

Wind and Solar in Kentucky





Renewable Energy for Kentucky



Solar Power

Photovoltaic or Thermal?

Photovoltaic generates electricity

Thermal generates hot water

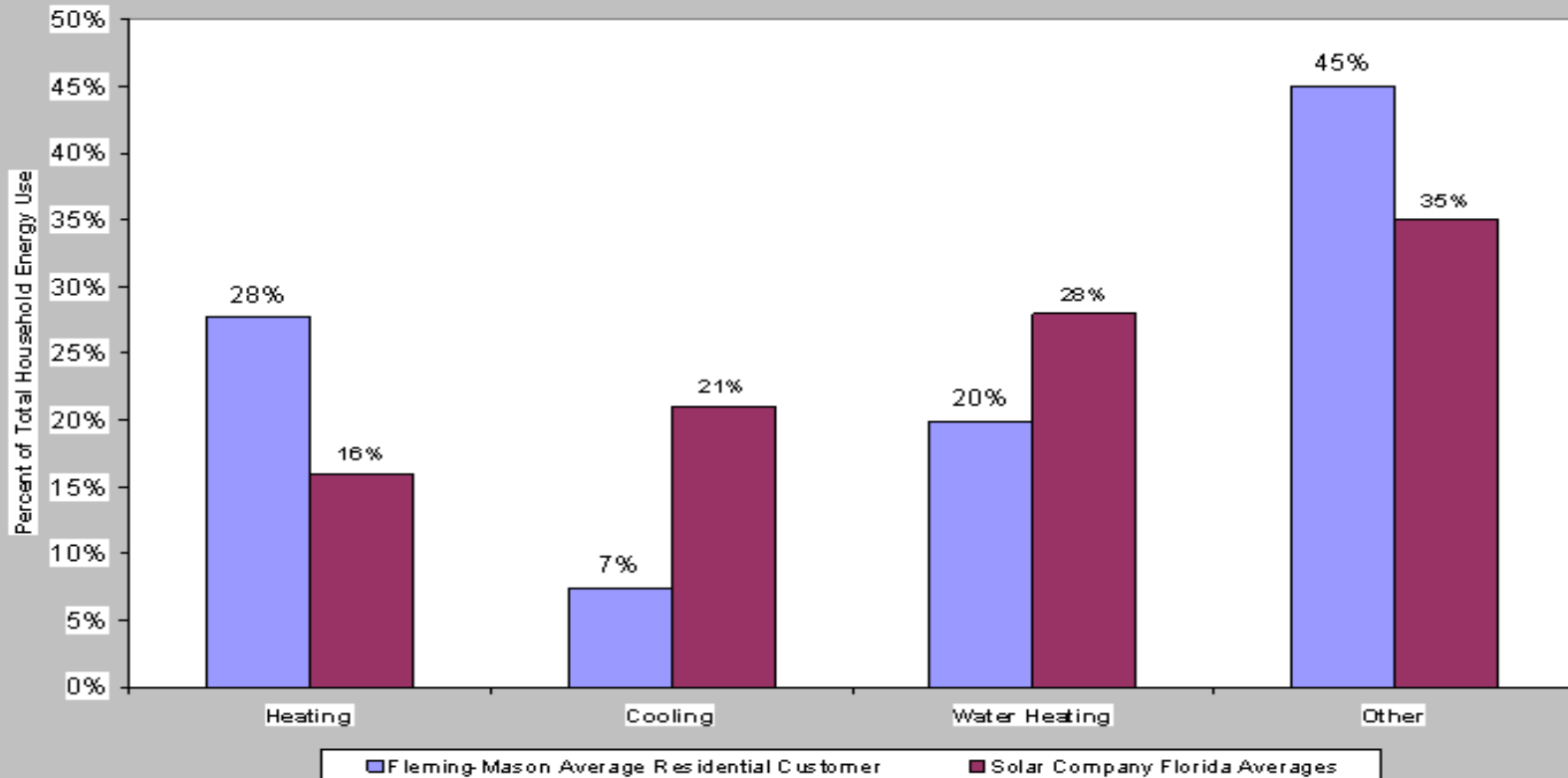


Renewable Energy for Kentucky

Solar Power

Heating vs Cooling

Home Energy Use: 'What makes up my electric bill?'





