

# Renewable Energy Guide for Buildings



**RENEWABLE ENERGY**  
THE INFINITE POWER  
OF TEXAS

## HIGHLIGHTS

- Insulation and efficient appliances reduce energy needs
- Passive and active solar applications provide cost-effective solutions
- Take advantage of Texas breezes

## INTRODUCTION

Builders and future homeowners can easily take advantage of renewable energy sources if they incorporate them in their initial plans. Solar water heaters, photovoltaic systems, passive solar heating and other techniques can be employed by builders who desire a cost-effective and comfortable living space.

## INSULATION, WINDOWS AND EFFICIENCY

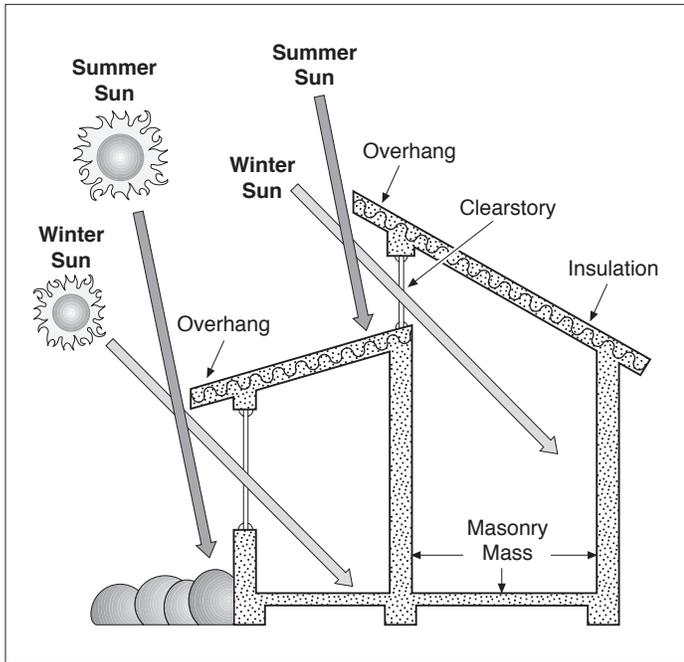
A home that uses renewable energy should first be energy efficient. The best-laid energy plans will have little effect if a house is not properly insulated, installing at least R-30 in the ceilings and R-13 in the walls. Radiant barriers, proper duct sealing, high performance windows and other relatively low cost measures will also make a home more livable and efficient.

Windows can improve the thermal performance of homes by minimizing heat loss in heating-

## RENEWABLE RESOURCE CHECKLIST FOR BUILDINGS

- ◆ Encourage designs that shade the structure to avoid after-the-fact fixes like solar screens.
- ◆ Encourage design “buffers” on west walls (like garages and closets) to reduce the impact of afternoon summer sun. Sometimes this is as easy as flipping the elevation so the garage is on the west side.
- ◆ Minimize carpet area and make use of the thermal mass of tile and finished concrete floors.
- ◆ Install windows rated by the National Fenestration Rating Council and optimize the climate appropriate window to square footage ratio.
- ◆ Ensure that window placement allows flow-through ventilation, both from prevailing breezes, and by low and high windows that draw air through the house.
- ◆ Optimize insulation levels.
- ◆ Install or encourage high-efficiency appliances.
- ◆ Minimize electrical needs.
- ◆ Reduce hot water needs with water conservation.

dominated climates and by minimizing solar heat gain in cooling-dominated climates. In climates with both heating and cooling seasons, select windows with both low U-values and low solar heat gain coefficient (SHGC). SHGC is



**NATURAL HEATING & COOLING OF THE HOME** Low winter sun through south-facing windows helps heat the home in the winter. Overhangs keep the high summer sun out, while still allowing indirect lighting.

a measure of the amount of solar energy that a glazing material allows to pass. Further south, the SHGC becomes more critical.

Appliances, particularly the refrigerator, washer and dryer, can consume huge amounts of energy. Select horizontal-axis washing machines that conserve water and the energy to heat it. When you do shop for an appliance look for the ENERGY STAR label.

