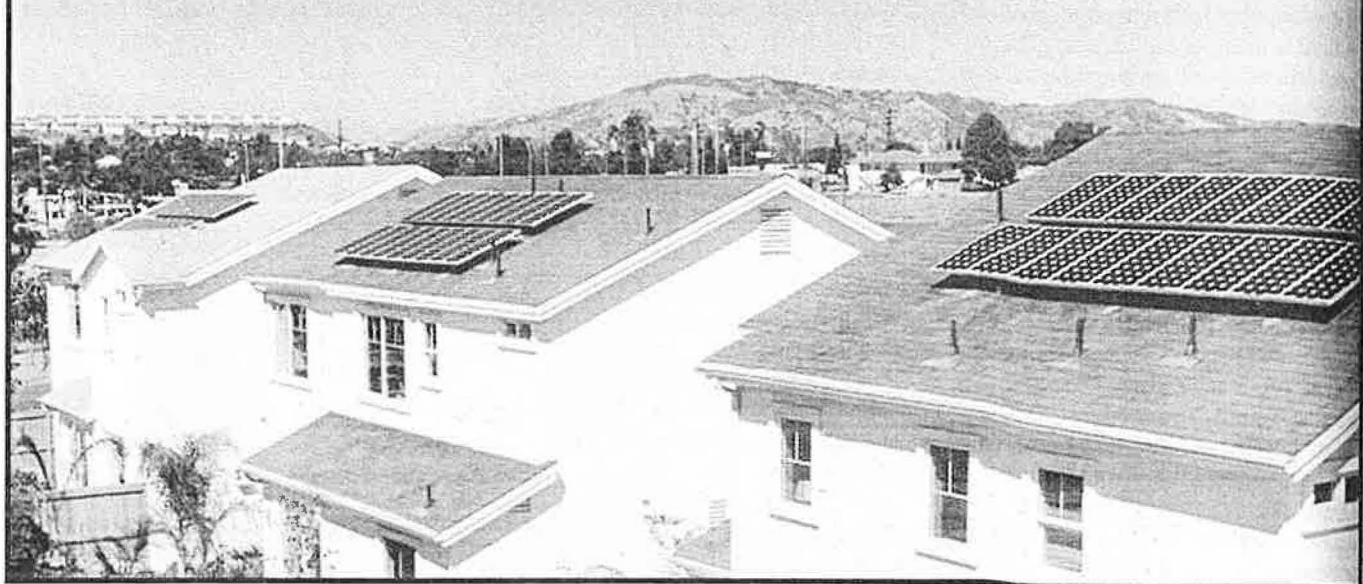


Putting Technology into Practice



by Mary James and Doug Peckler

At the Village Green in Los Angeles, new kinds of partnerships and new energy-efficient applications work hand-in-hand.

Village Green was on target to become another typical project of Lee Homes when the firm got an invitation in March 1998 to attend a talk on the brand new Partnership for Advancing Technology (PATH, see sidebar). "Participating in PATH seemed like a good opportunity to learn something new," says Jay Stark, director of development for Lee Homes, "so we volunteered our site." The development has become a working laboratory for energy-efficient applications.

Following that meeting, the White House Office of Science and Technology Policy asked the Department of Energy (DOE) to assign a Building America Consortium team to work with Lee Homes on Village Green. The team chosen, the Building Science Consortium (BSC), led by Joseph Lstiburek and Betsy Pettit, began by conducting a system engineering analysis of the proposed project. Working with the builder, BSC redesigned the homes from the house-as-a-system point of view. Subsequently, construction of the first of the re-engineered houses began in November 1998.

"A lot of the technologies that BSC

introduced were new to me, while others I had heard about but never worked with," says Stark. As a result of the collaboration, an abandoned 18-acre field in Los Angeles, California, has now given rise to 74 energy-efficient, technologically innovative homes. A second builder, Braemer Urban Ventures, joined the project early on.

Despite extensive energy efficiency innovations, the homes are still affordable for the Los Angeles area. The 1,400–1,700 ft² homes are selling for \$160,000 to \$190,000.

