

## The White Buffalo

Luke Skywalker mentored under Obi Wan Kenobi to become a Jedi Knight. King Arthur sought leadership counsel from Merlin. So where do we, two renewable energy newbies, turn for guidance and inspiration? Bob. Super Bob, that is.

We met Bob that first spring when we decided to install a solar hot water heating system for the farmhouse. This solar hot water heating system, or solar thermal system, made sense in our four-season climate to meet the hot water needs of ourselves, visitors and B&B guests. We were a bit cautious about putting it in that first year because of its \$4,000 price tag; while we had saved for the farmhouse renovations, we were quickly seeing our bank account dwindle because of the new



well, the bathroom additions and various other improvements. However, we knew that the long-term cost savings would result in the system paying for itself within ten to fifteen years. When we learned of the cash rebate offered by our local electric utility based on the square footage of the collectors, which would pay for about a quarter of the installation cost, we decided to go for it.

Good thing we did, too, since the solar hot water heating system cash rebate program was axed the following year. As a result, we began setting aside and earmarking savings to take advantage of any renewable energy rebates or incentives when they come up, to avoid the risk of missing out.

Once we decided to put in the system, we were left with the bigger question of exactly how to do it. Since this project went beyond our expertise and tool box, we contacted the Midwest Renewable Energy Association (MREA) and Real Goods (since renamed Gaiam Real Goods), both of which told us, “Bob’s your man.” The actual installation of a solar hot water heating system is mostly plumbing, but it’s unlikely that a local plumber will want to do it. Plumbers aren’t accustomed to working on a roof — or placing 4-foot by 8-foot ( 1.2 x 2.4 m) solar collectors at

*Solar thermal system for domestic hot water at Inn Serendipity.*

optimal solar gain angles. We needed someone who knew what they were doing and could ensure that the system would continue to run smoothly. So we made arrangements with Bob, a renewable energy contractor and consultant, to design the system and guide its installation.

We didn't know exactly what to expect when Bob pulled into our driveway, hauling behind him a trailer with our three solar collectors. Nearing age 50, he came from a different generation of renewable energy homesteaders who tended to wear their hair long and sport tie-dye clothing. While many of his generation turned mainstream minivan along the way, he and his wife, Marguerite, still exuded an independent, hard-working ethic of self-reliance on their land, growing their own vegetables and generating their own energy. Bob had some strains of gray in his long braided ponytail, but his enthusiasm and passion for living sustainably and close to the land reverberated youthfully.

We gave Bob his Super Bob title when we realized he was one of those people who had been there, done everything, it seemed. Although he's one of the leading experts on solar thermal in the Midwest, Super Bob earned his title for more than renewable energy. He's taught us a range of skills, from how to change a flat tire, fix our leaky faucet, and make the best whole wheat pancakes we've ever tasted.

After working all day on our solar thermal system, Bob would plop down on the kitchen floor and whip out his jar of peanut butter and a chocolate bar and share his stories as he dipped his dinner. Like Obi Wan and Merlin, Super Bob sat cross legged on the floor while we, the students, surrounded him, listening attentively. Super Bob may have been a hippie from another place and time and astutely practiced at rolling his own cigarettes, but a strong kinship bloomed between us (and later with his wife) that bridged generations. At that time, we were very new to farm life and renewable energy, green when it came to living green. Bob was among our first mentors and introduced us to these new ways of thinking, living and being. We have indeed been fortunate to have met up with many people since who have helped and inspired us.

In addition to our relationship with Bob, the whole process of installing the solar hot water heating system was a lesson in teamwork and community building. In addition to Super Bob's expertise, a medley of folks came together to see this project through. The first challenge was how to get the three solar collectors, each weighing over 100 pounds, onto and attached to the roof, over thirty feet up. In a

sort of modern twist to the barn-raising community effort, our hog and dairy farming neighbors down the road, Ivan and his son Brett, came by with their tractor to solve our dilemma. Paul, the contractor who was working on our bathrooms at the time, also lent a hand, since neither one of us has an affinity for high places. The guys loaded the collector into the tractor bucket, then Ivan and Brett maneuvered the tractor bucket upwards until it was parallel to the roof. Bob and Paul, naturally at ease on the roof, together lifted the panel out of the bucket and securely attached it to a rack on the steeply pitched roof. As with so many of our other efforts, nothing we do is accomplished solo or in a vacuum.

