

Reducing Electricity Use

Part 1

Why Save Electricity?

- **Most prefer generating more electricity (like adding solar panels).**
 - **More glamorous and fashionable.**
 - **More visible to others, a public statement.**
 - **Most equate savings with hardship but not generation.**
- **Saving electricity is usually much cheaper than generating.**
- **There are NO benign ways of generating electricity; ALL have some negative impact.**
- **If your goal is to eventually be off-grid, you'll have to significantly reduce your energy use because it will cost too much and take up too much space to generate all a typical household presently needs**

Standard Of Living Myth

- **Most people feel reducing their energy use will reduce their standard of living.**
- **Throughout the 1940's through most of the 1980's, the U. S. did have a better generally accepted standard of living than the rest of the world.**
- **By the 21st century, many countries have caught up and even surpassed the U. S. in standard of living.**
 - **Most of these countries are using less than half the electricity per household as a U. S. household.**
 - **The biggest reason for this difference is due to the mindset of the people.**

02/12/12

Average Electricity Use Per Household

Country	Per year	Per month	Cost per month (\$)				(Millions)	
	Used (kWhr)	Used (kWhr)	Electric	Hookup	Subtotal	Taxes	Total	Population
United States	12000	1000	\$120.00	\$8.76	\$128.76	\$3.22	\$131.98	310
Florida	14328	1194	\$153.28	\$8.76	\$162.04	\$4.05	\$166.09	17
United States (house)	17000	1417	\$174.21	\$8.76	\$182.97	\$4.57	\$187.54	310
France	3400	283	\$34.00	\$8.76	\$42.76	\$1.07	\$43.83	59
Germany	3900	325	\$39.00	\$8.76	\$47.76	\$1.19	\$48.95	78
Netherlands	3300	275	\$33.00	\$8.76	\$41.76	\$1.04	\$42.80	16
Switzerland	5700	475	\$57.00	\$8.76	\$65.76	\$1.64	\$67.40	7
United Kingdom	3300	275	\$33.00	\$8.76	\$41.76	\$1.04	\$42.80	60
Japan	5945	495	\$59.45	\$8.76	\$68.21	\$1.71	\$69.92	130
Australia	6400	533	\$64.00	\$8.76	\$72.76	\$1.82	\$74.58	22
Canada	11111	926	\$111.11	\$8.76	\$119.87	\$3.00	\$122.87	32
New Zealand	7873	656	\$78.73	\$8.76	\$87.49	\$2.19	\$89.68	4
Me (1989)	3220	268	\$32.20	\$8.76	\$40.96	\$1.02	\$41.98	
Me (2009)	1108	92	\$11.08	\$8.76	\$19.84	\$0.50	\$20.34	
Average for Europe	4667	389	\$46.67	\$8.76	\$55.43	\$1.39	\$56.82	380

Electric rate: \$0.120 Per kWh Plus \$0.01 per kWh for over 1000 kWh/month
Tax rate: 2.50%

How I Reduced My Consumption

- **Many of the things I did are discussed in the one hour Pinellas Energy Efficiency Project (PEEP) class.**
 - **Taught by Pinellas County Extension Service**
 - **Register at www.pinellascountyextension.org, search for “PEEP.”**
 - **Each participating household receives energy saving equipment worth between \$50 to \$200.**
- **I'll discuss things I did different or in addition to what the above class discusses.**
- **I didn't just make a couple of changes to reduce my electric consumption. I've done about 400 to 500 things over the years, most rather small, to get my electricity use so low.**
- **Many of the things I did also have other benefits:**
 - **Reduce sound entering or leaving house.**
 - **Reduce insects and other critters from getting into house.**
 - **Help protect house from storms, such as hurricanes.**

Air Conditioning Myth

- **The instantaneous reaction of most people to hearing how low my electricity use is: “You probably don't use any air conditioning.”**
 - **They are partly right, I do use much less air conditioning than most because I don't need it to keep my house a comfortable temperature.**
 - **But this is irrelevant, as most households in Florida go at least a couple months each year without using any air conditioning.**
 - **During these months, almost none of these household still have electric bills less than \$20/month.**
 - **You could forget about reducing your air conditioning needs and just concentrate on getting the rest of your electric use to less than \$20/month.**
 - **If you get the rest of your use to less than \$20/month, your air conditioning needs will also automatically drop significantly.**
- **Blaming high energy use on air conditioning is just an excuse for not doing anything.**