Renewable Energy for Kentucky




Solar Power - Photovoltaic



Photovoltaic Panels – 200 watt

Cost = \$1,100 per panel plus installation

10 panels generate 2 kW of electricity




Total cost of system = \$19,000 installed



Renewable Energy for Kentucky



Solar Power – Photovoltaic Average Sunlight Hours Each Day



Jan – 3.1

Feb – 3.8

Mar – 4.4

Apr – 5.1

May – 5.4

June – 5.6

July – 5.5

Aug – 5.5

Sept – 5.1

Oct – 4.6

Nov – 3.2

Dec – 2.7

Average for Kentucky – **4.5**

Average for Florida – **5.3**

<http://rredc.nrel.gov/solar/pubs/redbook/>

Renewable Resource Data Center (RReDC)

Ave cost of power in Ky – 7.2 cents

Ave cost of power in Fla – 11.2 cents



Renewable Energy for Kentucky



Solar Power – Photovoltaic
Do the Math



For example: Solar in Kentucky

4.5 hours of sunlight x 2 kW = 9.0 kWh per day



9.0 kWh/day x 30 days = 270 kWh/month



Renewable Energy for Kentucky

Solar Power – Photovoltaic

Do the Math @ \$.08 kWh

Cost of Unit: \$19,000- \$2500 tax credit

Net Cost = \$16,500

Savings/Year at \$.08 = 270 * \$.08 * 12 = \$259.20/yr

\$16,500/\$259.20 = 63.65 years

Payback at \$.08 = 64 years





Renewable Energy for Kentucky

Solar Power – Photovoltaic

Do the Math @ \$.12 kWh

Cost of Unit: \$19,000- \$2500 tax credit

Net Cost = \$16,500

Savings/year at \$.12 = 270 * \$.12 * 12 = \$388.8/yr

\$16,500/\$388.8 = 42.4 years

Payback at \$.12 = 42 years





Renewable Energy for Kentucky

Solar Power – Photovoltaic

Do the Math @ \$.16 kWh

Cost of Unit: \$19,000- \$2500 tax credit

Net Cost = \$16,500

Savings/Month at \$.16 = 270 * \$.16 * 12 = \$518.40/yr

\$16,500/\$518.40 = 31.82 years

Payback at \$.16 = 32 years





Renewable Energy for Kentucky

Solar Power – Photovoltaic

Do the Math @ \$.25 kWh

Cost of Unit: \$19,000- \$2500 tax credit

Net Cost = \$16,500

Savings/Month at \$.25 = 270 * \$.25 * 12 = \$810/yr

\$16,500/\$810 = 20.4 years

Payback at \$.25 = 20 years





Solar Water Heaters

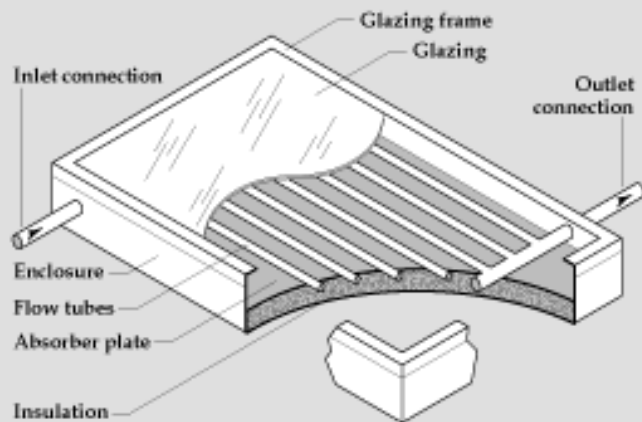




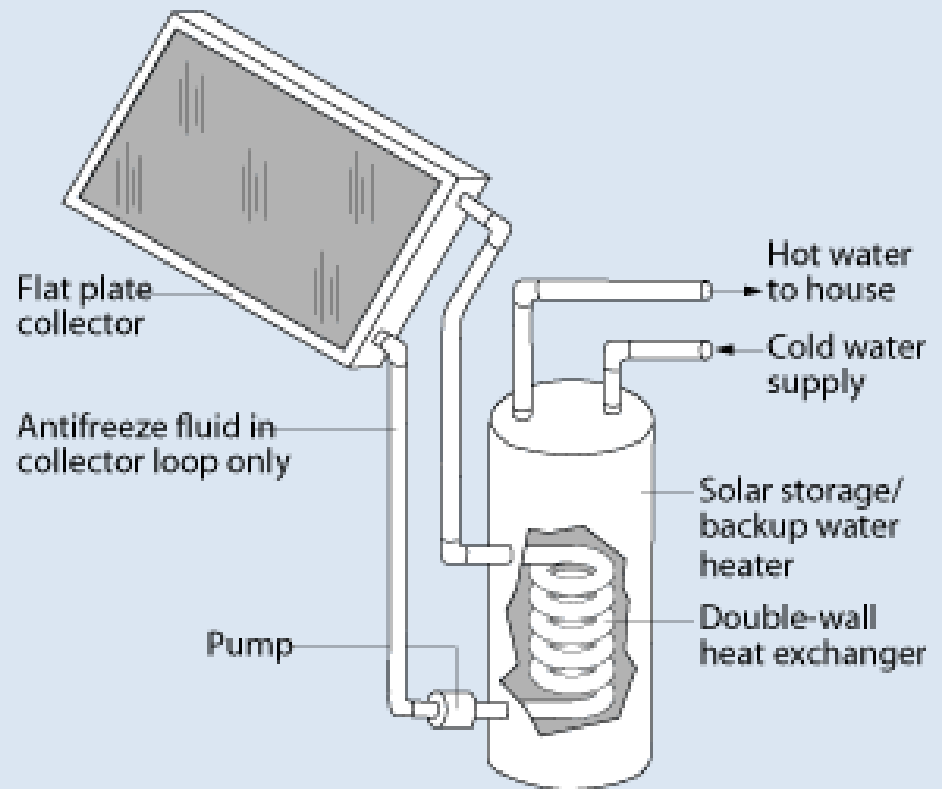
How Do They Work?