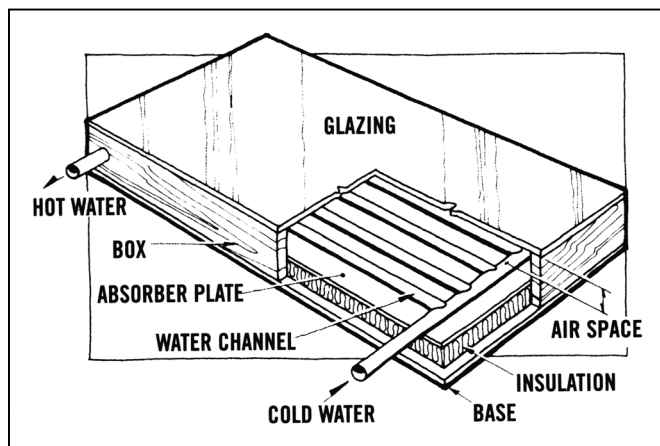
We repeated this process with the other two collectors, after which we gazed at the collectors, toasting our efforts with lemonade and our house bakery specialty, an energy-boosting chewy chocolate and oat cookie bar. Although we'd managed to get the collectors successfully mounted atop our roof with an unobstructed year-round view of the sun, we decided that in the future, our systems would either be ground-mounted or placed atop lower structures. In addition to requiring less in the way of installation acrobatics, this would also make the system much more accessible for occasional maintenance and seasonal tasks such as clearing snow off the collectors to increase output.

Over time, we continued to cross paths with Super Bob. While attending the Renewable Energy and Sustainable Living Fair one year, we participated in a fund-raising silent auction, where we purchased our woodstove. Our little Geo Metro couldn't handle the size, much less the weight, of the woodstove, so Bob graciously offered to store it in his garage and deliver it with his truck sometime down the line.

That sometime turned out to be the following year, when Bob and his family were en route to Janesville, Wisconsin to see Miracle, the white buffalo calf. He e-mailed us to say he was going to see the white buffalo, and that he'd stop by on the way to drop off the woodstove. We had no idea what the white buffalo was; once again, Super Bob enlightened us. Not only is a white buffalo scientifically rare, it's a highly sacred symbol to many Native Americans. The appearance of this white buffalo, the first since 1933, is seen by thousands of people as a symbol of hope for humanity and for greater harmony in our world, particularly to folks like Bob, who revere the sacredness of the Earth. To us, the Super Bobs of the world are our symbols of inspiration and renewal, keeping us going on our journey to live closer to, and lighter on, the earth.

## Solar Hot Water System Basics

Adapted with permission, in part from the Wisconsin Department of Administration, Division of Energy; and from the fact sheets of Wisconsin Focus on Energy <[www.focusonenergy.com](http://www.focusonenergy.com)>; and in part from materials developed by the Midwest Renewable Energy Association <[www.themrea.org](http://www.themrea.org)>.



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A solar hot water heating system, or solar thermal system, utilizes thermal energy from the sun to heat a transfer fluid, which can then be used in ways ranging from heating domestic hot water for showers to heating air with a liquid-to-air heat exchanger. These systems are considered active closed loop solar thermal systems, since pumps are used to circulate a set amount of heat transfer fluid through a pipe system.

*Cut-away of flat plate collector for solar thermal system.*

Our solar hot water heating system consists of three 4-by-8-foot (1.2 x 2.4 m) flat-plate solar collectors, heat transfer fluid, a circulating pump, a heat exchanger and a storage tank.

The three collectors are each made up of a flat, insulated weatherproof box containing a dark absorber plate over a grid of tubes covered by tempered glass. We added them to the south-facing roof and pitched at a 45° angle to harness the thermal energy of the sun to heat the transfer fluid, an antifreeze solution (inhibited propylene glycol). The flat-plate collector panels come in various sizes, and the number used is determined by the needs and lifestyle of individual home owners. In our case, three collectors were considered adequate to meet the hot water needs for our family and various guests. The transfer fluid used in our system is inhibited propylene glycol (also called RV antifreeze), a stable, non-toxic antifreeze solution. The alternative antifreeze solution, ethylene glycol, contains highly toxic VOCs, and despite its toxicity, is still readily commercially available.