Electricity Eventually Becomes Heat

- **Virtually all energy used eventually becomes heat.**
- **Consequently, minimizing electric use also minimizes the heat generated, which in turn minimizes the need for air conditioning.**
 - **Most people just think of keeping outside heat from entering the house and ignore the heat being generated inside the house.**
- **People give off heat; about 100 W per person at rest, more if active.**
 - **Dietary calories (really kilocalories) are really a measure of heat.**
 - **That is one reason why it feels hotter at parties and other crowded situations.**
 - **Fanning yourself actually makes you hotter as you burn energy to move the fan, increasing your power generated.**
 - **The best way to keep as cool as possible (all else being equal) is to be as relaxed as possible.**

Electricity Eventually Becomes Heat (Continued)

- **Heat pumps (air conditioners and refrigerators) do not generate cold, they just remove heat and put it someplace else.**
 - **“Cold” is the absence of “heat,” sort of like an “empty” glass of water is a glass where water is absent.**
 - **Since heat pumps have to be less than 100% efficient, they put more heat into that “someplace else” than they removed.**
 - **Refrigerators put that removed heat into your kitchen.**
 - **Air conditioners put that removed heat plus losses outside, so they are effectively heating the outside of your house. This is part of the “urban heat island” effect.**
- **Fans do NOT cool a room, they heat it up.**
 - **They consume electricity and virtually all their electricity is converted into heat.**
 - **Their effect is psychological and physiological; they only appear to cool a room if they are blowing on someone who feels it.**

Don't Turn Things On Unnecessarily

- **Don't turn TVs or radios on just for background noise.**
- **Don't leave ceiling fans on in unoccupied rooms.**
 - **Ceiling fans do NOT cool a room, they heat it up.**
- **Don't run water heater 24 hours a day. Put on timer or just turn on when needed.**
- **Don't leave computer on 24 hours a day.**
 - **Also makes computer more susceptible to viruses, power glitches, and lightning strikes and encourages spam.**
 - **Hard drives also wear out faster.**
 - **Don't automatically turn on all the accessories, such as printer, speakers, etc., when using computer.**
- **Don't leave modem on all the time.**

Water Heater Timer



Reduce Phantom Loads

- **“Phantom loads” are things that still draw power even when they are supposed to be “turned off.”**
 - **Obvious things are cell phone chargers, microwave ovens, computers.**
 - **Not-so-obvious things are doorbells, controls for central heat and air conditioning, stereos, ground fault interrupters (GFIs), remote power supplies (wall warts), clothes washers and dryers, computer printers and speakers.**
 - **An easy way to tell if something is drawing power when “off” is to feel it; if it is warm, it is drawing power.**
 - **Also can measure power draw of items with a “Kill A Watt” power meter, which can be borrowed from local libraries.**

Examples of Remote Power Supplies



Kill A Watt Power Meter



Reduce Phantom Loads (Continued)

- **Remove these items from the power line.**
 - **Unplugging is cheapest, but often a nuisance, especially if the outlet is behind something.**
 - **Use switched multioutlet strips.**
 - **If you don't use it (such as a doorbell), disconnect it.**
 - **This also helps reduce the damage from a lightning strike.**

Examples of Switched Multioutlet Strips



Saving On Lighting

- **Don't leave lights on in unoccupied rooms.**
- **Don't light up a whole room to read or work on computer. Put a light by reading chair or computer.**
- **Use compact fluorescent lights (CFLs) or LED lights.**
 - **Both use less than 25 % of the power used by incandescent lights.**
 - **CFLs presently much cheaper than LEDs.**
 - **Many avoid CFLs because they contain mercury.**
 - **But no mercury is released into the environment if the bulbs are recycled.**
 - **Also, about half of our electricity is generated by coal fired power plants, which are the primary source of mercury in the environment.**
 - **LED bulbs also contain toxic materials and need to be recycled.**

Saving On Lighting (Continued)