## SOLAR ENERGY

### **Passive Solar**

The location and orientation of the home on the site are the first and most critical steps to take advantage of passive solar gains and breezes. While the ideal site is not always available, you can make changes to the building form to fit the site. In our hot climate, it is best to look for ways to minimize living areas with large windows that face west in order to minimize heat gain from the sun. If possible orient the home to face south. Locate rooms like the kitchen or game rooms to

take advantage of day lighting. Leave vegetation and add overhangs to windows that have an east or west exposure. Consider “dog-trots,” or breezeways, to help collect wind and provide cooling to the building. Use materials that reflect the summer heat like a metal roof that can also be used to collect rainwater.

### **Day Lighting**

The sun not only provides the best light, it's free. Despite these facts, day lighting is rarely discussed when talking about energy needs in the home. Well-placed windows that allow indirect light decrease the amount of electricity needed for general and task lighting.

### **Solar Water/Space Heating**

While this option requires a higher initial outlay than gas or electric water heaters, solar water heaters are cost-effective. Solar panels can be used to pre-heat the water. Then, a small gas or electric heater is used to bring the water up to the desired temperature.

Solar water heaters can also be coupled with heat exchangers to heat the home. These systems usually rely on a large tank of water or other material that has been heated by the sun. That heat source is used to warm air that is then circulated throughout the home. While these systems can be more complex than conventional heating systems, their fuel requirements can be significantly reduced by replacing gas or electricity with solar heat.

Solar water heating is particularly attractive in homes with swimming pools. Depending on the location, solar pool heaters cost from \$2,000 to \$5,000 installed and can pay for themselves in 2 to 7 years by replacing conventional forms of energy with heat from the sun.

### **Solar Electric Power**

While the cost of photovoltaic (PV) cells continues to drop, the practicality of meeting all

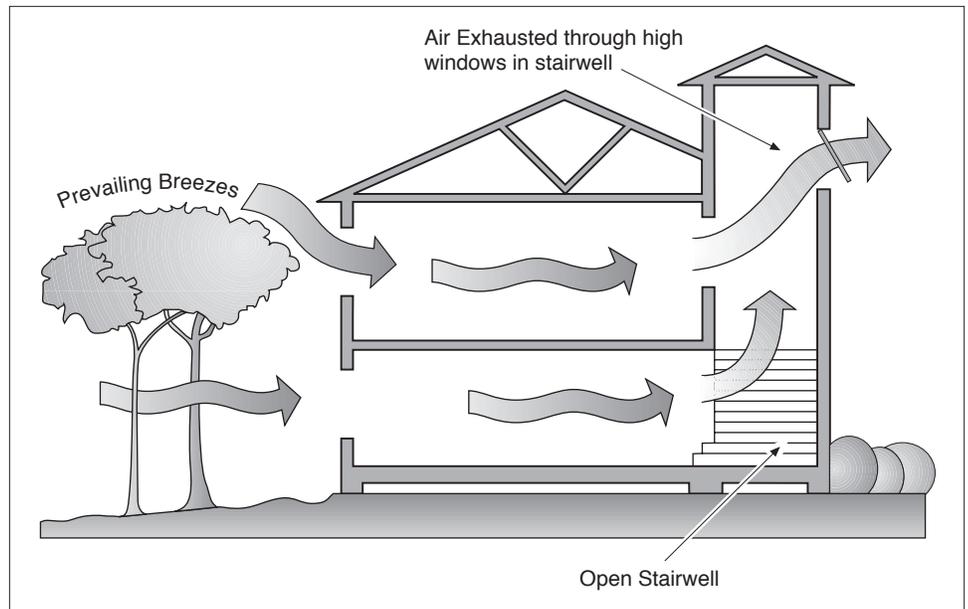
or most of the homes' electrical needs with solar is still limited.

Innovations continue to emerge, like roofing material made of PV cells, but lower cost options, including solar-powered gate openers, outdoor lighting and water pumps, can pay for themselves in a short time.

