

Energy Savings Checklist

by Pete Melby¹, Miller Allen², Frank Barbour², Claire Gatlin², Sean Miller², Jeremy Murdock², Hall Roberts², Mandy Rogers² and Aaron Ruffin²

SCH Report 9

2008

REGENERATIVE TECHNOLOGIES FOR RESIDENTIAL SHELTERS

The following guidelines for energy-saving regenerative technologies can be employed in residential shelters and will result in significant savings in energy bills while promoting environmental stewardship through the reduction of fossil fuel consumption and pollutant discharge. Many of these technologies must be planned in advance of a shelter's construction, while a significant amount lend themselves to the retro-fitting of an existing structure.

These considerations also include daily energy-saving practices which may be employed at any time with little or no cost. This list of considerations was compiled for homes in the hot-humid climate of the southeastern United States where an emphasis is placed on reducing cooling costs. Many of these technologies require modest up-front costs, while many can be employed with little to no added cost. The included energy use breakdown illustrates the ultimate financial gain incurred through using a combination of these energy-saving considerations.

TO SAVE MONEY ON YOUR TOTAL ENERGY BILL:

- **Create a rectangular shaped shelter and site your home with the broadest side facing south**
 - This will save on your cooling bill by preventing the summer sun's hot western rays from striking the broadest portion of your home.
 - This will also reduce heating costs by allowing the low angle of the winter sun to warm the broadest portion of the house and enter into south facing windows to warm the inside of the house.
 - The combined energy savings is 33% of your heating and cooling cost.
- **Use geothermal heating and cooling**
 - This can save 45-55% on your heating and cooling bills. However, if you use a combination of energy efficient technologies, you can save greater than 55% on your heating and cooling costs without the extra expense of a geothermal system.
- **Have sufficient insulation**
 - Your home will be warmer in the winter by retaining interior heat, and the insulation will block the sun's heat from entering your home in the summer. Use extra insulation in the walls and beneath the roof to reduce the flow of heat.
- **Consider earth sheltering**
 - By building "into" the earth or mounding soil around a portion of your home, the home can use the earth's warmth during the winter to keep it warm, and the earth's coolness in the summer to keep it cool.

¹ASLA, Professor and Co-Director, Center for Sustainable Design, Department of Landscape Architecture, Mississippi State University

²Graduate Students, Department of Landscape Architecture, Mississippi State University

TO SAVE MONEY ON YOUR COOLING BILL:

- **Plant evergreen or deciduous trees along the eastern and western sides of your home**
 - The trees will block summer eastern and western rays of the sun from striking your home, reducing the temperature by 10-15°F, but will not interfere with passive winter heating which comes from the southern exposure.
 - Evergreen tree and shrub planting along northeast, northwest, and north sides of the structure will serve as a wind ramp to deflect winter wind, reducing the loss of heat from the shelter by protecting your home from harsh winter winds. Winds accelerate heat loss from whatever they strike. Place a combination of shrubs and trees to ramp the wind up and over your home and outdoor use areas. This will reduce winds at a distance of five times the windbreak height.

- **Change your thermostat**
 - You can save money simply by changing the set point on your thermostat to a higher temperature during the summer, such as from 70-75°F.

- **Add de-humidification in the summer**
 - Your home will feel up to 7°F cooler by using a dehumidifier, and this will allow you to set your thermostat at an even higher set point, thus saving money spent on cooling your home.

- **Add an overhang onto the southern portion of your home**
 - Make it wide enough to block the hot southern rays of the summer sun, but allows the rays to enter in the winter, allowing for passive heating.

- **Use shades, blinds, or awnings on your windows during the summer**
 - These will help block sunlight not blocked by trees and overhangs. If using awnings, they should be retractable to allow light in during the winter.

- **Use a reflective, light-colored material on your roof**
 - The sun's rays will be reflected rather than absorbed. A dark roof is for use up north where they have a greater heating need than cooling need.

- **Have windows that open and include screens. These should be located on both the southern and northern side of the home.**
 - During the transition season, such as April–May, and October–November, you will be able to open the windows and the cross ventilation will keep the home at a comfortable temperature without the need for heating or cooling. Humidity levels are low at this time as well. When the dew point is below 60°F you will not notice humid conditions.
 - In addition, an open interior floor plan will help with air circulation and cross ventilation.

- **Build on a raised foundation**
 - This will allow adequate airflow beneath your home which will keep it cooler.

- **Use high ceilings**
 - The heat will rise and you will be cooler at lower levels.

