

A Year Without a Car and Six Months With Solar Panels

A real life case study of energy efficiency

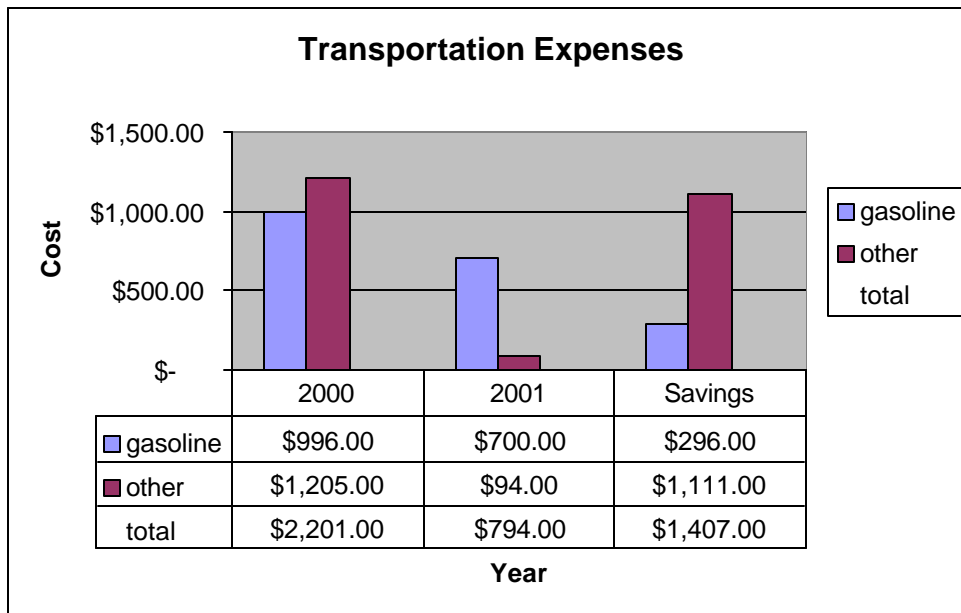
By Gregory J. Reis

In the last year (Nov. 2000-Nov. 2001), I made several changes in my life that increased my energy efficiency, saved me money, and reduced my fossil fuel consumption. All the changes were incremental and each of them has turned out to be more than justified. The following is an analysis of the energy and cost savings of each one. It is hoped that this analysis will demonstrate that these changes are applicable on a large scale by the average person without too much inconvenience or up front costs.

AUTOMOBILE

The automobile I previously had owned stopped working in November 2000. I was not able to afford another one, and didn't really need another one, since my commute to work involved a 3-minute walk. The following table and graph summarize differences between the year with the car (2000) and the year without (2001).

Year	Gasoline Use			Costs of Transportation	
	gallons	miles	cost	other	total
2000	498	9960	\$ 996.00	\$1,205.00	\$2,201.00
2001	350	7000	\$ 700.00	\$ 94.00	\$ 794.00
Savings	148	2960	\$ 296.00	\$1,111.00	\$1,407.00
%	30%	30%	30%	92%	64%



As you can see, a 30% reduction in miles traveled saved 148 gallons of gasoline, however insurance and repairs were by far the biggest cost savings. The miles still traveled were accumulated while riding with others or borrowing cars. On one occasion I

borrowed a truck with very bad gas mileage to bring supplies for building a greenhouse from L.A. to Lee Vining. The “other” column for 2001 includes bike supplies and repairs.

Many friends living in this area have more than one vehicle and also have pets, and when they go on vacation they need someone to take care of their animals. I was able on several occasions to take care of pets in exchange for the use of a vehicle. This arrangement worked well for all parties and allowed me to make trips that otherwise would have been difficult.

