

Bringing ZEH Building Practices into the Mainstream



The U.S. Department of Energy, through its National Renewable Energy Laboratory (NREL), is operating a national initiative that aims to



bring the ZEH concept into the single-family, new home construction industry. NREL researchers are working with the NAHB Research Center and three other teams to achieve this goal.

Energy-efficient features and renewable energy systems typically add to home construction costs. Though there are not sufficient ZEH homes built to determine or estimate these costs, research has shown that these features and systems



may add about 25 percent or more to construction costs.



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400 Prince George's Boulevard
Upper Marlboro, MD 20774



Zero Energy Homes

Building energy independence, one home at a time.

The Zero Energy Home Concept

Imagine a home that is not only energy efficient, but also produces its own power. Just like a typical home, a Zero Energy Home (ZEH) is connected to and takes energy from the local utility.



However, at times, the ZEH makes enough power to

send some back to the utility. Annually, a ZEH produces enough energy to offset the amount purchased from the utility—resulting in a net-zero annual energy bill.

A ZEH combines state-of-the-art, energy-efficient construction techniques and equipment with renewable energy systems to return as much energy as it takes on an annual basis. Specifically, when renewable resources cannot provide all the home's power, e.g., at night or on a cloudy day, the homeowner purchases energy from the utility. When renewable resources produce more than the house is using, e.g., during sunny days when no one is home, power is sent back into the utility grid. Some utilities operate the home's electric meter in reverse, essentially providing the homeowners full retail value for their energy.

Case Study— The Tucson Zero Energy Home

In Tucson's Armory Park del Sol community, The John Wesley Miller Companies, in partnership with the NAHB Research Center and Tucson Electric Power, has built a 1,718 square foot, single-story home that is designed for net-zero energy use.



The home utilizes solar energy, in combination with an energy-efficient building



design and high-efficiency equipment, to produce as much energy as it consumes on an annual basis.

The John Wesley Miller Companies was an excellent candidate for constructing Tucson's first ZEH. The company already employs energy efficiency and solar energy systems in every home in Armory Park del Sol, and building a ZEH was the next logical step.

Tucson Electric Power is running the home's electric meter backwards when the home produces more energy than it needs.



Design

The team developed a new floor plan that couples the energy performance requirements of a ZEH with the aesthetic needs of discerning homebuyers. Nationally-renowned architect Devereaux and Associates, of McLean, Va., fused these functional and aesthetic design



elements into the home plans. The Tucson ZEH offers three bedrooms, two full baths, high

ceilings, an open great room, a private master suite, and outdoor living spaces.

Features

The home uses a 4.2 kW photovoltaic array to generate electricity from the sun, an integrated solar water and space heating system, and a reflective roof coating and radiant barrier roof decking to reduce attic heat gain. The home also



includes solid masonry construction, R-14 polystyrene exterior wall insulation, R-41 ceiling insulation, ENERGY STAR® appliances and bathroom ventilation fans, a very high efficiency air conditioning system, and low-energy soft



white fluorescent lighting. The additional cost of building the home was about 20 percent. This

incremental cost, however, is probably lower than it would be for typical regional construction, since the standard features in Armory Park del Sol include solar power, upgraded windows and insulation, and energy-efficient appliances.

Energy Use

Predicted annual energy use for the Tucson ZEH is about 7,000 kWh, which compares to over 18,000 kWh for a typically-constructed, all-electric home



of equal size in Tucson. The roof-mounted, solar electric system is expected to produce about the same amount of energy as the home uses. Space and water heating will be supplied primarily by solar energy, using rooftop solar hot water

collectors. Details of energy monitoring conducted by NAHB Research Center engineers is available at www.toolbase.org/ZEH.

The Tucson ZEH sold in less than one month to homebuyers Jose and Marciala Reyes of Tucson. The new owners explained that "it looks like a conventional home, actually better than one, but you have the added value of a Zero Energy Home."



Next Steps— Getting Involved

For the next round of ZEH construction, the NAHB

Research Center is looking for participants to build ZEH demonstration projects across the country. Eventually, entire ZEH neighborhoods will be built.

Companies that construct more than 100 homes per year, manufacturers, utilities, lenders, realtors, appraisers, and others who are looking to participate in future ZEH projects should contact Jeannie Leggett Sikora at the NAHB Research Center at (800) 638-8556, ext. 6289 or jsikora@nahbrc.org.