

Builders Challenge Guide to 40% Whole-House Energy Savings in the Hot-Dry and Mixed-Dry Climates

Case Study: Grupe

CARSTEN CROSSINGS | ROCKLIN, CA



Zero-Energy Sets Sacramento Area Builder Apart

In the volatile California housing market, near zero-energy construction has helped Stockton area home builder Grupe to stand out from the competition. The production builder's 144-home Carsten Crossings in Rocklin, CA, outsold the competition two to one in a very tough Sacramento home market. "The zero-energy features of these homes have definitely helped us close deals," said Mark Fischer, a senior vice president at Grupe.

Sacramento's new home market took a nose dive in March 2006 dropping 30% to 45% from 2005, just when the first 10 of the 144 homes at Grupe's Carsten Crossings project were completed. "We sold 23 of our first 30 homes in the first three months, even though the market in Sacramento was very slow, the slowest housing market in the country," said Fischer. Grupe's 144 homes sold in 31 months, 45 months sooner than builders with similar, but non-energy-efficient developments.

This was the first solar development for Grupe, a Stockton-based production builder producing 200 to 300 homes per year. They chose to make solar a standard feature on all 144 houses.

"We certainly like the fact that it made us unique and we felt good about offering it because we think solar is the right thing to do," said Fischer. Photovoltaics are only part of the equation. Carsten Crossings homeowners have seen utility savings of 40% to 80% per month compared to comparably sized homes built to California's Title 24, thanks to both the photovoltaics and an impressive mix of energy-efficient features that were offered as standard features by Grupe.

"Making solar a standard feature instead of an optional upgrade is the way to do it," said David Springer of Davis Energy Group, which is a partner in the U.S. Department of Energy's Building America program on the Consortium for Advanced Residential Buildings (CARB) team. "Our experience on previous projects has been that very few homeowners purchase solar photovoltaics when it is offered as an option. Grupe was able to negotiate a much better deal with their contractors by making it standard across the project," said Springer.

Despite a very slow housing market, Grupe sold its 144 energy-efficient homes at Carsten Crossings in Rocklin, California, more than twice as quickly as its competitors.

BUILDER PROFILE

Builder's Name:

Grupe

Where:

Stockton, CA

Development:

Carsten Crossings at Whitney Ranch in Rocklin, CA

Size:

144 homes

Square footage:

2,168-2,755 sq.ft.

(3-5 bedroom, 3 baths)



Grupe's Carsten Crossing Community won the gold award for moderate climate production homes in the 2007 Energy Value Housing Award competition held by the National Association of Home Builders Research Center.



Powerlight integrated solar roof tiles blend in with surrounding roof tiles to provide 2.4 kw of clean, quiet energy.

KEY FEATURES

2.4 kW roof-mounted photovoltaic system

Tankless gas-powered hot water heaters

Energy-efficient windows

High-efficiency, variable speed furnace 90+AFUE

SmartVent automatic night ventilation cooling

“FreshVent” continuous ventilation system

Dual-zone equalizer two-zone heating and cooling system

Energy-efficient lighting

ENERGY STAR dishwasher

R-49 attic insulation

Radiant barrier sheathing in attic ceiling to reduce cooling

1-inch rigid foam exterior insulation

Ducts in attic covered with blown-in cellulose insulation

Wall insulation soy-based foam (option)

Homerun parallel piping central manifold for plumbing

Third-party duct and air sealing testing

Other builders have found that when solar is offered as an upgrade, buyers will often choose more immediately visible options like upgraded counter tops or flooring. A RAND Corporation study done for Building America partner ConSol in 2006 shows that the majority of buyers are interested in energy-efficient and green construction. But, as Bill Dakin of Davis Energy Group pointed out, it’s much easier to actually sell solar when it’s in the context of an all-solar community where it is included in the price of the home than to sell the homebuyer solar as a \$15,000 to \$20,000 upgrade perceived to be an extra out-of-pocket expense.

Carsten Crossings is the second largest community to meet the California Energy Commission Zero-Energy New Homes initiative criteria and one of the largest all-solar communities in Northern California.

“The Carsten Crossings project has been a positive learning experience for Grupe” said Lew Pratsch, the DOE Project Manager for Integrated Onsite Power.

Building America’s Davis Energy Group has helped Grupe on several aspects of the project, including selecting energy efficiency measures, preparing bid specifications for the photovoltaic system, testing and inspections during construction, and post-construction analysis. Davis also helped develop educational materials for staff and the public.

Energy-efficient construction can be a great selling tool if sales staff know how to use it. Grupe conducted 4 hours of formal training for all its sales staff, followed by ongoing training. “If you are going to put it in, be prepared to train your whole organization on why it’s a good deal, especially sales staff. They have to be able to tell potential buyers why zero-energy construction is so great,” said Fischer.