Village Green houses feature very tight building envelopes, designed by BSC, which enable the builders to downsize the heating and cooling equipment by 50%. The tightness is offset by mechanical ventilation.

The builders replaced the traditional furnace and hot water heater with an integrated system. An instantaneous gas water heater in the garage supplies instant hot water to the house, and in winter also supplies space heating through a heat exchanger at the air handler.

One of Village Green's innovative technologies is its gas-powered air conditioner, which reduces high demands for electricity in the

summer months. With financial assistance from the Southern California Gas Company, DOE, and the Robur Corporation, the builders installed natural gas absorption chillers (GAX) in each of the homes. These air cooling systems use chilled water for air conditioning and require no ozone-destroying agents.

Village Green is presently the largest solar subdivision in the nation. The 1.5kW PV systems are expected to generate enough electricity to meet a substantial amount of the community's electricity needs, with each system producing approximately 2,000 kWh a year. The Los Angeles Department of Water and Power has contributed funding for the systems, which were developed by BP Solar.

According to BSC forecasts, monthly energy bills for Village Green homes are anticipated to be as low as 40% of those of conventional homes—quite a bargain considering that typical summertime cooling bills have been \$150/month. The savings will become even more important with energy prices soaring this year. Active monitoring is currently underway by the National Renewable Laboratory.

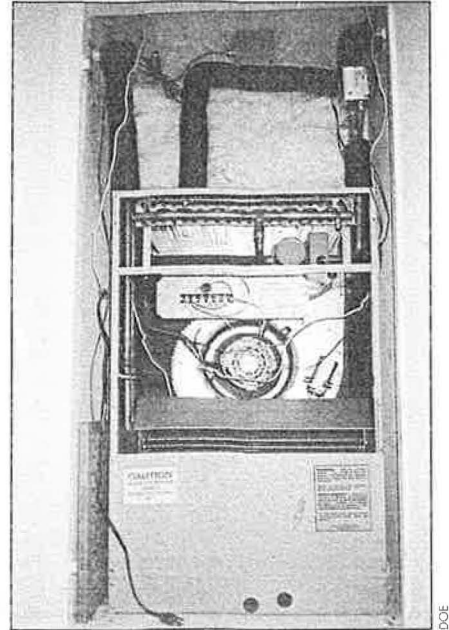
Important home features include:

- advanced framing techniques using 2 x 6s that make room for added cellulose insulation (minimums of R-19 walls, R-30 ceilings);
- open web trusses to reduce the length of ductwork runs;
- HVAC systems (air handler and heating and cooling coils) located in a conditioned utility closet;
- horizontal axis washing machines; and
- spectrally selective low-E glass to reduce heating and cooling costs.

Village Green's greenness goes beyond the homes' individual features. The development is located right next to a Metrolink transit stop. The developers also chose to place an open-access 25,000 ft² park in the center of the site. Such careful land planning and site design, along with its assortment of innovative technologies, have earned Village Green the PATH National Pilot Program designation. A National Pilot Program development provides a model for the nation's construction industry.

Four More in Store

Four other National Pilot Program sites are under construction or in the design phase (see Figure 1). These receive technical support through Building America's Integrated Business and Construction Solutions Consortium (IBACOS). The Summerset project within the city limits of Pittsburgh, for instance, is a massive reclaiming of a large brownfield area containing virtually a century of slag from its former steel mills. IBACOS has provided technical support in drafting the residential performance



The integrated water and space heating system allows redirected hot water from the water heater tank (left) to be used to heat Village Green homes. The small incremental cost to use the water to heat the home is far less than the comparable cost of an electric heat pump. The air handler (right), with heating and cooling coils, can be located anywhere in conditioned space, preventing unnecessary duct leakage.

guidelines rating system and resource information package that has been adopted community-wide. Groundbreaking for the first of 713 houses occurred late in 2000, with the first unit to be completed in the spring of 2001.

