Residential Case Study: New Construction, Townsend, MA

Transformations, Inc., a residential development company (www.transformations-inc.us) based in Townsend, is pioneering zero net energy homes in the Commonwealth. In 2008, Transformations Inc. was chosen among six builders to participate in the state's investor-owned utilities Zero Energy Challenge, a competition to encourage builders to plan and develop a home with a HERS Index below 35 before December 2009.

Carter Scott, President of Transformations, Inc. brought together a team of design and energy experts to not only meet the challenge, but to figure out how to get all the way to zero while still building a below market rate affordable new home. The team designed a three-bedroom 1,232-sq/ft house called the "Needham," which has scored a "-4" HERS rating, which means the home is producing more energy than it is using.

To get to (below) zero, the home includes a super-insulated thermal envelope with PV and solar water heating.

Roof (R-Value 75): 5 inches of high-density polyurethane foam and 13 inches of high-density cellulose all along the slope of the second-floor roof rafters; 2x12s and a 2x4s held off by 3 inches for a thermal break separation

Walls (R-Value 49): 2x4 outside wall; added a second 2x4 wall for a total depth of 12 inches; filled 3 inches with high-density polyurethane foam (HDF) and 9 inches with cellulose

Basement Ceiling: 3 inches of HDF and a layer of R-30 fiberglass batts

Windows: Paradigm triple-pane model 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's solar water-heating system

The heat loss on the "Needham" is only 10,500 BTUs, which is the equivalent of two 1500 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.

"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.