

# FEATURES & PERFORMANCE OF ZERO-ENERGY HOMES



Lowry Plan by Thrive Home Builders, Denver, CO; Photos courtesy U.S. DOE

This briefing provides information on the design features, incremental costs, and energy savings potential of zero energy homes, including project examples and brief descriptions of completed zero energy home projects.

## ENERGY EFFICIENCY FEATURES

It's easy to find many cost-effective opportunities to improve the energy efficiency of new homes through a combination of improvements to residential building design, construction practices, higher efficiency levels of installed equipment, and homeowner education about ways to save energy. Common energy efficiency design practices and measures that are used in high performance homes include but are not limited to:

- The Integrated Design Process (IDP) is the process of establishing a construction team (owners, architect, operations and maintenance managers and construction trades) early in the building design to collaborate, prioritize and plan ways to accomplish energy efficiency and zero energy goals.
- Proper site selection and building orientation, which can help reduce heating costs in the winter and cooling costs in the summer, and facilitate the use of on-site PV to generate electricity
- Higher levels of ceiling and wall insulation coupled with advanced framing techniques to minimize thermal bypasses
- Use of thermal mass for improved heating and cooling performance
- High-performance windows with spectrally selective glass, which reduces solar heat gain in summer and reduces heating costs in the wintertime
- Properly designed and installed heating and cooling systems that help keep energy costs low improving comfort and indoor air quality by including:

- Engineered HVAC (proper sizing and diagnostic testing of HVAC systems)
- Advanced evaporative cooling systems such as direct-indirect evaporative cooling systems
- Properly sized ducts located inside conditioned space with diagnostic air leakage testing
- All electric heat pump units (mini splits) for efficient heating and cooling
- Tankless, fuel cell and solar water heating options
- High-efficiency lighting (e.g., LED or fluorescent lamps and fixtures), and or a combination of lighting products with lighting controls (e.g., dimmers and occupancy sensors)
- Energy-efficient appliances, including refrigerators, clothes washers, dryers, dishwashers, and consumer electronics
- Integration of controls to monitor home energy use, including switches and controls for turning off designated electrical outlets (to reduce losses from standby devices)
- Third-party verification (analysis of home design and onsite inspections and testing to verify and rate the energy performance of the home on the HERS or HES scale)

## RENEWABLE ENERGY SYSTEMS AND FEATURES

Renewable energy systems and design features—such as incorporating passive solar thermal design strategies, solar photovoltaic (PV) electric systems, and solar thermal hot water—can generate a portion of a home's electricity and water heating needs. Passive solar thermal design strategies can often be implemented at little or no incremental cost through proper building orientation, daylighting, and use of thermal mass. The initial cost of renewable energy systems has literally dropped to \$0.00 because of the third party leasing option offered by many solar companies. This model leases the solar system to the homeowner for up to 20 years, in many cases for no cost to the homeowner. Of course, solar PV systems can still be purchased directly by the homeowner. The initial costs of PV systems continue to decline, and are reduced further through a combination of federal, state, and utility tax credits or rebates. Utilities can also use residential PV systems to satisfy state renewable portfolio standard requirements by offering renewable energy credits to homeowners that have installed grid-tied PV systems.

## ENERGY SAVINGS AND COST EFFECTIVENESS

Zero Energy (ZE) homes built today are capable of more energy savings than the base energy code by combining energy-efficient technologies and solar energy systems. These homes are cost-effective for homeowners when compared on the basis of the total cost of mortgage and utilities payments. Energy efficiency measures are typically more cost-effective to implement than renewable energy measures, and can last longer, but combinations of efficiency and renewable are also viable while delivering valuable peak electricity savings for utilities.

The energy, economic and environmental benefits of improving the efficiency of new homes in the Southwest region are significant. Homes have advanced so much in the past decade that what used to be considered an “above-code” home is now a code-minimum home. We now have examples of small and large builders across the region that offer single family homes that reach the net zero energy annual goal.

For more information, see <http://www.swenergy.org/buildings/zero-energy-buildings>

