

From Tragedy to Triumph— Rebuilding Green Homes after Disaster

About Green Homes

A green home can save you thousands in utility bills and make your home a healthier and more comfortable place to live. Green homes save money with energy-saving features such as effective insulation, high-performance windows, tight construction, and efficient heating and cooling equipment and appliances. Green homes are healthier because they perform better and use green products, protecting homeowners against cold, heat, drafts, moisture, indoor pollutants, and noise. Green homes also protect homeowners against future utility rate increases for gas and electricity.

Green homes encourage the use of renewable energy, which can reduce your home's impact on the environment because it is the cleanest form of energy around. A variety of renewable technologies are available, including small wind energy systems, geothermal heating and cooling, and solar energy systems used to produce electricity and heat water. The most common form of renewable energy used by homeowners is solar energy, which is often financed with a home mortgage. In areas with frequent storms or after a natural disaster, renewable energy can provide emergency power if batteries are integrated into the system.



Decker Homes, NREL / PIX15617

This home in Ohio uses a roof-integrated solar electric system to offset energy consumption.

Green Benefits to Homeowners

- Lowers utility bills
- Provides tax credits to homeowners
- Improves a home's energy performance
- Healthier and more comfortable home.

Green Benefits to the Community

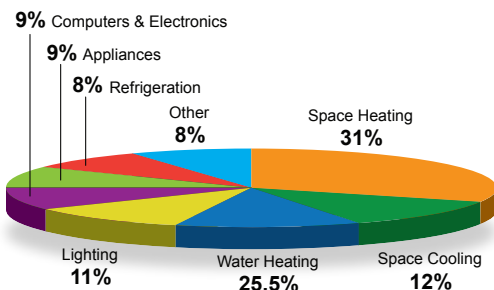
- Stimulates local economies
- Restores neighborhood pride
- Promotes cleaner environment.

Rebuilding your home after a natural disaster such as a flood, hurricane, or tornado can be daunting. You can turn a tragedy into an opportunity to create a healthier, more comfortable, and more energy-efficient home by rebuilding your next home "green."

- Grants tax credits to homeowners
- Offers protection against rising utility bills
- Supplies reliable power after natural disasters
- Protects the environment.

Renewable Energy Benefits

- Generates electricity from the sun or wind
- Heats and cools your home quietly and naturally



How We Use Energy in Our Homes

Source: 2007 Buildings Energy Data Book

Rebuilding Green in Greensburg

After a tornado devastated their town in May 2007, the citizens of Greensburg, Kansas, turned disaster into opportunity by rebuilding as a

model “green” community. New homes will use 40% to 50% less energy than current building code. Renovated homes will use 25% less energy than current building code. Greensburg’s green housing projects include:



Mason Earles/PIX 16644

Eight of the 16 units at the Prairie Pointe Townhome complex (above) are estimated to use about 50% less energy than code.



Lynn Billman, NREL/PIX 16643

Mennonite Homes is building green homes in Greensburg, Kansas, with features such as energy-saving light bulbs, a 90% efficiency furnace, a tankless hot water heater, and efficient insulation in the walls and attic.



Stephanie Peterson/PIX 16645

The Waters family of Greensburg, Kansas, built this green home after their town was destroyed by a tornado in 2007.

Prairie Pointe Townhomes—a 32-unit complex awarded the first residential LEED (Leadership in Energy and Environmental Design) Platinum rating in Kansas.

Mennonite Homes—Mennonite Housing Rehabilitation Services, a local nonprofit group, built 10 affordable energy-efficient homes in Greensburg and plans to build 40 more that will use 50% less energy than standard homes.

Waters Home—The Waters family rebuilt their home in Greensburg using these green strategies:

- Wall and roof insulation with an R-Value greater than 25
- A ground-source heat pump for heating and cooling
- Shading east/west windows with trees and shrubs to keep the sun’s heat out in the summer and reduce cooling loads
- Light colors for surfaces and finishes to reflect sunlight deeper into the interior
- High performance windows and doors
- ENERGY STAR® computer equipment and appliances.

The home achieved a home energy rating score (HERS) of 47 in 2008, which means the home is more than 50% more efficient than a conventional home of similar size and type.

For more information about Greensburg, contact:
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Greensburg, KS 67054

To see case studies of these and other Greensburg buildings, visit:
<http://greensburg.buildinggreen.com>

Green Home Checklist

Green construction methods can be integrated into buildings at any stage, but the most significant benefits result from using green methods in the earliest stages of a building project. Below is a checklist of green home features you can discuss with your builder.

Energy Efficiency

- ✓ **South orientation**—Build your home facing south to optimize its solar gain in winter and reduce heating loads. This also optimizes the efficiency of any renewable energy systems for producing electricity or heating water.
- ✓ **Efficient insulation**—Capitalize on one of the easiest, most cost-effective ways to save energy by using efficient insulation for foundations, walls, and roofs. Usually, the higher the R-Value of the insulation, the better it performs.
- ✓ **Seal openings and cracks**—To prevent infiltration of hot air in summer and loss of warm air in winter, properly seal openings and cracks to reduce cooling and heating costs.
- ✓ **Energy-efficient windows and doors**—Look for windows and doors with an ENERGY STAR® rating. Consider installing double-paned windows with a “low-e” glazing to hold in heat in winter and keep heat out in summer. Usually, the lower the U-Value, the better the performance.
- ✓ **Energy-efficient heating and cooling system**—Choose a high efficiency system with a cooling efficiency rating of SEER 13 (seasonal energy efficiency ratio) or higher. ENERGY STAR® SEER is 14.
- ✓ **Daylighting/passive solar gain**—Use natural light to offset electricity loads on weekends and to heat concrete, tile, or brick floors to reduce heating loads in winter. Proper window overhangs will block the summer sun and reduce cooling loads.