TO SAVE MONEY ON YOUR HEATING BILL:

- **Utilize thermal mass, such as stone or concrete masonry floors and walls**
 - The sun's rays will be absorbed by the material and will be stored until your home begins to cool; then the heat will be released to provide natural heating.
 - Thermal mass also helps to cool by absorbing interior heat during the summer. Heat moves from areas of high concentration to areas of low heat concentration.

- **Use large and tall windows on the south side of your home**
 - In the winter, the sun's rays will enter your home through these windows and strike the thermal mass in your floors and walls, providing natural heating.

- **Change your thermostat**
 - Changing your thermostat to a lower set point in the winter, such as 68-70°F, will save money on your heating bill.

- **Add humidification in the winter**
 - Humidifying your home, such as with the use of indoor plants or a humidifier, will allow you to set your thermostat lower, and still feel warm.

TO SAVE MONEY ON YOUR LIGHT BILL:

- **Make use of natural daylight by having windows on the north and south portions of your home, and/or skylights and solartubes**
 - This will allow you to enjoy your home during the daytime, without the use of electric lights. Become lighting independent during the daytime.

- **Use task lighting**
 - Use lamps when possible instead of overhead lights, which typically use more energy.

- **Use energy efficient light bulbs**
 - They cost more than a standard bulb but use far less energy and last far longer.

- **Use timers for holiday or night lighting to come on only when desired.**

OTHER WAYS TO SAVE AND IMPROVE YOUR SPACE:

□ **Use a solar hot water heater**

- Your hot water bill will typically be reduced by 50 - 95% by using a solar hot water heater. You will recoup your investment in 3 years through energy savings.

□ **Use photovoltaics (solar panels)**

- By utilizing photovoltaics, you can generate enough energy to power your entire household (this will result in a net energy bill of \$0!).
- In addition, photovoltaics are great for the environment, as no carbon dioxide is produced by using them. They are powered by a renewable energy source, the sun. Their use preserves fossil fuels for future use.
- If you have used enough energy saving technologies you can reduce your overall energy use by nearly 70% and the remaining 30% can be made up with photovoltaics.

□ **Re-use grey water**

- The water you use to bathe or do laundry is great for watering plants. The plants will be improved by the nutrients present in the grey water.

□ **Harvest rain water**

- Rain water can be collected, cleaned and filtered and used for potable water and household use. In the hot-humid region, all indoor water needs can be provided from the water that falls on the roof of a small home.

□ **Purchase energy efficient appliances**

- The newer Energy Star appliances use as much as 50% less energy than other models. They are worth the extra cost.

□ **Compost kitchen scraps**

- You can enrich your soil by composting your kitchen scraps, providing plants with vital natural nutrients and micro-nutrients.
- This practice is environmentally friendly and reduces the material that goes into landfills.

□ **Include indoor plants**

- Indoor plants not only add humidity to the home in the winter, they are wonderful air cleaners for removing airborne microbes. They also help to clean up VOCs (Volatile Organic Compounds) from furnishings and building materials.

□ **Choose home furnishings made of natural materials such as cotton or wool**

- Steer clear of materials with high concentrations of VOCs.
- The quality of your indoor air will be improved, which might result in fewer allergies and respiratory illnesses.

□ **Practice energy-saving activities**

- Hang clothes to dry (the dryer is a huge energy user).
- Unplug appliances when they are not in use.

-
- **Many appliances use energy in the form of “phantom loads.” For example, VCRs with clocks use energy even when the power is not turned “on” to keep the time on the clock correct.**
 - Take shorter showers.
 - Skip the heated dry cycle of the dishwasher (another large energy user).
 - Only wash clothing when there is a full load.
 - Use the proper setting on appliances such as the light load cycle on washers.
 - Change the temperatures on appliances—Turn down the temperature of the hot water heater to 120°F. Recommended temperatures are 37–40°F for the refrigerator and 5°F for the freezer.

