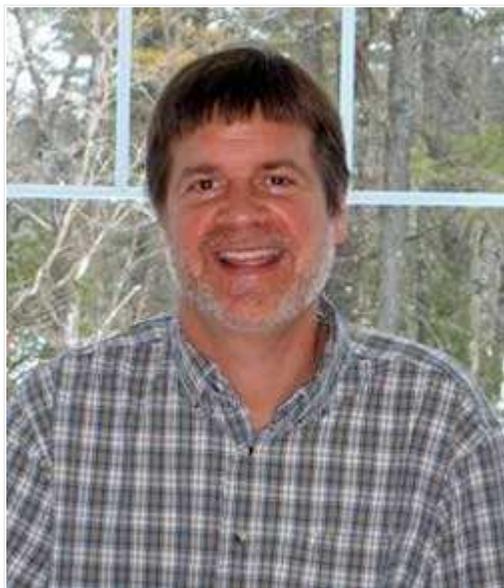


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Zero net-energy houses going up in Devens

by Sydney Blackwell



Developer Carter Scott of Transformations Inc.
(Courtesy photo)

Carter Scott, president of Transformations Inc., has a simple formula for success: build new homes with almost no energy costs to sell at market-rate prices. At least he makes it sound simple, but it is a formula the Townsend developer has been honing for years, most recently at Devens Green, where he is building eight single-family "zero net-energy" houses. Scott shared his constructions methods, materials, and costs at a Devens Enterprise Commission sponsored talk and tour last week.

Devens Green, located on Cavite Street and Adams Circle, just east of the Rogers Field parade ground, is part of MassDevelopment's 20-unit Sustainable Housing Pilot Project. Across the street, Metric Corporation of Boston is building 12 townhouses. MassDevelopment expects the two projects, which emphasize energy efficiency and affordability, to be models for sustainable development at Devens and elsewhere in the state.

Nothing about Transformations' traditional-styled houses at Devens Green—three completed and one underway—appears very different from conventionally built homes, until you see the solar panels on south-facing roofs, one of three keys to their net-zero claim. Scott attributes 60 percent

of his homes' energy savings to a tight shell that allows little air or heat loss, plus energy-efficient appliances. Solar photovoltaic electricity makes up the remaining 40 percent.

First, reduce energy needed

Scott starts with a super-insulated shell. He uses two-inch rigid foam under the slab and 3.5 inches of high-density foam on basement walls. Without a basement, he ups the under-slab insulation to six inches of rigid foam. Scott constructs a 2x4-framed outer wall and adds a parallel interior 2x4 wall for a total depth of 12 inches, which he fills with low-density foam. The attic is insulated to R-60. On the outside, Zip System sheathing and tape creates a water and air barrier.

Triple-glazed windows with krypton gas minimize heat loss, while a 30-degree flare from the interior wall to the window allows additional daylight in. Scott is researching window options, he said, because the trade-off for very tight windows in winter is the possibility of too-tight windows in summer. In one house, the vinyl-clad windows expanded in the summer and wouldn't open on an 85 degree day.

A tight envelope allows for a smaller heating and cooling system than more conventionally-built homes require. Scott uses Mitsubishi Mr. Slim dual-stage heat pumps with two ductless indoor units—one upstairs and one down—that fit high on a wall. He pointed out that it takes only the energy equivalent of two 1,800-watt hair dryers to heat his new home models.

A Panasonic Whisper Quiet energy recovery ventilator provides the ventilation critical to a tight house. A Navien instantaneous gas water heater supplies hot water at an installed cost of \$1,800, significantly less than a solar thermal system, Scott said.

Energy efficient lighting and Energy Star appliances further reduce energy requirements.

These efficiencies produce a Home Energy Rating System (HERS) index of 40, representing 60 percent less energy required than a home built to the 2006 International Energy Code (HERS 100). For comparison, the stretch energy building code that Harvard adopted two years ago to become a Green Community requires a HERS rating of 65 for houses under 3,000 square feet. An index of zero, Scott's goal, represents no net purchased energy.

Second, generate energy

To get to that HERS 40 down to HERS 0, Scott relies on rooftop solar photovoltaic installations to produce the electricity a homeowner uses. The solar electricity goes directly to the utility grid and is credit to the homeowner's account through net metering.

Scott attributed the recent surge in solar photovoltaic energy use to three recent "game changers." In 2010, the state Department of Energy Resources started a Solar Energy Renewable Credit (SREC) market to sell solar-generated electrical energy to private utility companies, which are required to get an annually growing percent of their electricity from solar sources.

The SREC market democratizes solar renewable energy generation by opening the market to even the smallest residential system, making a residential system economically feasible for homeowners with adequate solar access. In 2006, Congress renewed federal renewable energy tax incentives, which offer reduced costs when they are combined with state incentives. Third, as the demand for solar has grown, the price of solar panels and installations has declined.

"We're at a sweet point for solar PV," Scott said, implying the current opportunities might not last.

Third, watch the bottom line

Scott is interested in energy savings, but he also has both feet firmly planted on costs, he said. Several times during the presentation, when he was asked why he chose one option over another, he cited price.

Why vinyl siding? Popular Hardee board would add \$10,000.

Cost-saving possibilities are everywhere, he said. The flared window casings are not only attractive, they also eliminate interior window framing, a savings that pays for more efficient windows. Better insulation means smaller HVAC systems, which means HVAC system savings can pay for the better insulation. Standard house models reduce labor costs and increase the opportunity for volume discounts.

Scott gave a "builder's cost" for his standard model homes under \$105 per square foot, a cost that he said could easily double for a custom-built house.

There are six possible house designs for Devens Green that range from 1,500 to 1,800 square feet and are priced in the mid-\$300,000 range, with optional customizing. The price does not include the solar installation, which the homeowner may

purchase from Transformations or lease through a long-term energy contract from a third party.

Transformations has a 24-unit 40B development awaiting approval on Stow Road. Initially planned to be a five-house development, which met resistance, the site plans were changed five years ago to the 40B development and the approval process has been slow. When completed, the market-rate houses are expected to sell for between \$300,000 and \$500,000, and affordable units will be priced at \$200,000 for income-eligible owners, according to a June 2011 Harvard Press report.

Into the future

Scott has built houses that produce more energy than they use, net positive energy, and expects more in the future. As homeowners opt for additional solar electricity to power electric and hybrid vehicles, a house can contribute renewable energy and carbon reduction to the transportation sector, Scott said.

Apart from its home construction, Transformations has a growing solar electric installation business managed by Ben Cumbie, a certified solar professional.

Scott's formula for building homes with one eye on efficiency and the other on the bottom line is working for him. Scott said he has 100 houses in the pipeline.

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