- ✓ **Efficient water heating**—Choose the most energy efficient water heating system you can, such as a tankless water heater, or consider installing solar water heating.
- ✓ **Lighting technologies**—Select lights that not only save energy, but also last much longer than traditional incandescent light bulbs, such as the compact fluorescent lights (CFLs) that have been easily available for some time. New technologies that use light-emitting diodes (LEDs) may also be an option. LED lamps illuminate at equivalent light levels to CFLs and can use less energy. An LED bulb can last for as many as 60,000 hours and a CFL for 10,000, compared to the incandescent’s 1,500.
- ✓ **Programmable thermostat**—Install a thermostat that automatically turns itself down when you’re at work and at night to save energy.
- ✓ **Appliances**—Install ENERGY STAR® appliances.

Water Efficiency

- ✓ **Water-efficient fixtures and appliances**—Reduce water and energy consumption (using less hot water also means using less energy) by installing low-flow sink and shower fixtures, toilets, and water-efficient dish and clothes washers.
- ✓ **Native landscaping**—Reduce water consumption by choosing plants indigenous to your area and use drip irrigation when possible.

Renewable Energy

- ✓ **Solar electricity**—Consider installing a small solar electric (photovoltaic) system on the roof to offset electrical loads. Invest in energy efficiency first to reduce system size and cost.

- ✓ **Wind electricity**—Small quiet wind energy systems are available for powering homes.
- ✓ **Geothermal heating and cooling**—The earth’s natural temperature can be used to heat and cool your home using geothermal wells and a ground-source heat pump.

Air Quality

- ✓ **Nontoxic products**—Use products that don’t contain toxic chemicals, such as paints and adhesives with low volatile organic compounds (VOCs) and formaldehyde-free insulation.
- ✓ **Ventilation**—Ventilate your home well for a good supply of fresh air. A ventilation system will control the amount of incoming fresh air to the home.
- ✓ **Heating and cooling system**—Purchase a system with high-efficiency filtration for interior and incoming air.

Sustainable Building Materials and Construction

- ✓ **Recycled materials**—Select recycled materials such as carpet, countertops, paint, and tile. Select insulation with recycled-content such as cellulose insulation.
- ✓ **Sustainably harvested or reclaimed wood**—Purchase wood certified by the Forest Stewardship Council. Some builders use reclaimed hardwood floors and siding or cork and bamboo flooring as alternatives.
- ✓ **Recycled construction waste**—Try to recycle at least 50% of the wood, cardboard, and concrete from new home projects.

Incentives for Energy Efficiency and Renewable Energy

Numerous financial incentives, such as federal and state tax credits and utility rebates, are available to help homeowners make their homes more energy efficient and to offset the cost of a renewable energy system. Many utility companies also offer net metering for grid-connected renewable energy systems, which gives homeowners credit for excess energy produced by their systems. The *American Recovery and Reinvestment Act*, signed into law on February 17, 2009, contains provisions that will financially benefit homeowners.

For more information, visit the Database of State Incentives for Renewables and Efficiency at: www.dsireusa.org.

Green Building Resources

Energy Savers

Basic information about energy efficiency and renewable energy from the U.S. Department of Energy (DOE) www.energysavers.gov

ENERGY STAR®

This program of DOE and the U.S. Environmental Protection Agency helps homeowners save energy and money through energy-efficient products and practices www.energystar.gov

Green Home Building Guidelines

Guidelines for building green homes from the National Association of Homebuilders www.nahbgreen.org/Guidelines/nahbguidelines.aspx

Residential Remodeling Guidelines

Information about remodeling an existing home to make it green www.greenhomeguide.org/documents/regreen_guidelines.pdf



Pete Beverly, NREL / PIX14163

This green home in Colorado produces as much energy as it consumes over a one-year period with the aid of a solar electric system. An illustration of this home's green features is provided by the National Renewable Energy Laboratory online at: www.nrel.gov/buildings/zero_energy.html

Renewable Energy Resources

Own Your Power! A Consumer Guide to Solar Electricity for the Home

Offers homeowners information about solar energy systems, financial incentives, and warranties and insurance along with tips for success www.nrel.gov/docs/fy09osti/43844.pdf

Small Wind Electrical Systems

A consumer's guide containing information about small wind energy systems for rural areas, including maintenance and zoning issues www.windpoweringamerica.gov/pdfs/small_wind/small_wind_guide.pdf

Georexchange

A Web site from the Geothermal Heat Pump Consortium that presents information about geothermal heating and cooling www.georexchange.org

U.S. DEPARTMENT OF ENERGY

Energy Efficiency & Renewable Energy

EERE Information Center
1-877-EERE-INF (1-877-337-3463)
eere.energy.gov/informationcenter

Prepared by the National Renewable Energy Laboratory (NREL), a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy; NREL is operated by the Alliance for Sustainable Energy, LLC.

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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