To further the learning experience, Grupe turned the garage of one of its model homes into an energy efficiency and solar show room for training sales staff and educating potential buyers. They also conducted media outreach, like holding press conferences, and put together a GrupeGreen DVD.

It’s worked well. “Grupe’s sales staff is sold on solar; they are passionate about it,” said Bill Dakin of Davis Energy Group.

To learn more about the energy savings, Davis conducted duct blaster and blower door tests of the homes to test air leakage in the ducts and whole house during and after construction. Davis Energy Group also evaluated utility billing data after the homes were occupied.

The Solar System

For its solar system, Grupe chose a product called SunTile made by PowerLight, that is similar in size and dimensions to a row of concrete roofing tiles. Rather than sitting on top of the roof like traditional solar panels, these integrated solar tiles are used in place of some of the roofing tiles, in an overlapping pattern that blends in with the surrounding roofing materials.

“What really affects the power production of the PV cells is orientation toward the sun,” said Fischer. “We don’t limit ourselves to putting these tiles on the backs of our houses. We put tiles on the front, back, or sides of the houses, wherever they will get the most solar gain. They blend in so well with the cement tiles that buyers have no objection to seeing them. You almost can’t tell they’re there.”

Powerlight offered Grupe a complete turn-key package, including delivering and installing the tiles, 5 years of free post-installation performance monitoring, and a warranty covering parts, workmanship, and repairs.

“We had no difficulty working solar into the production schedule. The solar installation does not interfere with any other critical path in the construction process. It really didn’t add time for installation,” said Fischer. “The PV system was inspected while the city inspectors were already on site doing other inspections. That may vary by jurisdiction, but that was the case in Rocklin,” said Fischer.

Powerlight is unique in offering post-installation performance monitoring, which enables Powerlight to make sure each system is producing power. Homeowners can also access the information through a user-friendly website that lets them see how much power their PV system is producing on a given day and how much greenhouse gas emissions from traditional power sources their PV system is displacing.

Energy Efficient, Innovative, Green

A super-efficient building envelope and high-performance appliances are another key to cutting energy costs.

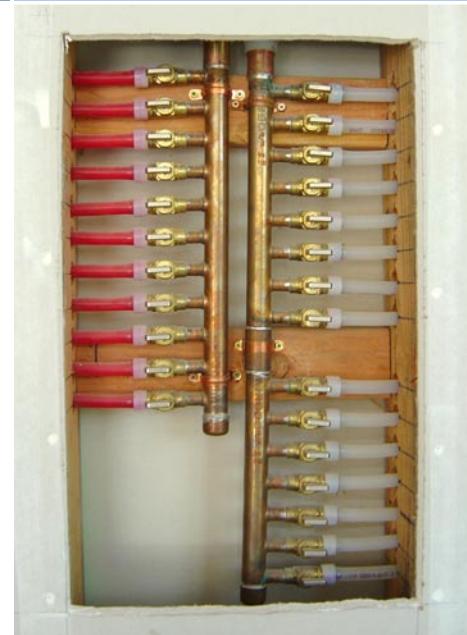
All of the Carsten Crossings homes feature energy-efficient low-emissivity windows, energy-efficient lighting, tankless gas-powered “on-demand” hot water heaters with a parallel piping manifold, high-efficiency variable speed 90+ AFUE furnaces, “FreshVent” continuous ventilation systems, and dual-zone equalizers.

To cut cooling costs, the homes use SmartVent automatic night ventilation cooling. The system uses a thermostat-controlled damper to automatically let in cool, filtered air when outdoor temperature drops at night. “Think of it as an intelligent whole-house fan. It provides filtered outside air to a specific set point, say 65 degrees, to cool off the house at night without having to open the windows,” said Dakin. A study of SmartVent’s effectiveness conducted on another project by PG&E showed average daily energy savings of 22% and peak demand reduction of 42% when temperatures were 104°F or higher and average daily energy savings of 16.3% overall and 48% peak demand reduction on days when the temperatures reached 92°F.

At Carsten Crossings, the attics have R-49 blown cellulose and the heating and cooling system ducts were wrapped, sealed, and buried in the attic insulation. The attic ceilings were lined with a radiant barrier to keep out heat. The 2x4 stud walls were filled with blown-in fiberglass or soy-based foam insulation. In addition, all of the homes’ exterior walls were blanketed with a 1-inch-thick layer of rigid foam for additional insulation. Duct and whole house air sealing was independently confirmed through duct blaster and blower door testing conducted by Davis Energy Group.

“By using a Building America consultant like Davis Energy Group, not only do we get third-party credibility,” said Fisher, “we become incredibly educated about the things we can do to save energy while building sustainable and beautiful communities” (as quoted in the *San Francisco Chronicle* July 2, 2006).

