

Photovoltaic Solar Electric Systems: A Veteran Builder Finds Something New Under the Sun

Builder's Experience



Challenges: Cost of technology and paperwork required by the utility.

Would he do it again? Yes

PATH Attributes:

-  Energy Efficiency
-  Environmental Performance

Builder Tips: Choose a competent dealer/distributor that can provide site-specific design assistance and layout.

Builder:

Bruce Wolfe, Project Manager
Peppertree Village, LLC
Fallbrook, California

Builder Type:

Mid-size Production Builder

The Technology:

Integrated Photovoltaic (PV) Roofing

The Project:

The WillowCreek at Peppertree Park project in Fallbrook, California, combines solar technology and energy-efficient design in 73 single-family homes ranging from 2,870 to 3,640 square feet. The homes exceed California's Title 24 energy requirements by over 40 percent. Each home is also ENERGY STAR® qualified and has earned recognition from the U.S. Department of Energy's Zero Energy Home Program and ConSol's ComfortWise® program. About 18 homes are scheduled for completion each year through 2008.

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— Bruce Wolfe

WOLFE'S STORY

"Solar technology has a lot of pizzazz with customers," says Wolfe. "Our houses are selling well, and PV systems are part of an environmental package that I think is responsible for our success. Home buyers have been very excited about the overall package that includes a wide range of energy-saving features. Our sales are brisk at a time when other builders are experiencing a cooling in the market."

"If you put yourself in the homeowner's shoes and think about the fact that you are producing electricity when you are not home and then using it when you get home, that's pretty cool. It's a big money saver. We estimated that the solar panels could provide up to 60 percent of power requirements for these homes. As it turns out, our homeowners have been happily surprised at their \$50 utility bills. These



Carefully interconnecting each module, two crew members tie in the first two rows of the integrated PV system with the concrete roofing tiles.

same homeowners were accustomed to paying bills in excess of \$200 a month and welcome the savings. On our model homes, the utility bills have actually been less than half of what we expected they would be."

THE ADDED VALUE OF SOLAR

"Based on the decision to build environmentally friendly homes, our energy consultant, ConSol, suggested installing solar panels, improving the building envelope, and using efficient home products."

"My main role was managing the installation and complying with the rules and procedures set forth by the utility company. Since the PV systems are interconnected with the utility grid, it



Developer Duane Urquhart was intent on developing a community of environmentally sensitive, superbly crafted homes. He chose Bruce Wolfe (pictured at left), an industry veteran with 37 years of home building experience in Southern California, to be his Project Manager. Working with an energy consultant, Wolfe installed PV to help meet Urquhart's environmental goals for Peppertree. WillowCreek was Wolfe's first experience with solar technology.

Why they chose to use solar:

"Our goal was to build a community of homes with a commitment to the environment that provided value for our customers."



The rooftop solar panels are invisible from the street.

Like standard PV systems, integrated photovoltaic (PV) solar systems convert sunlight into electricity, but are designed to blend seamlessly into most roofing materials to minimize their visibility from the street. The design team working on WillowCreek strategically placed an integrated PV system on the rooftop of each home without sacrificing architectural integrity or “curb appeal.” An integrated PV system significantly decreases what some homeowners might consider an unsightly detraction from the architectural appeal of their homes.

LEARN MORE:

- PATH Field Evaluation: Shea Homes
- PATH Field Evaluation: J.W. Miller Companies
- National Renewable Energy Laboratory’s Renewable Resource Data Center
- U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy

takes a lot of coordination with the utility company. A substantial amount of paperwork is required from the very beginning of the project until the time you hand the keys over to the homeowner.”

At first, Wolfe found the cost of the system and the complexity of the utility’s paperwork difficult to justify, but multiple rebates and lots of assistance from the local utility overcame his concerns.

“Due to the uniqueness of the project and our participation in ENERGY STAR, Zero-Energy Homes, and ComfortWise, we experienced a number of advantages during the construction process. The first was receiving discounts on the county plan check and permit fees to the tune of 7.5 percent. Second, our plan check process was expedited, which allowed us to begin construction sooner. Lastly, our contract with the PV supplier was based on their handling the California State rebate processing. So even though each PV system cost roughly \$18,000, the State rebate was approximately \$9,000. ConSol is also looking into whether we can receive federal incentives based on the recent energy legislation.”

“We were also very fortunate that our local utility had people focused solely on solar technology and were able to help us comply with regulatory mandates. The utility’s solar specialist has been my hero, having guided me through the paperwork required to complete the regulatory process.