Flat-Plate Collector



Active, Closed Loop Solar Water Heater





*Cost of Solar Water Heater
@ 50% Energy Savings
@ \$.08 per kWh*



Typical Unit for family of 4 = \$5500 installed

After 30% federal tax incentive = \$3850

After \$500 Kentucky State Rebate = \$3350

Energy usage = 12 kWh per day or 360 kWh per month



50% solar fraction = 180 kWh per month savings

*180 kWh * \$.08 per kWh * 12 months = \$172.80 per year*

\$3,350 / \$172.80 per year = 19.4 years



Payback is 19 years



*Cost of Solar Water Heater
@ 75% Energy Savings
@ \$.08 per kWh*



Typical Unit for family of 4 = \$5500 installed

After 30% federal tax incentive = \$3850

After \$500 Kentucky State Rebate = \$3350

Energy usage = 12 kWh per day or 360 kWh per month



75% solar fraction = 270 kWh per month savings

*270 kWh * \$.08 per kWh * 12 months = \$259.2 per year*

\$3,350 / \$259.2 per year = 12.94 years



Payback is 13 years



*Cost of Solar Water Heater
@ 75% Energy Savings
@ \$.12 per kWh*



Typical Unit for family of 4 = \$5500 installed

After 30% federal tax incentive = \$3850

After \$500 Kentucky State Rebate = \$3350

Energy usage = 12 kWh per day or 360 kWh per month

75% solar fraction = 270 kWh per month savings