- **Can calculate savings using CFLs or LED bulbs by using this spreadsheet: <http://www.homepower.com/files/kerrcflbulbs.xls>**
- **Paint the walls and ceiling white or a light color.**
- **Furnish rooms with light colored stuff.**

Compact Fluorescent Light Bulb Investment Analysis Worksheet

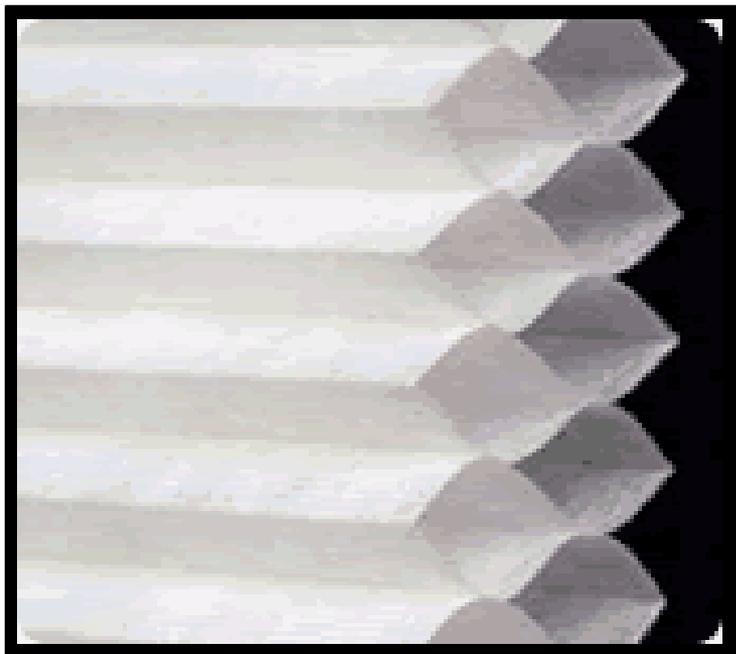
Vary only *italic bolded* values.

Factor	Unit	Value	Notes
ENTER THESE VARIABLES		ENTER HERE	
<i>Bulb use</i>	Hours/day	4	Enter your estimate of how many average hours the bulb is on each day.
<i>CFL bulb size</i>	Watts	26	Enter wattage size of CFL bulb (not what the packaging says in the incandescent equivalent).
<i>Brightness</i>	Lumens	1700	Enter lumens rating from packaging. Brightness is measured in lumens, not watts.
<i>Rated CFL bulb life</i>	Hours	8000	Enter rating from packaging.
<i>Cost of electricity</i>	\$/kWh	0.120	Enter your cost per kilowatt/hour for electricity (e.g. 6.1¢ = \$0.061).
<i>Wattage of incandescent bulb replaced</i>	Watts	100	Enter wattage of incandescent bulb replaced.
<i>Lumens of incandescent bulb replaced</i>	Lumens	1710	Enter lumens rating from packaging.
<i>Rated incandescent bulb life</i>	Hours	750	Enter rating from packaging.
<i>Cost of incandescent replaced</i>	\$	\$0.26	Enter the price of incandescent bulb being replaced.
<i>Cost of CFL bulb (before any rebates)</i>	\$	\$3.13	Enter cost of CFL bulb. First, subtract any rebates from utilities or government.
<i>Rebates</i>	\$	\$0.00	Enter amount of any rebates or kickbacks for buying the bulb.
<i>Combined federal and state tax rate</i>	%	25	Enter your combined federal and state tax rate as a percent.
Cost of CFL bulb (after any rebates)	\$	\$3.13	
Marginal increase in cost for CFL bulb	\$	\$2.87	The cost of your "investment instrument."
Power used	KWH/year	37.96	The amount of electricity the bulb uses in a year.
Money spent on electricity consumed	\$/year	\$4.56	How much money you will spend annually with a CFL bulb.
Power not used	KWH/year	108.04	The amount of electricity the replaced incandescent bulb did not consume.
Money saved on electricity not consumed	\$/year	\$12.96	The amount of money not spent by converting an incandescent to a CFL bulb.
Power consumption of CFL v. incandescent bulb	%	26.00	The percentage of electricity used by a CFL bulb versus a comparable incandescent bulb.
Brightness efficiency of CFL bulb	Lumens/watt	65.38	The amount of brightness per unit of energy consumed. Lumens good, watts bad.
Brightness inefficiency of incandescent bulb	Lumens/watt	17.10	Brightness is measured in lumens, not watts.
Number of incandescent bulbs you don't change	Pains in ass	9.67	Monetary savings (the value of your time) not quantified.
Simple payback on initial investment	Years	0.22	Simple payback in years.
Return on investment (tax-free)	%/year	451.74	Tax-free figure as a percent of CFL bulb cost (including recouping capital cost of bulb).
Return on investment (taxable)	%/year	602.31	The equivalent rate of return of a taxable investment. Money saved need not be earned. (If ROI negative, then strictly speaking, you use the CFL bulb so little as to not justify cost.)