## WIND POWER

Wind power was always considered a priority on farms and ranches before rural electrification because it was the primary method for pumping water. In many areas of Texas, small wind generators can compete with (and even beat) local electric rates for providing the home's electricity.

While relatively few new homes rely on wind power, homeowners can take advantage of the wind for cooling if they locate their home perpendicular to the prevailing wind. Window style (i.e. double-hung and casement windows), window placement and home design must allow flow-through ventilation, both from prevailing breezes, and by low and high windows that draw air through the house.



**CREATING A THERMAL CHIMNEY** A thermal chimney is designed to cool using the natural tendency of warm air to rise. Air is warmed by the sun in a stairwell, and as it exits through windows at the top, cooler air is drawn through the home.



**USING RENEWABLE ENERGY FOR YOUR HOME** This Central Texas "Cool" house uses passive solar design with a reflective roof, radiant barrier, overhangs, thermal chimney with operable windows, stained concrete floors and optimal wall and ceiling insulation.

SOURCE: SUSTAINABLE LIVING ALLIANCE

## ORGANIZATIONS

**Florida Solar Energy Center**  
1679 Clearlake Road  
Cocoa, FL 32922  
(407) 638-7400  
[www.fsec.ucf.edu](http://www.fsec.ucf.edu)

**National Renewable Energy Laboratory**  
1617 Cole Blvd.  
Golden, CO. 80401  
(303) 275-3000  
[www.nrel.gov/](http://www.nrel.gov/)

**Passive Solar Industry Council**  
1511 K Street, Suite 600  
Washington, DC 20005  
(202) 628-7400  
[www.sbicouncil.org](http://www.sbicouncil.org)

**Texas Solar Energy Society**  
P.O. Box 1447  
Austin, TX 78767-1447  
(800) 465-5049  
e-mail: [info@txses.org](mailto:info@txses.org)  
[www.txses.org](http://www.txses.org)

**Texas Renewable Energy Industries Association**  
P.O. Box 16469  
Austin, TX 78761  
(512) 345-5446  
[www.treia.org](http://www.treia.org)

## RESOURCES

### FREE TEXAS RENEWABLE ENERGY INFORMATION

For more information on how you can put Texas' abundant renewable energy resources to use in your home or business, visit our website at [www.InfinitePower.org](http://www.InfinitePower.org) or call us at 1-800-531-5441 ext 31796. Ask about our free Teacher Resource Guides and CD available to teachers and home schoolers.

### ON THE WORLD WIDE WEB:

U. S. Department of Energy, Energy Efficiency and Renewable Energy site  
[www.eere.doe.gov](http://www.eere.doe.gov)

El Paso Solar Energy Association. Lots of good information.  
[www.epsea.org](http://www.epsea.org)

Solar heating systems and green building products.  
[www.oikos.com](http://www.oikos.com)

A Source for Green and Sustainable Building covering energy, water, building materials, solid waste and other topics. A mammoth resource.  
[www.greenbuilder.com/sourcebook](http://www.greenbuilder.com/sourcebook)

**Renewable Energy Access** – renewable newsletter  
[www.renewableenergyaccess.com/rea/home](http://www.renewableenergyaccess.com/rea/home)

### BOOKS

*The Passive Solar Energy Book.* Edward Marzia, Rodale Press, 1979. (Often available in libraries.)

*Energy Efficient Building Association Builder's Guide: Hot and Humid Climates.* Joseph Lstiburek and Betsy Pettit, Building Science Corporation, 2000.



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**Financial Acknowledgement** This publication was developed as part of the Renewable Energy Demonstration Program and was funded 100% with oil overcharge funds from the Exxon settlement as provided by the Texas State Energy Conservation Office and the U.S. Department of Energy. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

**State Energy Conservation Office**  
111 East 17th Street, Room 1114  
Austin, Texas 78774  
Ph. 800.531.5441 ext 31796  
[www.InfinitePower.org](http://www.InfinitePower.org)

Texas Comptroller of Public Accounts  
Publication #96-823 (08/06)