

New Construction, Townsend, Mass.

[Transformations, Inc.](#), a residential development company based in Townsend, is a pioneer of zero net energy homes in the Commonwealth. In 2008, Transformations Inc. was chosen among six builders to participate in the [Zero Energy Challenge](#). Massachusetts' investor-owned electric utilities produced this competition to encourage builders to use advanced energy efficiency technologies and specifically, to plan and develop a home with a HERS Index below 35 (energy performance 65 percent better than code).

Carter Scott, president of Transformations, Inc., brought together a team of design and energy experts for the Challenge. Scott's goal was not only to meet the Challenge, but also to figure out how to build an affordable new home below market rate that went all the way to zero. The team designed a three-bedroom, 1,252-sq.-ft. house called "The Needham." To achieve zero net energy use, the home features a super-insulated thermal envelope with a solar photovoltaic (PV) system and solar water heating.

The Needham scored a HERS rating of -4, which indicates that it produces more energy than it uses. This super-efficient house won the second place prize in the Zero Energy Challenge.

"It has been incredibly satisfying to design and build a home that will essentially emit no greenhouse gases and cost the homeowner next to nothing for their heating, air conditioning, and electrical usage."

Carter Scott
President, Transformations, Inc.



The Needham's heat loss is only 10,500 BTUs, which is the equivalent of two 1,500-watt hair dryers and an 80-watt light bulb. This is the amount of energy it takes to keep the inside of the house at 70 degrees when it is 6 degrees outside.

Photo courtesy of Carter Scott

ENERGY-EFFICIENCY SPECIFICATIONS

ROOF: Second-floor roof rafters insulated with 5" of high-density polyurethane foam and 13" of high-density cellulose; 2x12s and a 2x4 are held off by 3" for a thermal break separation; R-75

WALLS: 2x4 outside wall; added a 2nd 2x4 wall for total depth of 12"; insulated with 3" of high-density polyurethane foam (HDF) and 9" of cellulose; R-49

ATTIC: 14" thick R-50 loose cellulose insulation

BASEMENT CEILING: 3" of HDF and a layer of R-30 fiberglass batts

WINDOWS: Paradigm triple-pane with Low-E and krypton gas

HEATING & COOLING:

Mini-split-system air-source heat pumps — Mitsubishi Mr. Slim split-ductless air-source heat pump; Lifebreath 155 ECM Energy Recovery Ventilator

ONSITE RENEWABLE ENERGY:

Electricity — Evergreen Solar's 30 Spruce Line 190-watt PV panels to create a 5.7-kW system
Hot water — SunDrum Solar system

HERS INDEX: -4