Such large projects are not PATH's only forum for fostering demonstration of new housing technologies. PATH is sponsoring 15 demonstration sites where innovative technologies are applied in smaller-scale development

projects. PATH demonstration sites mainly incorporate housing technologies whose cost and performance are already documented but not widely accepted. Emerging PATH-identified technologies may also be used in these homes. Demonstration sites take many housing forms—including market-rate developments, an Indian reservation, and employer-developed housing—but all sites illustrate and evaluate how technologies perform on a community-wide scale.

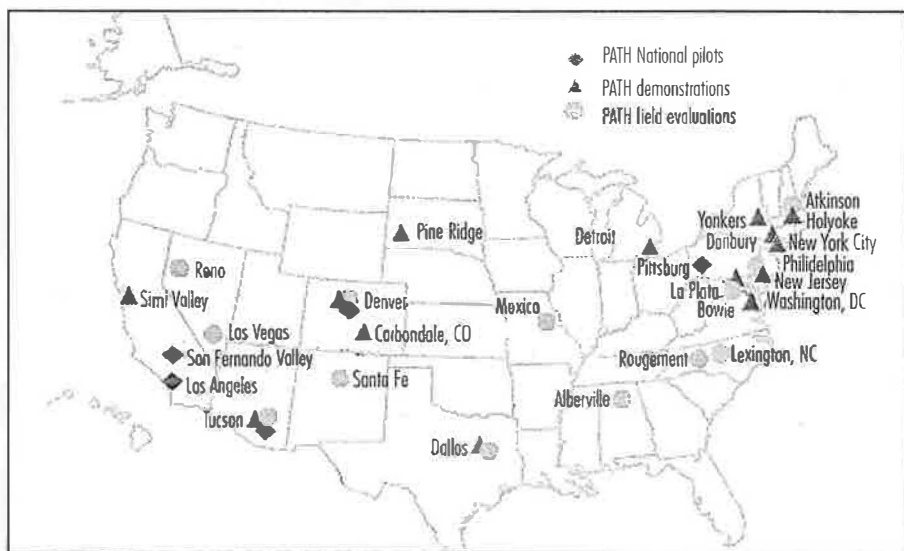


Figure 1. In just a few years, PATH projects have started to cross the country.

PATH in the Field

Another PATH venue for introducing new technologies is its field evaluation sites, which are often retrofits. Here, new housing technologies are tested over time, and their performance is rated by the National Association of Home Builders Research Center (NAHBRC). The association's president, Don Martin, has pledged builder support for PATH. "NAHB," he said, "is eager to work with the administration to form partnerships that will bring emerging technologies into residential construction. This means not just the 1.4 million new homes we build each year," Martin said, "but also the nation's 100 million existing homes. To make significant improvements by the year 2010 we must focus considerable effort on existing housing. After all, more than

Partnership Not Only Opens Doors, But Builds Them Too

The Partnership for Advancing Technology in Housing (PATH) is a public-private partnership aimed at improving the quality, cost effectiveness, durability, safety, and disaster resistance of housing in the United States. Administered by the Department of Housing and Urban Development (HUD), PATH works closely with the Department of Energy (DOE), especially DOE's Building America program. Other public sector partners include the departments of Agriculture, Commerce, and Labor, as well as the Environmental Protection Agency, the Federal Emergency Management Agency, the National Science Foundation, and the White House Office of Science and Technology Policy.

PATH's industry partners are just as critical to its success. These are coordinated by the NAHBRC's Industry Steering Council for PATH, and include trade associations such as the Manufactured Housing Research Alliance and individual home builders of all sizes. Insurance firms, utility agencies, manufacturers, and manufacturing associations also play big roles.

PATH was officially launched by President Clinton in May 1998 with ceremonies held at Village Green. Describing PATH as "the most ambitious effort ever to help private home builders and home owners make cost-effective, energy saving decisions that will pay big dividends throughout the 21st century," the President urged housing professionals to work together to spur housing design and construction innovations.

Through DOE's Building America program, builders are introduced to the systems engineering approach to home building, which recognizes a house as a system of interacting components. The Building America program helps builders identify energy-saving strategies, such as locating the heating and cooling systems in conditioned space and carefully sealing the ducts, allowing the downsizing of HVAC systems. Building America strives to accelerate the development of building innovations, generally at little or no cost over the builder's building practices.