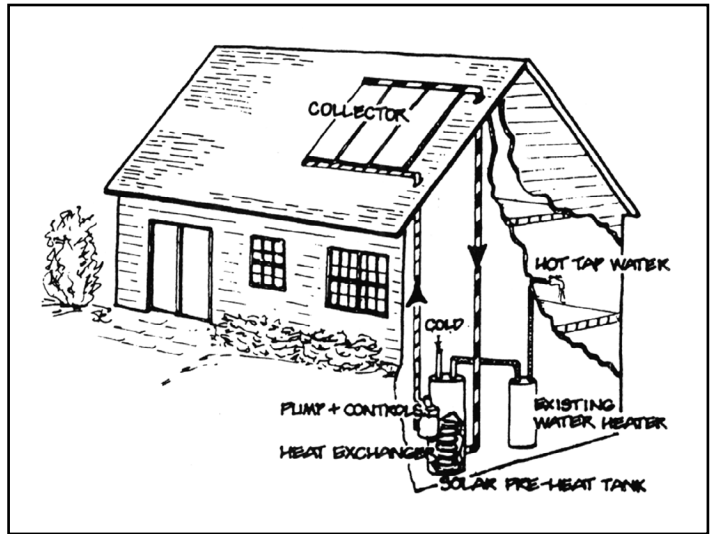
The transfer fluid is heated by the sun, pumped into the basement tank, and passed through a Quad Rod heat exchanger, where the heat is transferred to the well

water stored in a tank. The hot water is stored in an 80-gallon (300 liters) tank connected to our existing 65-gallon (246 liters) electric water heater and tank. By pre-heating our hot water, our conventional electric water heater needs to cycle on far less frequently. Taking seasonal fluctuations and the changing numbers of B&B guests and visitors into account, our system likely meets about 50 to 70 percent of our domestic hot water needs.

The solar thermal system for the greenhouse, designed by our neighbors, Phil and Judy (more on them later in this chapter), collects heat with ten 4-by-10-foot (1.2 x 3 m) collectors, angled about 52 degrees for optimal solar gain in winter. The heat is then transferred into 780 gallons (2,953 liters) of water stored throughout several tanks in the greenhouse. The water acts as a heat storage device; the stored heat is then transferred to the air through a liquid-to-air heat exchanger in a way similar to how an automobile's radiator-cooling system cools the engine, except we are heating the greenhouse.

Solar thermal systems are also commonly used in solar hydronic radiant floor heating systems, where the heated fluid is run through a grid of under-floor tubing to warm a

WISCONSIN DIVISION OF STATE ENERGY, AND THE WISCONSIN PUBLIC SERVICE COMMISSION.



*Solar thermal system schematic.*

*Solar thermal system for straw bale greenhouse at Inn Serendipity.*



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specially designed floor (usually concrete slab over a sand bed). The thermal mass of the floor stores the heat and slowly releases it during the night. In cold climates, the radiant floor heating systems supplement traditional heating system and can provide 50 to 70 percent of a home's heat. In the summer, the heated fluid is sent to a shunt loop that bypasses the house.

In contrast to the active solar thermal system, a passive solar thermal system uses no pumps to circulate fluid. Since water is among the most effective materials to store heat energy, our greenhouse includes a 250-gallon passive solar tank along with two Kalwall Cylinders filled with water, both of which directly absorb solar energy passing through the insulated south-facing windows. The greenhouse also incorporates a phase change salt tube in which the salt crystals turn to liquid when heated and release heat slowly as they return to a solid. The goal, and experiment, with the strawbale

greenhouse is to have a net zero heating cost by utilizing both passive and active solar thermal systems, passive solar design, and the super-insulating qualities of strawbale walls. In traditional greenhouses, with as much as 45 percent of the annual operation costs associated with heating, successfully growing with net zero heating cost means more profit per vegetable or fruit crop sold.

## SOURCES AND RESOURCES

US Department of Energy: Energy Efficiency and Renewable Energy Portal

Website: [www.eere.energy.gov](http://www.eere.energy.gov)

A gateway to hundreds of Internet sites and thousands of online documents on energy efficiency and renewable energy.

## Apollo's Blessing

We like to think Apollo, the legendary Greek god of the sun, is smiling down on Inn Serendipity. We're sun worshipers, but not in the traditional lounge on the beach and suntan sort of way (though we don't mind a little bit of that on occasion). The sun plays a starring role in our daily cycles: pragmatically, from a renewable energy perspective through our solar electric panels or solar thermal collectors; and inspirationally, when we take advantage of any opportunity to scatter sunbeams into our days.

We appreciate and look forward to the sun's grand entrance and exit. Sunrises and sunsets are nothing short of a daily dramatic performance. Our farmhouse is