Reduce Heat Transfer Through Windows

- **Caulk around window frame to seal cracks around frame.**
- **Put a reflective film on windows.**
- **Put a second layer on windows.**
 - **Best way is to replace with double pane windows, but quite expensive.**
 - **Can also put plastic film over windows.**
- **Shade windows from direct sunlight with vegetation, awnings, and/or roll down shutters.**
 - **Also can protect windows from storm damage.**
- **Use insulating coverings over windows, like insulating drapes.**
 - **Honeycomb cellular blinds appear to be best, especially ones with double cells and side rails.**
 - **Translucent ones let a lot of light through even when closed.**

Honeycomb Cellular Blinds



Reduce Heat Transfer Through Doors

- **Caulk around door frame to seal cracks around frame.**
- **Use a metal face door with foam core.**
 - **Best if gaskets on door frame are magnetic.**
- **Doors with windows have a lot more heat loss and gain but let more light in; a trade off.**
- **Least heat transfer if door doesn't go straight from air conditioned house to outside, but through intermediate room which acts like air lock.**
 - **Was common in older houses up north: The vestibule.**
 - **Also helps reduce sound and pest transfer into house.**
 - **I usually enter my house through the garage to the kitchen.**

Get More Efficient Appliances

- **This is not cheap and appliances usually last a while, so this is more of a long term strategy.**
 - **But since appliances do last a long time and tend to use a lot of power, choosing a more efficient appliance when you do buy one can add up to big savings over the years.**
- **An Energy Star label on the appliance does not necessarily mean the lowest energy use.**
 - **Almost all appliances have an Energy Star rating.**
 - **There are very big differences in energy use between appliances with similar sizes and features.**
 - **Learn to read the Energy Star tag on the appliance. Look for the lowest projected kWh/year.**
 - **Can compare on these websites:**
<http://www.energystar.gov/default.shtml>,
<http://energiguide.nrcan.gc.ca/html/home.html>
- **More efficient appliances often cost little or no more than less efficient appliances.**

Example Of Energy Star Label

U.S. Government Federal law prohibits removal of this label before consumer purchase.

ENERGYGUIDE

Refrigerator-Freezer

- Automatic Defrost
- Side-Mounted Freezer
- Through-the-Door Ice

XYZ Corporation
Model ABC-L
Capacity: 23 Cubic Feet

Estimated Yearly Operating Cost

\$67

Cost Range of Similar Models

630 kWh
Estimated Yearly Electricity Use

Your cost will depend on your utility rates and use.

- Cost range based only on models of similar capacity with automatic defrost, side-mounted freezer, and through-the-door ice.
- Estimated operating cost based on a 2007 national average electricity cost of 10.65 cents per kWh.
- For more information, visit www.ftc.gov/appliances.

Source: www.ftc.gov

Key features of the appliance are listed here, for easy comparison between models.

Appliance information like make, model, and size are listed to give basic information about the appliance.

The estimated cost to run the appliance is based on electricity use and national electricity prices. Compare the estimated energy cost as you would features of the appliance.

The cost range chart compares how much this appliance can potentially cost annually versus other similar models.

The annual estimated energy use based on average use. Simply multiply this number by the rate on your electricity bill and you will find the operating cost.

