

## Deep Energy Retrofit, Gloucester, Mass.

### KEY DRIVER

After working in the energy efficiency industry for 20 years, John Livermore decided it was time to “walk the talk.” In August 2008, he began construction on a deep energy retrofit of his home in Gloucester. He consulted Marc Rosenbaum of Energysmiths — a national leader in deep energy retrofits — to design the details for his home. “My main motivation was to reduce my family’s carbon footprint ... to demonstrate to myself and others what is possible,” said Livermore.

### DESIGN & IMPLEMENTATION

Livermore aimed to attain a level of energy efficiency that only a “handful of projects in the country” had achieved at that time. When Livermore proposed his idea, the town’s building inspector was skeptical. Once he had convinced the inspector that the retrofit was “not going to make the house fall down”, the inspector began to show enthusiasm. Neighbors were confused when Livermore explained his project, but they too became interested as the work progressed. Some neighbors even began to think about retrofitting their homes.

Due to the lack of precedence for deep energy retrofits, Livermore had few examples to look to for guidance. Some aspects proved to be more challenging than he had anticipated. For example, to reduce waste, Livermore attached the wall trusses directly to the exterior without removing the siding. This proved to be a difficult task that extended his timeline to complete the retrofit.

### IMPACT

Livermore estimated the cost of his retrofit to be approximately \$60,000, as a result of performing much of the labor himself and receiving rebates for two of the most expensive features. The solar photovoltaic (PV) system, cost \$9,000 after a 70 percent subsidy from Commonwealth Solar and a \$2,000 federal tax credit; the solar hot water cost decreased to \$11,500 due to a National Grid rebate and federal tax credits. Through the HERS rating system, Livermore estimated his home’s total annual energy costs to be \$560/yr., which yields \$2,238 in annual savings when compared to his pre-retrofit energy bills. Livermore aims to bring his home closer to net zero through further energy conservation practices by his family. If successful, then the PV system will have paid for itself within four years.

During the 2008 winter, the Livermores were able to turn off their heating system and use a small Danish wood stove in the basement to heat their 2,400-sq.-ft house. The PV system produced a net gain of 1,986 kW hours during its first year. “The most satisfying part of the project has been experiencing a high performance house,” Livermore said. “It is lighting a fire in the wood stove, going to bed, and having it burn until around two or so, then waking up in the morning when it’s 15 degrees outside, and it’s still 65 inside the house. It is amazing.”



Photo by John Livermore

### ENERGY-EFFICIENCY SPECIFICATIONS

**WALLS:** R-43 closed-cell foam insulation

**ATTIC:** R-76 cellulose insulation

**WINDOWS:** Thermotech, triple-pane, Low-E

**HEATING:** Wood stove

### ONSITE RENEWABLE ENERGY:

4.3 kW solar panel PV system; solar thermal

**LIGHTING:** All LED & CFL fixtures/bulbs

**APPLIANCES:** ENERGY STAR

**HERS INDEX:** 10