The PATH program involves significant interagency research and development work with other federal agencies such as FEMA, which led to the Safe Room technology for survival during tornadoes; the Forest Products Laboratory; EPA, which improves existing homes through its EnergyStar program; and the National Institute of Standards and Technology (NIST).

PATH's Durability Research Program (PATH-D), led by NIST's Building and Fire Laboratory, is another example of how PATH is helping to better serve the needs of the housing sector. Builders, trade contractors, manufacturers, insurers, and federal agency researchers together laid the groundwork for the PATH-D program. The PATH-D agenda calls for researchers to begin developing an industry-wide consensus on what constitutes a durable material or product, how durability should be measured, and how products should be rated. They will look at the durability of roof and wall components and at how well they attach to one another. The service life of sealants, the main line of defense in preventing moisture penetration around window and door frames, will also be considered. The durability evaluation work will include such aspects of home exteriors as paint and joint sealants, roof coverings, concrete slabs, wooden components, window seals, and steel ties in masonry walls. PATH-D is particularly interested in developing a method for evaluating the service life of steep roof coverings.

The NAHB Research Center will work with the housing sector to collect, analyze, and summarize data on the durability of selected key products used in residential construction. NIST will use the data to develop durability evaluation tools, methods of analysis, and finally a computer integrated knowledge system (CIKS) for the housing components. Demonstration projects will showcase the results of the program. Eventually designers and builders will be able to make better-informed decisions on different products by using CIKS to evaluate different housing components. The NAHB Research Center disseminates durability information through its Toolbase Web program.


85% of the nation's housing inventory in 2010 will have been built prior to today."

An example of field work is the evaluation of advanced duct sealing technologies developed by DOE's Lawrence Berkeley National Laboratory. This study will speed the introduction of such advanced duct sealing technology as sealing with an aerosol spray, to DOE's low-income Weatherization Assistance Program, the nation's largest retrofit program. Six local weatherization agencies in widely different regions have begun testing the aerosol technology and advanced manual duct sealing techniques. The agencies will monitor heating energy use in a total of 96 houses for 4–8 weeks before and after the ducts are sealed. Energy savings may be significant, because duct systems in existing homes are only 50%–75% efficient. The Center for Energy and Environment in Minneapolis, Minnesota, will provide the monitoring equipment and analyze the data collected before and after the ducts are sealed. Aeroseal, Inc. will provide the aerosol sealant and application equipment as well as train the weatherization teams in its use.

While visiting any of these actual PATH sites to learn more about these technologies' performance may be difficult for a busy builder, visiting PATH's virtual site isn't (www.PATHnet.org). PATH has also devoted significant resources to creating a Web-based inventory of more than 150 currently available, yet innovative, housing technologies, through Toolbase, which is maintained by NAHBRC. With more than 25,000 visitors a month logging on, both Web sites are helping PATH achieve its goal of disseminating reliable technical information.

At least one builder's practices have been transformed by its interaction with the PATH program. "We're already working on another PATH National Pilot site," says Stark. Lee Homes is one of the Phase 1 builders at the largest infill parcel left in the city of Los Angeles—a 1,000 acre site in Marina Del Rey that formerly was a Hughes Aircraft plant. The proposed redevelopment, Playa Vista, will eventually house 13,000 residential units, hundreds of hotel units, and millions of square feet of commercial space. Government partners will include the U.S. Army Corps of Engineers and the Department of Inte-

rior, working on wetlands and endangered species protection.

"We're applying skills we learned in building Village Green to Playa Vista," says Stark. Lee Homes will again be working with BSC on Playa Vista's engineering, but this time around most of the techniques won't be new to the builders. 

Mary James is the publisher and Doug Peckler is an associate editor of Home Energy.

For more information:

For information on PATH and energy efficient application:

www.pathnet.org

www.toolbase.org/toolbase

www.eren.doe.gov/buildings/building_america

www.huduser.org

www.epa.gov/energystar.html

www.bfrl.nist.gov

www.buildingscience.com/

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