

High-Performance Home Technologies: Solar Thermal & Photovoltaic Systems

Case Study: Clarum Homes – Vista Montaña Watsonville, CA



Nation's Largest Zero Energy Home Community a Winner in Watsonville

In 2003 Bay area production builder Clarum Homes partnered with Building America to build the nation's largest zero-energy home community, Vista Montaña, in Watsonville, California, near Santa Cruz. The development of 177 single-family homes, 80 townhouses, and 132 apartments opened in August 2003 and sold out in its first year. Clarum initially advertised prices of \$379,000 to \$499,000 but some units sold for as much as \$600,000. Every home sports a 1.2 to 2.4 kW photovoltaic system on the roof and a slew of energy-efficiency measures throughout in a package of zero energy features that Clarum offered standard at Vista Montaña.

Clarum is a leader at zero energy home construction. The builder installed its first solar system in 1999 and opened its first zero energy home in 2000. In August 2001 Clarum announced the opening of its first zero energy home development, Cherry Blossom, in Watsonville. Each one of the 31 single-family homes came with a 3.2-kwh PV system and energy efficient features as standard equipment. Clarum also made zero energy construction standard on its Shorebreeze IV community of 20 single-family homes, which opened June 2003 in East Palo Alto.

"I was first introduced to the solar and green building methods at a national homebuilder conference in Atlanta in 1999," said John Suppes, founder and president of Clarum Homes. "I came back and immediately started incorporating the ideas into our communities so that we could offer more efficient homes and give our homebuyers the opportunity to actually produce electricity in the midst of this energy crisis we were facing. I feel very strongly about the need to promote sustainable energy sources." He made a commitment in 2001 that all of the homes built by Clarum Homes would be designed and built using photovoltaic systems and as many "green" building features as they could afford to include.

Clarum partnered with ConSol, leader of the Building Industry Research Alliance (BIRA) Building America team, on both Shore Breeze IV and Vista Montaña and the developments included Clarum's Enviro-Home green building and energy-efficiency features designed to save homeowners 60% to 90% on their whole house energy usage. Clarum is working with BIRA and the Davis Energy Group, another Building American partner, on four highly efficient demonstration homes at Borrego Springs.

Clarum's Vista Montaña in Watsonville, California, near Santa Cruz, is the largest zero-energy home community in the nation, with 177 single-family homes, 80 townhouses, and 132 apartments. The all-solar development opened in August 2003 and sold out in the first year. *Photo courtesy of ConSol.*

BUILDER PROFILE

Builder's Name:

Clarum Homes www.clarum.com

Where: Palo Alto, California

Founded: 1994

Employees: 35-50

ZEH Commitment:

Committed to all sustainable, energy efficient construction since 2001.

Development:

Vista Montaña, California

Size: 177 single-family homes, 80 townhouses, 132 apartments

Square footage: 3-5 bedrooms, 10 different floor plans

Price Range: \$379,000 to \$600,000



Clarum is building four zero energy research homes at Borrego Springs, California.
Photos courtesy of Clarum Homes.

KEY FEATURES

1.2 to 2.4 kw photovoltaic system

Tankless water heater with
0.82 energy factor

Foam wrapped walls

Radiant roof barrier

Low-E, U-factor 0.4, SHGC 0.4 windows

90% AFUE furnace with a
programmable thermostat

Tightly sealed ducts

Low-flow showers

Ceiling fan outlets

ENERGY STAR appliances

Florescent lighting

“Clarum is the first builder to sign a memorandum of understanding saying they will commit to the California Zero Energy New Home criteria,” said Bruce Baccei, the BIRA project manager for ConSol.

“We have a commitment to high-performance houses and we have a commitment to the environment,” said Suppes. “Since 1999, we have been dedicated to building sustainable communities.”

Energy Efficient Features

Clarum partnered with ConSol and others to develop its Enviro-Home package of energy efficiency and solar power features, designed to reduce homeowner energy bills by up to 90%. Each Enviro-Home™ has been professionally designed, certified, and inspected to reduce energy consumption and use sustainable resources while improving comfort. The program has also earned the U.S. Environmental Protection Agency’s ENERGY STAR® seal, ConSol’s ComfortWiseSM designation, and the California Building Industry Institute’s California Green Builder certification.

In addition to a solar electric home power system, each Enviro-Home™ in the Vista Montaña community features a tankless on-demand water heater, and a high-efficiency furnace as standard features. The homes also feature a foam-wrapped building envelope, increased insulation, radiant roof barrier, advanced HVAC technology, tightly sealed ducts, and low-E energy-efficient windows. Ceiling fans, fluorescent light bulbs, water conserving plumbing fixtures, and water conserving landscaping are also incorporated, providing homeowners further utility savings.

