Case Study – Zero Net Energy Building

Greenlee Home

Zero Net Energy Building

16713 Greenlee | Truckee, CA 96161 | (530) 448 9692
Chris Worcester, Solar Wind Works | chris@solarwindworks.com

The goal of a zero net energy (ZNE) building is to create enough renewable energy on site to satisfy the building's annual energy needs. The "green home" on Greenlee in Truckee exemplifies a completely off-the-grid net-zero lifestyle through building, landscape, and lifestyle design. In the late 70's Chris Worcester and his brother applied their expertise in energy-efficient design and system services to construct the eco-conscious Greenlee home from scratch.

"It's so doable. You do earn it. You do have to put in your own sweat equity to live a sustainable lifestyle. But the reward is greater at the end of the day."

- Chris Worcester, Solar Wind Works

The Greenlee house is a 3000 square foot, 3 bedroom, 2 bathroom home on 5.7 acres. It features photovoltaic solar panels and high-efficiency appliances designed for off-grid use. The house is designed to optimize natural heat retention and cooling through passive solar design aspects. These include the solar gain through the abundant south-facing double and triple-paned windows, passive cooling in the daylight basement food pantry, and innovative thermal convection loops throughout the home that draw heat from the integrated stone and brick-insulated greenhouse.

Additional energy-efficient features include extra mass built into the tile floors, walls and exterior insulation around the basement's foundation for winter heat storage and summer cooling insulation. Heating is further retained during winter months with highly insulating thermal honeycomb window shades. The EPA II rated Lopi Wood Stove is supplied by sustainably harvested wood from the property and efficiently heats the house, while also supporting the innovative convective water heating system. Most all of the interior lights are compact fluorescent or LED. Industrial 20 year batteries, 120 VAC inverters and a backup propane generator supply uninterrupted power.

Water efficiency is achieved with a solar powered well pump, on-site spring water, and a pump free solar and wood fired hot water system which runs through a thermal syphon to the third floor hot water tank. Composting toilets and the septic system conserve water, and the home's greywater has occasionally irrigated the orchard.

All construction of the house was appropriately permitted with standards that exceed ZNE guidelines for increased longevity and stability/safety during natural disasters. Many eco-friendly high-end and repurposed construction materials and methods were also incorporated, such as organic oil-based finishes and salvaged wood from disassembled structures.