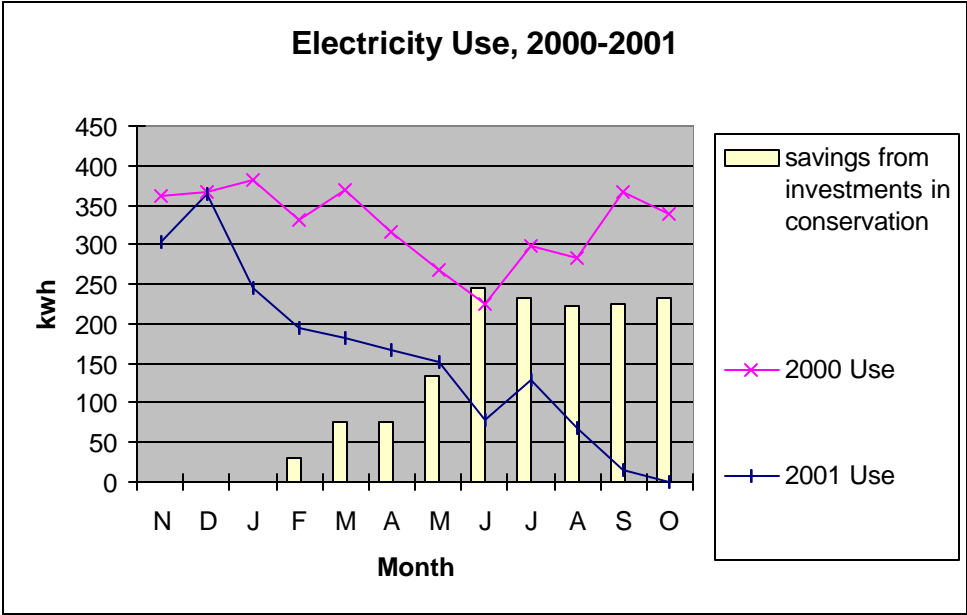
Mono County has a very limited public transportation system. The town of Lee Vining, where I live, has very limited stores and services. For example, a trip to Mammoth Lakes, 30 miles south, is necessary for going to the bank or the movies. This situation made not having a car much more inconvenient for me than it would be for most people in more populated areas. The additional inconvenience for me was not much more than the inconvenience of already living in this rural area (with regards to shopping and services).

I used an average of 20 miles per gallon and \$2 per gallon in these calculations. Using the figure of 20 lbs of CO₂ per gallon of gasoline, the CO₂ figures are the same as the mileage. I kept 2960 lbs of CO₂ out of the atmosphere by reducing the miles I drove, and approximately 1,500 lbs of carbon monoxide. By deferring the purchase of a car by at least one year I deferred the energy use it would have taken to manufacture a new car, the equivalent of driving 13,000 miles (and emitting 13,000 lbs of CO₂ and about 6,000 lbs of carbon monoxide).

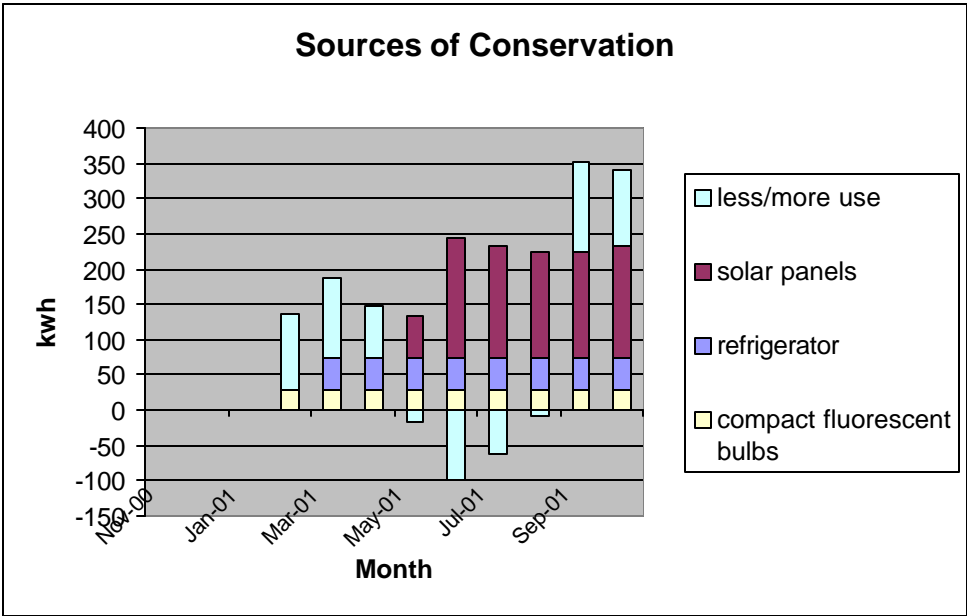
HOME ELECTRICITY USE

Over the course of the past year, I implemented several electricity conservation measures. The only forms of energy my house uses are electricity and wood (for wintertime heating). There is no gas or propane. The house is about 950 square feet, has an electric water heater and stove, and no air conditioning. I had a housemate in 2000 and from May to August 2001. I attained no net use of electricity in October 2001.