*270 kWh * \$.12 per kWh * 12 = \$388.80*

\$3,350 / \$388.80 per year = 8.6 years

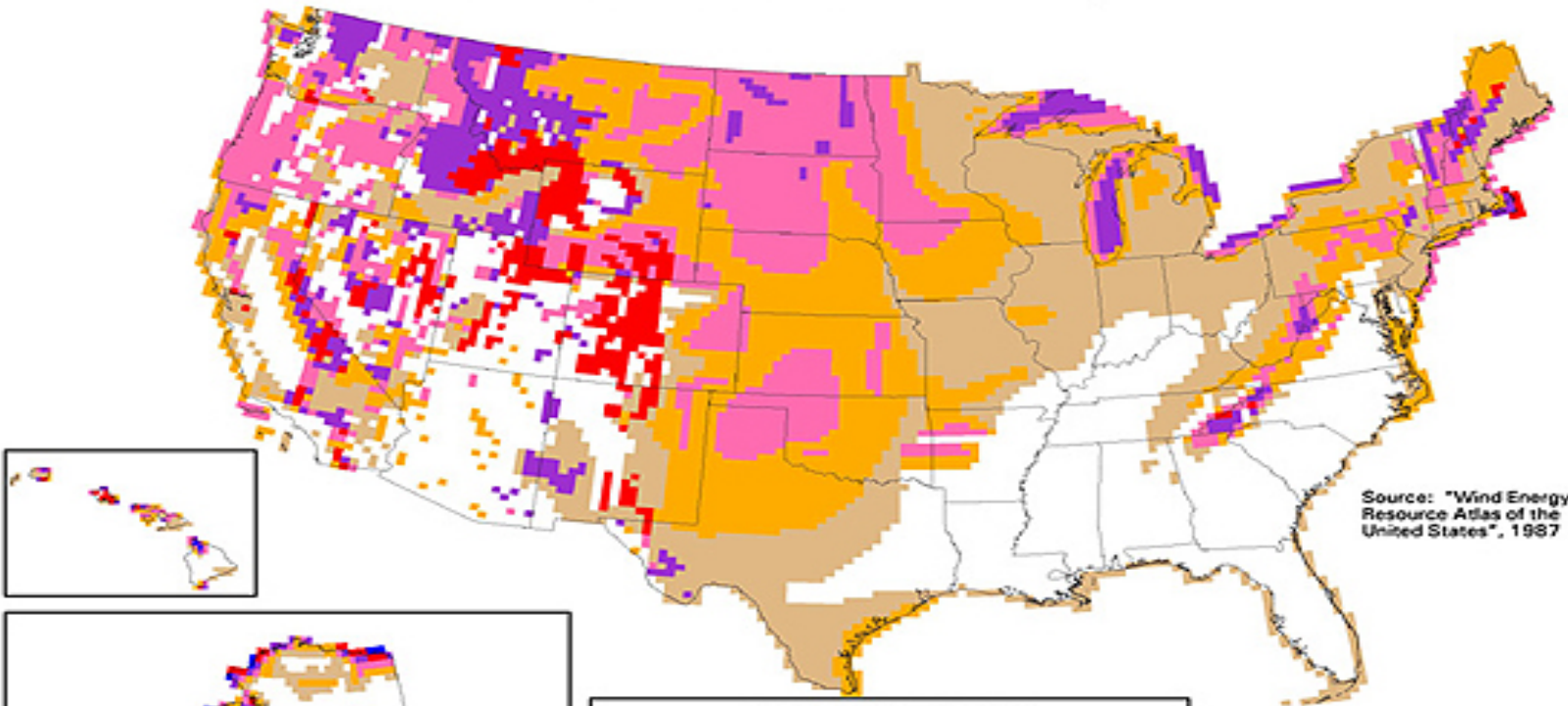


Payback is 9 years

Renewable Energy in Kentucky

Wind Resources

United States - Wind Resource Map



Source: "Wind Energy Resource Atlas of the United States", 1987

Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m ²	Wind Speed ^a at 50 m m/s	Wind Speed ^a at 50 m mph
2	Marginal	200 - 300	5.6 - 6.4	12.5 - 14.3
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	800 - 1600	8.8 - 11.1	19.7 - 24.8

^aWind speeds are based on a Weibull k value of 2.0

U.S. Department of Energy
National Renewable Energy Laboratory





20-MAR-2000 1.1.5

Renewable Energy in Kentucky

*In Kentucky – the higher the elevation,
the better the wind resources*

Black Mountain






Renewable Energy in Kentucky
Residential Units
Skystream 3.7





Wind Resources Needed to Operate:

1.8 kW @ 22 MPH optimum

8 MPH to release the brake



Cost - \$13,000-\$15,000 installed



Wind and Solar in Kentucky Summary



Solar not cost effective at current utility rates

Solar Thermal is a better buy than photovoltaic

Kentucky House Bill 2 provides new incentives



Wind resources an issue in Ky

Important to inform our members who are interested