ENVIRONMENTALLY FRIENDLY PRACTICES:

- **Sequester carbon**
 - Planting trees will help absorb the carbon dioxide your energy use creates, thereby preventing it from harming the atmosphere. If you use a lot of the recommended energy saving technologies and photovoltaics, you might not be producing any carbon.
- **Use native plants**
 - These plants are perfectly suited to your area and do not require the amount of care, energy, and materials that exotic plants may need. They do not generally require extensive use of fertilizers and you don’t have to worry about them escaping your yard and becoming an invasive problem elsewhere.
 - The over-use of fertilizers is harmful and ends up in our streams causing eutrophication (too much fertilizer) and resulting in large dead zones in the seas.
- **Xeriscape**
 - Use plants that do not require much water. You’ll save on your water bill and help conserve water at the same time.
- **Use mulch in your planting beds**
 - This will help keep your plants’ roots cooler in the summer and warmer in the winter, as well as help to conserve water.
- **Garden organically**
 - Use naturally occurring fertilizers, such as compost and fish emulsion, and natural herbicides and pesticides. These are better for the environment.
- **Grow your own fruits and vegetables organically**
 - Your food will be free of toxic chemicals.
 - You will consume fresher food since it may be picked and eaten in the same day.
 - Energy will be saved by your food supply not being shipped from far away.
- **Use local products and materials**
 - This saves energy from being used to transport items from great distances.
 - Many times this savings will be reflected in what you pay for the product. Local products will probably be less expensive.

- **Help improve water quality by not adding impermeable surfaces to your landscape, and by retaining nearly all of the water that falls on your site**
 - Impermeable surfaces allow water to “run off” into the storm water management system, carrying with it dangerous components such as pesticides, herbicides, animal feces, hazardous materials, and the like.
 - Consider using materials such as pervious concrete or pervious asphalt for paved surfaces.
 - If you use permeable materials, mulches and plantings to detain water that enters your site, the quality of the water will be improved.
 - Harvesting your rainwater helps as well because you keep runoff water on site instead of contributing to large amounts of water runoff.

- **Recycle**
 - You can earn money on certain items that you recycle.
 - Recycling saves items from going to expensive land fills.

- **Install a rock-reed or plant-reed sewage treatment system**
 - Much less energy is required to treat sewage water in this method.
 - If well-designed and managed, this can be an attractive garden feature.
 - Using rock-reeds is a more natural way of treating waste.

Some of these practices may require more “up-front” costs than other traditional methods, but there are good reasons to consider using them:

1. You will save money in the “long run” by having reduced energy bills
2. You will be helping the environment by being a steward of the land, preserving our resources for generations to come

TYPICAL ENERGY USED AND ENERGY THAT CAN BE SAVED

Average 1,800 square foot home in the Hot-Humid Climate Zone

- Dryer/Dishwasher = 4% = 613 kWh
- Food Prep. = 5% = 767 kWh
- Lighting, TV's, Radio's = 8% = 1226 kWh
- Freezer/Refrigerator = 8% = 1226 kWh
- Water Heating = 20% = 3066 kWh
- Heating/Air Conditioning = 55% = 8432 kWh
- Total Energy Used = 15,330 kWh/year = \$1533.00/yr @ \$.10/kWh

Home with Regenerative Technologies

- Rectilinear building sited to face south—33% saved on heating/cooling load
- Shading on east and west sides with proper overhangs and wind breaks—10% saved on heating/cooling load
- Natural Daylighting—10% saved on lighting use
- Cross ventilation during transition seasons (4 months/yr), no use of heating or cooling system—10% saved on heating/cooling load
- Thermal mass and high ceilings—10% saved on heating/cooling load
- Solar hot water heating—70% saved on hot water heating load
- Use of energy efficient appliances—15% saved on dryer/dishwasher and freezer/refrigerator loads
- Thermostat set point of 69°F in winter—3.1% saved on heating load
- Exterior Materials w/high Albedo—10% saved on cooling load
- Humidity Control—10% saved on H/C load
- Ground source heating/cooling—50% saved on H/C load—but, not needed because the heating and cooling load is already reduced by 86%.

Thus

- Dryer/Dishwasher/Freezer/Fridge = 1563 kWh
- Food Prep = 767 kWh
- Lighting, TV's, Radio's = 1103 kWh
- Water Heating = 920 kWh
- Heating/Cooling = 1180 kWh

Total Energy Used = 5533 kWh/year = \$553.30/yr @ \$.10/kWh

Average Home = \$1533.00/yr in energy costs

Home Employing Regenerative Technologies = \$533.30/yr in energy costs

Yearly Energy Savings can be 64% over traditional energy costs

LITERATURE CITED

P. Melby, T. Cathcart. 2002. *Regenerative Design Techniques: Practical Applications in Landscape Design*. John Wiley & Sons, Inc. New York (ISBN: 0-471-41472-7). 416 p.

Order online @ www.csd.abe.msstate.edu; www.amazon.com; www.barnesandnoble.com; www.walmart.com.