The Enviro-Home™ features that are included as standard equipment will provide more than \$20,000 of added value to homebuyers at no cost, says Suppes.

In addition to its energy-efficient features, the Enviro-Home™ incorporates sustainable building materials, such as engineered lumber, recycled decking material, and fiberglass doors, and offers recycled content carpet, bamboo flooring, cork flooring, and environmentally friendly paint as optional items.



Clarum markets its homes with the EnviroHome package, which combines high energy efficiency with sustainable building practices.
Schematic courtesy of Clarum Homes.

Extreme Heat Meets Extreme Cool

Showing the ingenuity that can pay big dividends for a production home builder, Clarum is branching out into the Anzo Borrego desert with four test homes that could help Clarum offer homes that beat the heat and high energy costs at a cost to Clarum that will still ensure profits as the Bay area builder reaches into hotter, drier locales.

Clarum partnered with Building America partners ConSol and the Davis Energy Group to build four super-efficient demonstration homes in Borrego Springs where temperatures routinely soar past 100 degrees F 6 months of the year.

“These demonstration homes in Borrego Springs provide an opportunity to try out new products that could be economically viable in the regular and affordable housing markets we serve,” explained Suppes.

The four homes use an identical floor plan sporting three bedrooms and three baths in 2,000 sq ft of living space and Clarum installed identical 3.2-kW Kyocera photovoltaic solar systems on each home. The PV panels mount to the standing seams of the homes’ metal roofs so there are no roof penetrations. The homes also have several energy-efficiency features in common including tankless water heaters, rigid polystyrene insulation around the foundation, and ENERGY STAR appliances and fluorescent lighting. Heat gain from the sun is kept to a minimum through use of a radiant roof barrier, low-emissivity windows, five-foot shade overhangs over the homes’ perimeters, and shade screens on the windows and doors of all four homes. But there are some unique differences between the homes, including three different kinds of exterior wall systems, three different cooling systems, and two kinds of space heating.

The demonstration project homes showcase two types of advanced wall systems – rigid foam insulated thermal mass concrete walls, in this case a Dow product called Styrofoam T-MASS, and structural insulated panels (SIPS), as well as 16-inch-on-center 2x6” lumber framing on one house for comparison.

The homes are equipped with three different cutting-edge cooling systems. Two of the homes feature Speakman OASys two-stage evaporative coolers; the third home features both a Freus water-cooled condenser (which cools indoor air as well as the floor) and a NightBreeze night ventilation cooling system; and the fourth home features a Lennox 20.5 SEER air conditioner. The cooling systems were designed to accommodate both the hot-dry conditions that prevail most of the summer and the hot-humid weather that accompanies the monsoon season in late summer. Three of the homes are also equipped with under-floor radiant heating.

Building America partner Davis Energy Group designed the heating and cooling systems for the homes, which were completed in May 2006. Davis is working with ConSol to monitor energy use through summer 2007 to collect two cooling season’s worth of data, one without occupants and one with. They hope to collect data on cost, construction schedule, production feasibility, energy efficiency, product lifecycles, embodied energy, and cost and energy savings. Clarum hopes at least one of the homes will show a 90% reduction in cooling energy.



Clarum is building four zero energy research homes at Borrego Springs, California. Polystyrene slab edge insulation helps to carefully control heat gains and losses. Photos courtesy of Clarum Homes.



Clarum is building four zero energy research homes at Borrego Springs, California.
Photos courtesy of Clarum Homes.

Solar Systems

AstroPower supplied the photovoltaic panels on the solar electric power system for Vista Montaña. The systems range in size from 1.2 to 2.4 kilowatts and enable homeowners to generate their own electricity, reduce their utility bills, and protect the environment. Additional panels were offered as upgrades if homeowners wanted to generate even more electricity.

Suppes advised builders contemplating adding solar to just try it. “Put them on. Have the PV manufacturer come out and train your subs to put the panels on correctly, and use your existing subs; you’ll save a lot of money that way.”

Dollars and Sense

Clarum works with Building America to use their cost and energy savings analysis to point to the most cost-effective combination of features for the climates it builds in. Once a cost-effective combination is chosen, economies of scale can be achieved through volume purchasing and training of subcontractors.

The Bottom Line

“Solar electric power adds value to the homes we build,” said Suppes. “By giving homeowners the tools they need to generate their own electricity, we’re enabling them to save money on their utility bills. We’re also differentiating our homes in the marketplace. We set out to provide exceptional value for our customers by adding solar power, and in the process we did something exceptional for our business.”

For more information visit:
www.buildingamerica.gov