Two thermal storage tanks are piped in series to encourage enhanced thermal stratification.

The supply feed to the collector array is piped from one tank while the hot water return from the collectors flows into the other tank. Since both tanks develop stratification, the coolest water is delivered to the array which enhances the collection efficiency. Radiant heat distribution delivers the solar heat throughout the house.

The preceeding material in this folder was supplied by:

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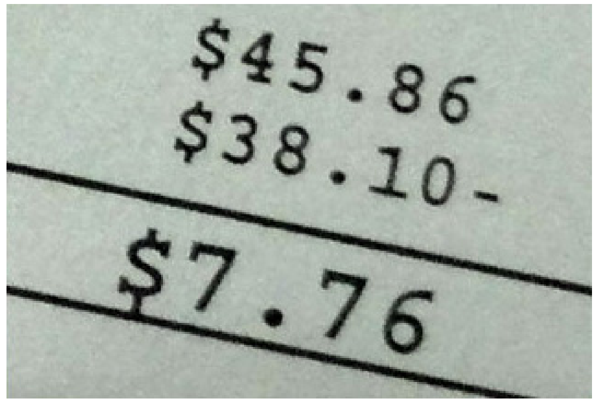
Results by William Lord: Living in a solar house is a wonderful experience. My wife and I are now ‘solar ground-hogs,’ waking up each day looking for the sun. There’s no question we are much happier when we see it coming over the horizon. It means our solar tanks will be heated and our attitude will be sunny.

Out life is enhanced by Steven’s design as we are warmer in the winter thanks to the solar gain and radiant floor heat and cooler in the summer thanks to the heavy insulation and the Atlantic’s southwesterly winds

We knew we were building an efficient home but only recently have we realized significant financial gain. Our energy bills are far lower than any of our neighbors.

Below is one of this summer’s (2008) electricity bills - $.7.76 - the basic charge to be hooked up to the grid.



Not only are we saving money, but we’re making a contribution to improving the environment.

Pollution NOT released in 13 years
~354 lbs NO2 nitrogen dioxide
~710 lbs SO2 sulfur dioxide
~171,000 lbs CO2 carbon dioxide or 85 tons

Keep up with our solar living experience by regularly visiting:

www.solarhouse.com

Welcome to the Maine Solar House

Sited on a knoll on The Maine Coast facing The Atlantic Ocean

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www.solarhouse.com

Whole Building Design: Using an integrated design approach now becoming known as "Whole Building Design", the Lords' house design and its energy support systems were developed together to compliment one another, creating a whole which is greater than the simple sum of its parts.

A key principal of Whole Building Design is careful attention to the balancing of each side of the energy equation - both supply and demand. While this approach requires a departure from conventional practice of how a house is put together, this investment in new thinking delivers handsome returns.

The Lords' 2,800 sq. ft. home features a cathedral ceiling in the great room, architectural lighting, hardwood floors, a radiantly heated shower, whirlpool bath, home theater media center, home office and other amenities typically found in a custom home. In addition, their house is sun-filled, comfortable year round and powered by the sun.

Demand: Energy efficiency (or the absence of wastefulness) is a part of every design decision and, each decision is made with consideration of its impact on the whole building. Using passive solar design to welcome the sun's warmth in winter and exclude it in summer, along with superinsulation, advanced glazings, monolithic air and moisture barriers, air-to-air heat exchanges with heat recovery for ventilation, internal thermal mass and high-efficiency appliances and lighting, the resulting design reduces the energy demand to about 35% of the requirements of a typical home of similar size in northern New England.

Thermal Integrity: A high degree of thermal integrity is essential for a solar home. Superinsulation standards are employed with R values of 40 in the walls and 60 in the ceilings. Rigid insulation is carried down to the footings on all foundation walls to protect the house from the deep Maine frost. In addition monolithic, air and moisture barriers are installed to control unwanted air infiltration and moisture migration.

Typically, greater than 50% of the heating requirements in a standard house are the result of uncontrolled air infiltration. When air infiltration is controlled, dramatic gains in comfort are also achieved.

Supply: The home's form and geometry are configured to present a generous amount of south-facing roof to the sun at an optimum angle to maximize solar harvest,

Some 500 sq. ft. of selective-surfaced, solar thermal collectors share the south roof with 4.5 kiloWatts of photovoltaics. The solar thermal array is backed with high-temperature thermal insulation while the PV array has a passive thermosyphon air chimney behind it to provide convective cooling of the crystalline silicon solar modules, increasing electrical harvest while dissipating unwanted thermal gain from the roof.

Both systems are roof-integrated to create a single, uniform, glass plane for the south roof.

Solar Electricity: The solar electric array consists of 16 large-area, glass-superstrate photovoltaic (PV) modules which are directly integrated into the roof to form the roof structure and finished weathering skin.

The solar array is installed above the roof framing to create an air plenum to allow natural convection air flow to cool the modules. The soffit is screened to allow unimpeded air flow. A full-width louver on the north side of the ridge vents the warm air out. The direct current (DC) electricity produced by the PV array is converted to utility-quality alternating current (AC) by means of a utility-interactive DC-to-AC inverter. Solar power is then fed to the house via conventional circuit breakers in the main electrical distribution panel.


PV installation—1994

Solar Thermal: The solar thermal collector array is also constructed as a roof-integrated assembly using the same glass size and glazing details as the solar electric array. The collector array is configured as a drain-back loop with a syphon return to minimize pumping energy. Water is used as the circulating fluid. When collection is complete, circulation stops and the water drains back from the collectors into the storage tank to avoid freezing conditions. Water is favored over the antifreeze solution typically used as water carries more thermal energy, suffers no degradation.