The utilities’ requirements can be intimidating at first, but our utility contacts were extremely friendly and very patient. They really helped speed the process and I’m not sure we could have done it without them. The utility process didn’t hold us up at all. It simply required an extra area of focus.”

“The county building inspectors were not too familiar with solar technology and asked a lot of questions. However, their inquiries were based on wanting to learn more about PVs since they see solar as an up-and-coming technology. Overall, they were supportive and interested in gaining experience with the technology.”

MATERIALS

“The PV system we chose for WillowCreek is manufactured by GE and comprised of 48 GEPV-055 modules, engineered to produce 2.4 kilowatts during ideal conditions. GE designed the system specifically for each house based on its orientation, roofing type, and our request that no solar panels face the street. Design and layout took less time than the county’s building permit process.”

“The size of our PV system was based on the estimated daily load requirements of the home. We used energy-efficient appliances, HVAC, windows, and lighting, and improved fiberglass insulation [R-38 in ceilings and R-13 in walls] throughout the home, which cut the daily load and avoided having to install a larger, more expensive PV system.”

“Another important design consideration is making sure your PV designer uses solar data specific to the area where the PV system will be installed. These steps will help control your expenditures on solar equipment and ensure you get a properly sized system.”

INSTALLATION & TRAINING

PV roofing systems are usually ready to install once they’re delivered. Depending on the type of product, they can be installed by a roofing professional or an electrician;

TECHNOLOGY HIGHLIGHTS

This project included the following PATH-profiled technologies:

- Fluorescent lighting
- High-efficiency heating and air conditioning units with tightly sealed duct systems
- Integrated photovoltaic roofing
- Radiant roof barrier sheathing
- Tankless water heaters

The Partnership for Advancing Technology in Housing (PATH) brings together builders, manufacturers, researchers, government agencies, and other members of the housing industry. PATH partners work to improve the quality and affordability of new and existing homes. The program is administered by the U.S. Department of Housing and Urban Development's Office of Policy Development and Research.

To learn more about PATH, visit www.pathnet.org.
To learn more about PATH-profiled technologies, visit www.toolbase.org/techniv.



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however, they must be wired to the house power supply by a licensed electrician.

"Installing an integrated PV system just requires some coordination between trades, mainly involving the roofer and the electrician. We chose an electrician to install the PV systems and incorporated the installation into the construction schedule. We try to control our projects right down to the day and integrate everything we can to avoid construction delays."

"We installed normal roofing felt over the entire roof and then we laid down composition shingles in the area where the PV system would be installed. Next, we laid a couple rows of roofing tiles—either concrete or mission tiles, depending on the floor plan elevation—on the bottom edge of where the PV system would be, to act as a stop for the solar panels to rest against. We then interconnected each module, or set of integrated panels, to create the larger PV array. Once the entire system was installed, the roofing tiles were laid. Although the PV panel slightly complicates the area of the roof that contains the PV array, we worked with our roofing contractor to ensure proper tie-in between the roofing tiles and the PV system. We used only flat tiles on the elevations where the PV systems were installed."

"Training basically consisted of bringing all the players together and figuring out how it was going to work. We tried our system on the model homes first and found that it worked well. Besides working with the electrical and roofing contractors to coordinate the installation, we also had to manage minor issues with the plumber regarding the placement of roof penetrations for things like vents and exhaust fans. Since each house is oriented differently, there are individual adjustments that need to be made depending on the placement of the panels."

SCHEDULING, AVAILABILITY & JOB-SITE STORAGE

"Lead-time and transportation were not a problem for us. We tried not to keep the PV panels stored on site for very long and we did our best to schedule their delivery to fit our production schedule. Ideally, we receive them, place them on the roof, and screw them down all in the same day. It's pretty seamless."

"One thing you have to be careful of is protecting the panels during the course of construction. For example, we used Visqueen to protect the panels from stucco and paint overspray."

LOOKING AHEAD

"Although PV systems have a high initial cost, we were able to save thousands of dollars on each house by participating in incentive programs. We saved on permit fees and were able to start construction earlier given our expedited plan check status. Equally important, we believe the long-term value of the PV systems will continue growing for our customers, especially since energy prices are slated to keep rising year after year. It's been two years since the completion of our first home, and we have yet to receive any complaints or callbacks regarding the PV systems. I don't think there is anything we would do differently next time."