In the chart below, you can see that during the period from May-August my total electricity use in 2001 was higher than it was in 2000, although the net use was lower. This is because I had a roommate during this time in 2001; while in 2000 my roommate and I were away during much of this time.



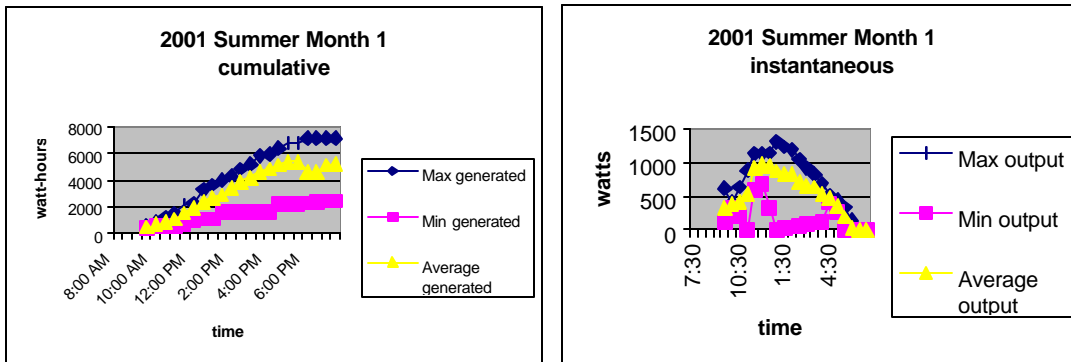
In February 2001, I installed compact fluorescent light bulbs in several fixtures in my house. The main savings is from a hanging light in the kitchen with 5 bulbs. In 2000 it had five 75-watt bulbs, for a total draw of 375 watts. In February I replaced them with 11-watt compact fluorescent bulbs, for a total draw of 55 watts, and a savings of 320

watts. I estimated a savings of 1 kwh per day from this measure, or 30 kwh per month. I estimate the payback period to be 1.3 years.

In March, I replaced my old refrigerator with a new one that used half as much energy. My old one used approximately 3 kwh per day, and the new one uses 1.5 kwh per day. I estimated a savings of 45 kwh per month. I estimate the payback period to be 15.2 years.

In May, I had a 1.147 kilowatt solar photovoltaic grid-intertie net metering system installed on my house. It produced between 5 and 7 kwh per day, or 150-170 kwh per month. I estimate the payback period to be 27 years.

In the graphs below you can see the cumulative Watt-hours and instantaneous Watts generated by the solar panels during the first month of summer, June 22-July 21, 2001. In the instantaneous graph (minimum output) you can see the morning generation depressed by the shadow of a tree and the afternoon generation depressed by thundercloud buildup. I am currently trimming the tree at roofline so the morning generation will be higher next year.



In terms of electricity cost savings, the compact fluorescent bulbs saved me \$35, the refrigerator saved me \$47, simple conservation saved me \$56 (probably mostly from not having a roommate during most of the year), and the solar panels saved me \$123, for a total savings of \$205, or almost a 50% reduction in my electricity bill, and a combined payback period of 17.2 years.

In total I saved over 2000 kwh. Assuming I did not have greenmountain.com renewable energy for the period prior to February 2001, the following is what I would have saved based on the California Power Mix: 321 kwh of polluting coal generation, 381 kwh of salmon-killing large hydroelectric generation, 702 kwh of greenhouse-gas-spewing natural gas generation, 341 kwh less toxic and dangerous nuclear generation, and 20 kwh less "other" generation. Based on 800 lbs of CO₂ per MWH generated with fossil fuels, I kept 818 lbs of CO₂ out of the atmosphere.

Considering the negative environmental trade-offs associated with traditional power production, I feel that the 17-year payback period has been reduced to zero. My

investments in conservation have already paid for themselves, if we account for the true hidden costs of other forms of energy.

CONCLUSION

Through modest, relatively inexpensive energy conservation measures, I was able to reduce my CO₂ emissions this year by 3778 lbs. This was accomplished through a 30% decrease in miles traveled and a 50% decrease in electricity consumption. The net cost of \$5,400 worth of efficiency investments will pay for itself in about 3 more years (if the savings from not having a car are included in the mix).