The Energy Star logo is visible when the appliance is Energy Star rated. Energy Star models are more energy

Saving In Kitchen

- **Make sure reflectors under stove burners are clean.**
- **Often, small specialized appliances, such as slow cookers (crock pots), toaster ovens, breadmaking machines, and microwave ovens, use less electricity than the regular stove or oven.**
- **If possible, move heat generating appliances outside of air conditioned house during warm weather.**
 - **For example, I use my breadmaker in the kitchen in cold weather but run it in the garage during warm weather.**
 - **In old Florida, the kitchen was often in a building separate from the main house.**
- **Use the minimum amount of water necessary for boiling or steaming items.**
- **If possible, cook items in the same pot at the same time instead of using multiple pots and burners.**
 - **Heat egg noodles and beans in the same pot at the same time.**
 - **Make stews or soups instead of separate dishes.**

Saving In Kitchen (Continued)

- If possible, use only one heater and cook items sequentially instead of all at once on multiple heaters.
- Once your stove burner and liquids get to temperature, they will stay at temperature for a long time.
 - Consequently, you can “coast cook” by turning the electricity off before the food is totally cooked and let this stored heat finish the cooking.
 - When I cook pasta, I bring the water to a boil, put the pasta into the pot, and then turn the electricity off. The pasta still cooks thoroughly in the same amount of time as if I had left the burner turned on.
 - Be careful and research food first as some items, such as beans and some tropical spinaches, need to be cooked a minimum time to deactivate toxins.
- When draining hot water from pots drain it into a bucket in house during cold weather, outside of house during hot weather. Let it cool before disposing.

Saving In Kitchen (Continued)

- **Always use lids on your pots and keep the lid completely over the pot.**
- **Smaller pieces and thinner items cook faster and need less energy to cook than bigger and thicker pieces.**
- **Don't use an electric dishwasher.**

