



Living Solar – A Report from the Front Lines

We bought our first house, a true “fixer-upper,” in 1983. It was an 835 square foot summer cabin with single pane windows, no floor insulation, electric wall heaters, and an electric water heater. The best thing about the place was it was built on a south-facing hillside and one side of the house faced south.

The first thing we did was install a solar water heating system. I measured our savings the first year and found that solar energy had covered over 80% of the hot water needs for our family of four. The same system is still saving today and we’ve only had to replace a pump motor and sensor over the last 25 years (about \$250).

In 1986, when it became apparent a new member of the family was going to be gracing us soon, we began making plans to remodel and do an addition. It was already pretty tight quarters for four people and we needed space! We added on about 900 square feet of living space and, in the process, transformed our little summer cabin into a sustainable home. The home itself actually works in sync with nature now, reaping the benefits of the south-facing site for reducing heating and water heating costs. The east, north and west sides of our home are naturally shaded by large Canyon Oaks that help cool the home in summer. And overhangs above the south windows block the high summer sun from entering the house but allow the low winter sun in.

The most important design decision for the remodel/addition was to re-proportion the glass (originally scattered evenly around the house) so most of it was on the south side. The computer program I used to simulate the performance of the design indicated about 50% of all the glass could be weighted to the south because we had enough energy-storing “thermal mass” to keep from overheating on a winter day. For thermal mass we poured a stamped concrete floor on the lower level, put extra plasterboard on interior walls, and used a special phase-change storage material under the dining room floor. Extra roof and floor insulation was added along with a hydronic (hot water) heating system.

Having most of the glass facing south means we’re able to capture the low winter sun, storing the energy in the thermal mass of the home. If it has been a sunny January day the inside of the house will usually reach 76 to 78 degrees by the end of the day. Later that night, the heating system won’t come on unless it gets down to freezing outside. My neighbors, who have trees blocking the south sides of their homes, are all burning wood through the night while the solar energy we stored from the previous day has allowed our home to drop to just 68 degrees by morning.

Favoring windows on the south of a home and using thermal mass to store the heat provided by the low winter sun has been called “Passive Solar Design,” “Design with Climate” and, many years back “Just Plain Good Sense!” It was around the time central heating and air conditioning became popular that building designers started ignoring which way the building faced. It became the heating and air

conditioning contractor's problem to "just make it comfortable." But with high energy prices coming back again, many people are interested in designing or remodeling their home to work with the climate to reduce their heating and air conditioning costs.

About eight years ago we added a grid-tied, battery-backup solar electric power system and, two years ago, I added another 1200 watts of solar modules in an attempt to "zero out" our electric bill. The last thing we did was replace the 1980's vintage metal-framed, double-pane windows with modern, vinyl frame "low-e" windows. Appliance-wise we've bought only the most energy-efficient appliances we could find.

In 2007 we used about \$360 worth of propane. A single, mid-efficiency water heater is used to heat both our domestic hot water and radiantly heated floor. Our clothes dryer, range and oven also use some propane, but hanging clothes out to dry when weather permits reduces our clothes drying costs.

In 2007 we spent about \$49 on electricity, which includes daily charging of my electric vehicle. We have energy-efficient fluorescent lights inside and out, most of which we keep off. We have a modestly-sized but energy-efficient 21 cubic foot refrigerator, and an energy-efficient dishwasher. We don't have a well pump or pressure tank, which helps a little, and we have an energy and water-efficient front-loading clothes washer. There is no second refrigerator or freezer and no electric hot tub, but then my electric vehicle probably uses as much energy as they would!

From a purely economic point of view, the investments we've made in our home over the years have given us a return on investment of ten (Solar Electric), fifteen (Solar Hot Water) to hundreds of percent (the Passive Solar Design). But even more gratifying than that is the feeling of comfort and security that comes from living solar. When it's December and the sun is shining, there's snow on the ground, and it's 75 degrees inside - all on account of the sun - that's true comfort. And knowing that we're not dependent on as many non-renewable resources as we would be otherwise gives us a warm sense of security!



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