

January 22, 2007

Olson Residence
199 Adams Street
Berea Kentucky

A seven-year-old, 1600 ft² conventional ranch house, purchased in 2005 and retrofitted with:

1925-watt grid intertie photovoltaic system, operational since May 8, 2006

11 175-watt Shell SQ 175-PC photovoltaic modules
Xantrex GT2.5 2500-watt grid intertie inverter

Panels are fixed at a 24° angle, which maximizes summer output and should provide the same total annual output as a panel angled at 37.5° (latitude of Berea). With grid intertie, there is no concern with overcharging the system during the summer.

Cost

Total materials plus tax	\$13439*
Installation and electrical	1895
Estimated federal tax credit	(2000)
Net cost	\$13334

* Includes PV modules (\$750 each, \$8250 total) and inverter (\$1593)

Photovoltaic system performance: May 8 through October 5 (150 days)

	Total (kWh)	Daily average (kWh)
Electricity produced	1012	6.75
Exported to grid	636	4.24
Used by house	376	2.51
Imported from grid	1531	10.21
Total house use*	1907	12.71
Maximum observed daily production = 10 kWh		

Photovoltaic system performance: October 6 through January 22 (109 days)

	Total (kWh)	Daily average (kWh)
Electricity produced	480	4.40
Exported to grid	259	2.38
Used by house	221	2.03
Imported from grid	4134	37.93
Total house use*	4355	39.95

*Electric heat pump, electric backup for hot water, lights, clothes washer (no dryer), refrigerator/freezer, radios, computer, microwave, clocks, fans.

In 259 days of operation, the photovoltaic system has displaced the burning of approximately 1500 pounds of coal and prevented the emission of roughly 4290 pounds of carbon dioxide and smaller amounts of particulates, sulfur dioxide, and mercury.

Solar hot water system, operational since May 4, 2006

40 ft² (4x10) AET collector
80-gallon storage tank with heat exchanger
TACO high head pump
Differential controls with sensors
10-gallon drainback reservoir

Cost

Total all materials plus tax	\$3122
Labor	839
Kentucky Solar Partnership rebate	(500)
Est. fed tax credit	(1200)
Net cost	\$2261

Collector installed at fixed angle of 28° for aesthetics. The optimal angle for maximum solar collection in winter is latitude (37.5) + 15 = 52.5°. The pump starts when the temperature of the collector is 16° warmer than the storage tank, and stops when the differential is 5° or less or the storage tank temperature reaches 180°. The circulating fluid is water only (no anti-freeze). The heat exchanger is wrapped around the outside of the storage tank to form a double-walled heat exchanger. There is an electric heating element in the storage tank, but this is usually turned off.

Five 10” Suntubes with 4-ft of tube

Cost: Suntube \$175 each
2’ tube extenders (4) \$ 31 each

Vermont Castings Encore 2550 Catalytic Woodstove

Log Length (Max.)	20 in.
EPA Emissions Rating	1.6 (grams/hr)
Btu/hr Range EPA Test Method	8,700 to 41,700 Btu/hr

Tempered solar design uses windows with a size and orientation to admit a moderate amount of solar heat in winter without special measures for heat storage. Because we retrofitted an existing conventional house, options for adding thermal mass for true passive solar were limited. We installed approximately 66 ft² of glazing on the south-facing wall. The Sun Windows (Owensboro KY) are double-glazed, Argon-filled, low-emissivity with R-value of approximately three.

Other features include compact fluorescent bulbs in most fixtures and a Sun Frost RF-19 refrigerator/freezer.