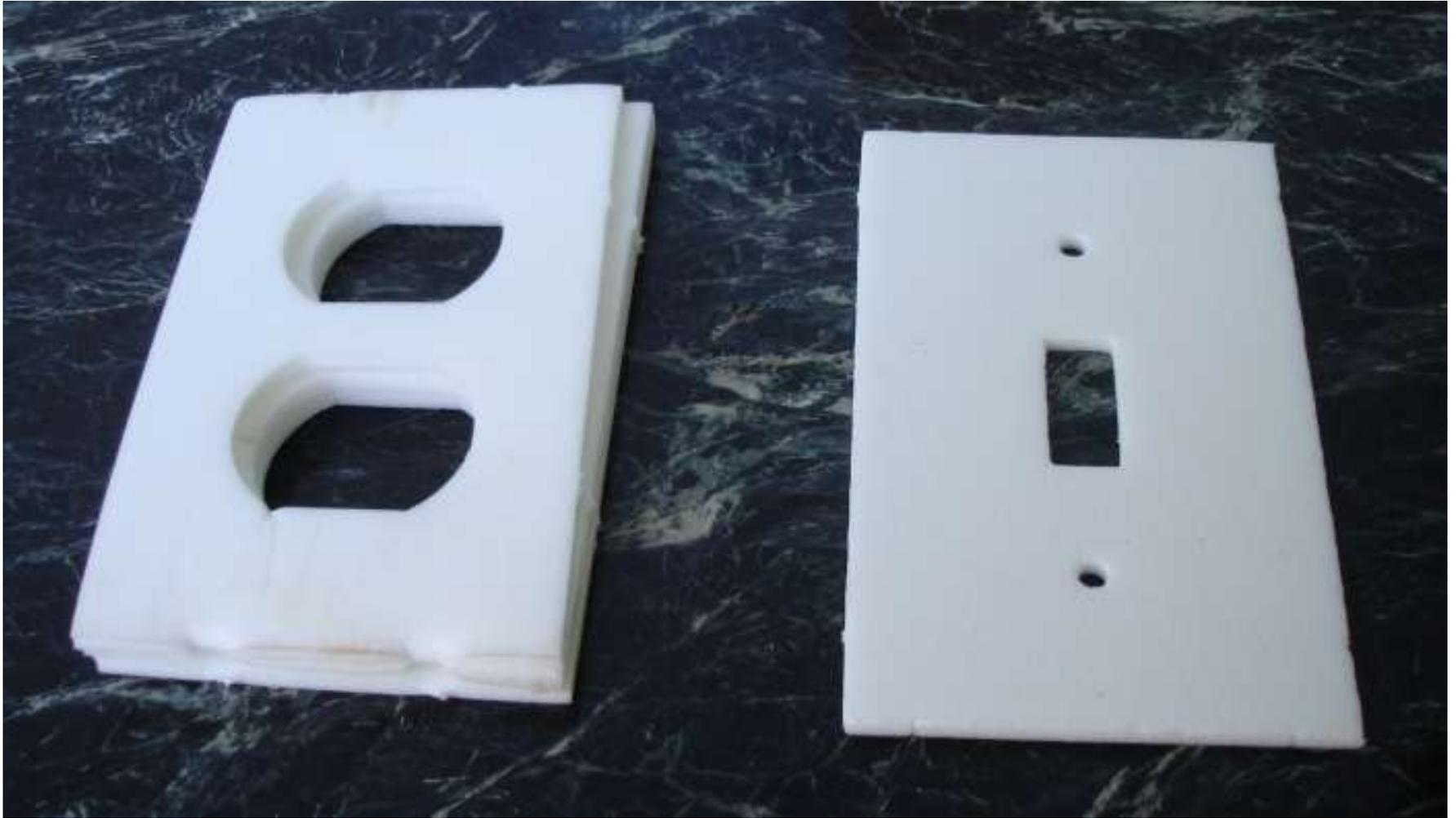
Saving While Doing Laundry

- **Wait until you have a full load to do laundry.**
- **Front loading washers tend to use less energy and water.**
- **Set controls for the shortest time necessary to do job.**
- **Wash and rinse with cold water.**
 - **Many modern laundry detergents are designed to be used in cold water.**
- **Don't use electric dryer, use clothesline or drying racks.**
- **If you use an electric dryer, put it in garage, not in air conditioned room.**
- **Vent the dryer outside. Use as short and straight a vent pipe as possible.**
- **Clean lint from lint trap before each use of dryer.**
- **Keep vent pipe path clean of lint.**
- **Remove items from washer and dryer as soon as load is finished.**

Seal Air Leaks

- **One of the cheapest ways to significantly reduce heating and air conditioning needs, but tends to be labor intensive and tricky to do correctly.**
- **Some are concerned about sealing house too well.**
 - **Need a minimum air exchange for health.**
 - **It is virtually impossible to seal an older house too well.**
 - **It is possible to seal a new construction house too well.**
 - **If not enough air exchange, add a heat exchanger to introduce enough air exchange.**
- **Obvious is to better seal around doors and windows.**
- **Add gaskets to light switches and electrical and telecommunications outlets.**
- **Seal where plumbing goes through walls and floor.**
- **Also seal where wires and plumbing goes through top of walls to attic and bottom of walls to crawlspace.**

Examples Of Electrical Outlet Gaskets



Seal Air Leaks (Continued)

- **Seal central heat and air registers to ceilings and walls.**
- **Seal central heat and air ductwork.**
 - **Cloth duct tape not good enough.**
 - **Aluminum duct tape much better, but still not good enough.**
 - **Mastic should be used to seal all seams in ductwork.**
 - **Fiberglass tape (looks like a narrow roll of fiberglass window screen) should be used on all joints with mastic. Embed tape in mastic and cover with more mastic.**

Examples Of Sealing Materials



End Of Part 1

- **This discussed more lifestyle oriented stuff.**
- **Part 2 discusses more construction oriented type stuff, such as:**
 - **Insulation: Different materials and techniques.**
 - **Roofs: Comparisons of different types, impact of color, venting.**
 - **Radiant barriers.**
 - **Floors, including coverings.**
 - **More on sealing techniques.**
- **A copy of the slides in this presentation may be found at:**
 - **www.stonemarmot.com**
 - **Look for the link to the “Rants and Raves Blog” in the left column of the home page.**
 - **Other articles on saving energy, solar power, and other miscellaneous stuff are in the blog, can search blog with search feature at the top of the page.**