Grupe marketed the homes as GrupeGreen. With their bundle of energy-efficiency measures, the homes met the criteria of Building America’s Zero Energy Homes, the California Energy Commission’s Zero Energy New Home (ZENH) Initiative, and the ENERGY STAR homes program. Grupe also participated in the LEED (Leadership in Energy and Environmental Design) Homes Green Building certification program. Compliance with the LEED Homes program required water efficiency, on-site recycling, use of local materials, and site selection that ensures open spaces, along with energy efficiency and renewable energy systems, according to Dakin.



Plumbing manifold gets hot water to its destination faster.

Positive Cash Flow from Day One:

Grupe sales staff showed buyers how they would actually make money back on their energy-efficient home

YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Mortgage Payment				
(\$1,391)	(\$1,391)	(\$1,391)	(\$1,391)	(\$1,391)
Utility Savings				
\$1,440	\$1,483	\$1,527	\$1,573	\$1,620
Tax Credit				
\$2,000				
Tax Benefit				
\$280	\$277	\$274	\$270	\$266
Net Positive Cash Flow to Buyer				
\$2,329	\$369	\$410	\$452	\$495
Cumulative Cash				
\$2,329	\$2,698	\$3,108	\$3,560	\$4,055

Assumptions: 100% Financed, 6.5% Interest Rate, 25% Tax Rate, 3% Energy Inflation



(top) Grupe is marketing the zero-energy homes as GrupeGreen homes. With their bundle of energy-efficiency measures, the homes meet the criteria of Building America's Zero-Energy Homes, the California Energy Commission's Zero-Energy New Home (ZENH) Initiative, the ENERGY STAR homes program, and the LEED Homes Green Building certification program.

(bottom) Using a real-time monitoring system, the solar installer can check the PV system's performance from a portable computer or BlackBerry at any time.

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Mark Fischer, a senior vice president at Grupe (as quoted in the San Francisco Chronicle July 2, 2006)

"The Grupe Company has been a leader in energy efficiency," said Pratsch, who noted Grupe was among the first ENERGY STAR builders in its area and one of the first to use blown-in insulation. "We hope the Carsten Crossings solar project provides a model that other builders will follow."

Dollars and Sense

In its first foray into an all-solar development, Grupe did get a boost from the California Public Utilities Commission. In January 2006, the Commission approved a 10-year, \$2.9 billion program to give homeowners or builders a \$7,000 per home subsidy to add solar units to their homes. This brought Grupe's cost for adding solar down to about \$18,000 for solar plus all of the energy efficiency measures.

In addition to the \$7,000 subsidy, homeowners get a \$2,000 federal tax credit (which goes directly to the homeowner and not to the builder or developer), providing additional benefit to the homeowner.

Based on first and second year utility bill data, CARB projected annual utility savings of \$1440 to \$1620 for the first five years. According to Springer, even based on a system cost of \$18,000 to \$20,000, if that cost is included in a 30-year mortgage with a 6.5% interest rate, the utility bill savings are greater than the annual incremental cost to finance the PV system. When rebates and tax benefits are rolled in, CARB calculated that homeowners come out \$4055 ahead after 5 years.

An energy-efficient appraisal estimated that adding the solar and energy efficiency features would increase the value of a Grupe Carsten Crossings home by \$24,300 in the first five years and by \$28,185 after 10 years (in 2007\$).

Because of the soft market, Grupe did not charge more for the energy-efficient homes than its competitors who were selling similar sized houses—they "gave away" the solar but Grupe found that it did not lose the money. They got it back, and then some, through faster sales even in a slow market.

Grupe compared its sales rate to that of eight competitors with similar homes selling in 2006 and 2007. Grupe determined that the GrupeGreen features cost an additional \$2,642,000 for the 144 homes. The cost to carry that extra expense on the 144 homes at Carsten Crossings was \$311,000 per month for every month they weren't sold. Grupe determined a typical rate of sales among competitors was 1.9 homes sold per month. At that rate it would take 76 months to sell all the homes. If they could sell out 8.5 months sooner, i.e., in 67.5 months, they would make up the extra carrying cost. That meant selling at a rate of 2.1 homes per month. Grupe found they actually sold at a rate of 4.6 homes per month, well above their break-even rate of 2.1 homes per month and more than twice as fast as their competitors. They sold all 144 homes in 31 months, 45 months sooner than the competition, for a savings of \$14 million (45 months x \$311,000/month).

The Bottom Line

For Grupe, solar homes make a lot of environmental sense, but they also make sense from a business stand point. "They helped Grupe outsell the competition more than 2 to 1," said Daikin.

Said Fischer. "In a few years, you will see this everywhere."