the road as you move forward, your community can draw renewed strength from that sense of shared accomplishment.

After a disaster, your city, your town, or your community will never be the same . . . but it can be better. Although your challenges are daunting, your opportunities are even greater. By rebuilding a greener, more sustainable community, you can inspire others—of your generation and the next, in big and small cities both near and far—to do the same. If large cities like New Orleans and small towns like Greensburg can lift themselves out of devastation and take bold steps toward a greener future, your community can too.

All of us, and the planet that sustains us, will be better for it.

A Grassroots Nonprofit Helps with the Greening of Greensburg

Recognizing early on that Greensburg’s small city staff would need some help during the green rebuilding process, a sustainability advocate from nearby Stafford County, Daniel Wallach, and his wife, Catherine Hart, founded Greensburg GreenTown. Interested local citizens immediately stepped forward to serve on the nonprofit’s board of directors and then worked closely with city and county officials, business owners, and fellow residents to incorporate sustainable principles into the rebuilding process. Wallach says “This team effort is the true secret to Greensburg’s success—the fact that so many community leaders were encouraging folks with a common vision and direction.”

And because of its nonprofit status, GreenTown has been able to accept donations of green building materials, alternative vehicles, and other items with tax benefits to the donors.

Today, Greensburg GreenTown serves as an educational resource for the community and as a living example of how this type of nonprofit model can help other communities.

For More Information

Disaster Response Resources

International Association of Emergency Managers (IAEM): www.iaem.com

U.S. Department of Energy (Model Guidelines for Incorporating Energy Efficiency and Renewable Energy into State Energy Emergency Plan[s]): apps1.eere.energy.gov/state_energy_program/pdfs/emerg_plan_guide.pdf

U.S. Department of Homeland Security (DHS) Preparedness & Response: www.dhs.gov/xprepresp

U.S. Federal Response Plan: www.disasters.org/emgold/frp.htm



DOE and NREL Resources

Alternative Fuels & Advanced Vehicles
Data Center: www.afdc.energy.gov/afdc

Alternative Fueling Station Resources: www.afdc.energy.gov/afdc/stations/find_station.php

Biomass Power Assessment Tool:
rpm.nrel.gov/fbase/biopower/launch

Builders Challenge:
www.buildings.energy.gov/challenge/builders.html

Builders Challenge EnergySmart Home
Scale (E-Scale):
www.buildings.energy.gov/challenge/energysmart.html



Courtesy of BNIM

Building America Program: www.buildings.energy.gov/building_america/publications.html

Building Technology Program
Information Resources:
www.buildings.energy.gov/information_resources.html

Buildings Database:
<http://eere.buildinggreen.com>

EERE Network News:
apps1.eere.energy.gov/news

Energy Education:
www1.eere.energy.gov/education

EnergyPlus Energy Simulation Software:
apps1.eere.energy.gov/buildings/energyplus

Federal Energy Management Program (FEMP)

Building Life-Cycle Cost (BLCC) Programs:
www.femp.gov/information/download_blcc.html

Energy Cost Calculators:
www.femp.energy.gov/procurement/eep_eccalculators.html

Industrial Technologies Program:
www.industry.energy.gov

K-12 Energy Lesson Plans & Activities:
apps1.eere.energy.gov/education/lessonplans

Save Energy Now®:
www.industry.energy.gov/saveenergynow

Wind Powering America:
www.windpoweringamerica.gov/schools.asp

Greensburg Resources

City of Greensburg Web site:
www.greensburgks.org

Greensburg Sustainable Building Database:
<http://greensburg.buildinggreen.com>

Greensburg GreenTown:
www.greensburggreentown.org

Greensburg City Hall will house the city's administrative offices and council chambers and serve as a gathering space for town meetings and municipal court sessions.

Built to incorporate solar panels and geothermal technology, it will be the first LEED Platinum-certified city hall building in America. Building materials will include recycled wood and reclaimed brick left behind by the tornado. It will also have a green roof with vegetation growing on the east end of the roof. This project is on track for completion in July 2009.



Courtesy of ENIM/PIX 16674

New Orleans Resources

BuildingGreen:
www.buildinggreen.com/press/new-orleans.cfm

Global Green USA:
www.globalgreen.org/neworleans

School Facilities Master Plan for Orleans Parish:
www.sfmppop.org

Other Resources

3TIER FirstLook:
<http://firstlook.3tiergroup.com>

Alternative Energy News Public Transportation:
www.alternative-energy-news.info/technology/transportation/public-transit

American Council on Renewable Energy (ACORE):
www.acore.org

American Solar Energy Society (ASES):
www.ases.org

American Wind Energy Association (AWEA):
www.awea.org

ASHRAE Advanced Energy Design Guides
(free download):
www.ashrae.org/publications/page/1604

Database of State Incentives for Renewables
& Efficiency (DSIRE):
www.dsireusa.org

Disaster Relief Agencies:
www.disastercenter.com/agency.htm

Edison Electric Institute:
www.eei.org

ENERGY STAR:
www.energystar.gov

Federal Emergency Management Agency (FEMA)
www.fema.gov

Geothermal Energy Association (GEA):
www.geo-energy.org

Green Communities:
www.greencommunitiesonline.org and
www.epa.gov/greenkit/index.htm

International Biofuels Association (IBA):
www.internationalbiofuels.org

Interstate Renewable Energy Council (IREC):
www.irecusa.org

National Association of Energy Service Companies:
www.naesco.org

National Association of Homebuilders (NAHB)
National Green Building Program:
www.nahbgreen.org

Residential Energy Services Network:
www.natresnet.org

Southern California Edison Renewable &
Alternative Power (RAP) program:
www.sce.com/EnergyProcurement/renewables

Solar Electric Power Association (SEPA):
www.solarelectricpower.org

U.S. Department of Agriculture (USDA):
www.usda.gov and
www.rurdev.usda.gov/rbs/energy.htm

U.S. Department of Housing and Urban
Development (HUD):
www.hud.gov

U.S. Green Building Council (USGBC):
www.usgbc.org

U.S. Small Business Administration (SBA):
www.sba.gov

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ENERGY | Energy Efficiency &
Renewable Energy

For Additional Information, Please Contact:

Energy Efficiency and Renewable Energy
Information Center
1-877-EERE-INF (1-877-337-3463)
www.eere.energy.gov

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This document is one in a series of documents outlining the options for and benefits of rebuilding green after a disaster. The series draws on lessons learned by teams from the U.S. Department of Energy and its National Renewable Energy Laboratory as they helped the townspeople of Greensburg, Kansas, rebuild green after a devastating tornado. To see the other documents in this series, visit www.buildings.energy.gov/greensburg/.

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