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GREEN BUILDING: Zero-energy homes combine construction, appliance efficiencies

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As you wade through your stack of monthly bills, do you ever dream that your house could produce all the power that it needs? The rise of "zero-energy" homes is making those dreams a reality. The U.S. Department of Energy's zero-energy homes research initiative is bringing a new concept to homebuilders across the United States. A zero-energy home combines state-of-the-art, energy-efficient construction and appliances with commercially available renewable energy systems, such as solar water heating and solar electricity.

The combination can result in net zero energy consumption from the utility provider. Zero-energy homes are connected to the utility grid but are designed and constructed to produce as much energy as they consume annually.

A home with such innovative technology already exists in North Carolina. It was built in Hickory by Catawba Valley Habitat for Humanity in cooperation with the Appalachian State University Energy Center and Department of Technology through a grant from the N.C. State Energy Office. The home meets the requirements of NC HealthyBuilt Homes — North Carolina's green building program developed by the N.C. Solar Center — as well as the standards for SystemVision, which is an energy bill guarantee program for affordable housing offered by the Advanced Energy Corporation.

So what makes the home a zero-energy home? First, the home was designed to use the sun and Earth's energy to condition the space. Passive solar design was used by increasing the amount of glass on the south side, adding thermal mass and properly sizing the overhangs.

The home also boasts a geothermal heat pump, which uses the temperature of the Earth to increase efficiency. The highly efficient space conditioning is complemented by properly sealed ductwork.

Other features incorporated into the home include energy efficient framing and an enthalpy recovery ventilator, which provides ventilation while controlling moisture. Energy-efficient insulation strategies — including spray foam wall insulation, R-52 insulation in the attic, and an insulated slab — keep the home comfy all year round. Other elements found in the home are recycled tile flooring, insulated window shades, Energy Star appliances and compact fluorescent lighting.

How does the zero-energy home produce the rest of the energy it needs? Hot water is generated by a batch solar water heating system donated by Solarhart. The electricity comes from a 4.5 kilowatt photo-voltaic system, located on the home's south-facing roof. The system is tied into Duke Power's utility grid, and the power produced by it is monitored by a "smart" meter that was installed in addition to the standard power meter used on a typical home. N.C. GreenPower purchases all excess power at 18 cents per kilowatt/hour, which is a premium rate. If the home doesn't produce all the energy it needs each month, the homeowner still may "break even" over a year's time because of the money received from NC GreenPower during its "productive" months.

The future looks bright for zero energy homes. For more, visit www.energy.appstate.edu and click on "zero energy home."

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