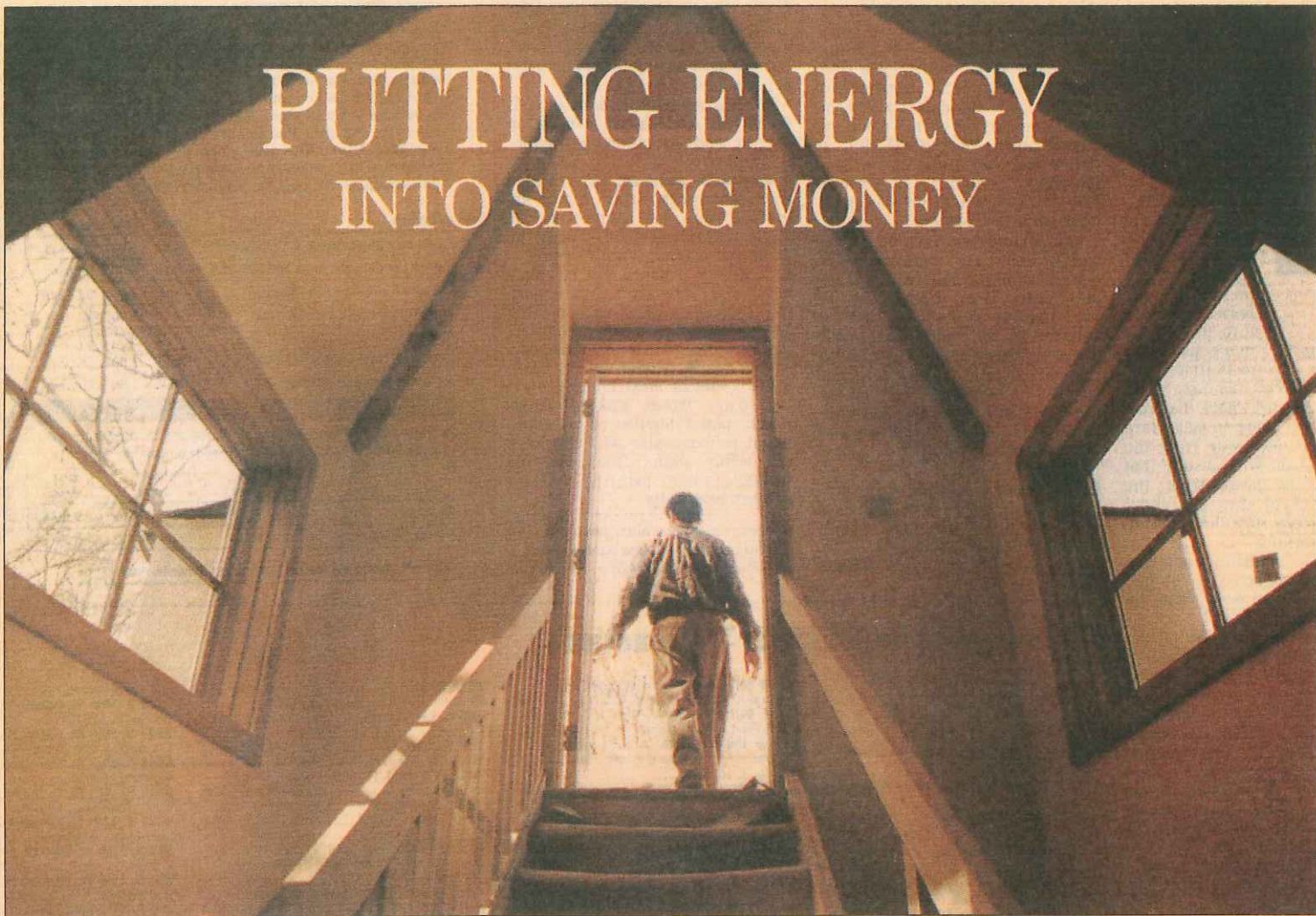


PUTTING ENERGY INTO SAVING MONEY



For The Inquirer / DAVID SWANSON

Architect Paul Macht walks onto the rooftop overlook of a house he designed in West Chester. Macht uses windows to aid heating and cooling.

New appliances. New systems for the home. New construction and design techniques. All these and more can combine to make today's homes use less energy and cost less to operate.

By Alan J. Heavens
INQUIRER REAL ESTATE WRITER

Whether your pocketbook or the planet is your chief concern, energy efficiency can add up to a lot of savings.

Federal energy-efficient standards introduced in 1987 are expected to save consumers \$30 billion over the lifetime of such products as refrigerators, air conditioners, washers, dryers and heating systems sold through 2000, the U.S. Department of Energy says.

The Alliance to Save Energy, in Washington, maintains that a household that merely buys the most energy-efficient appliances and heating and cooling equipment could prevent the release of 70,000 pounds of carbon dioxide over the lifetime of the products. That's a saving equal to taking a car off the road for eight years.

As a further financial incentive, buyers can qualify for larger mortgages if the home being purchased is energy-efficient, or they can finance energy improvements in the mort-

gage and pay for the improvements over the life of the loan.

There aren't many takers for these mortgages, though. While surveys have shown that buyers are interested in energy efficiency, few are willing to add the higher initial expense to the price of the house.

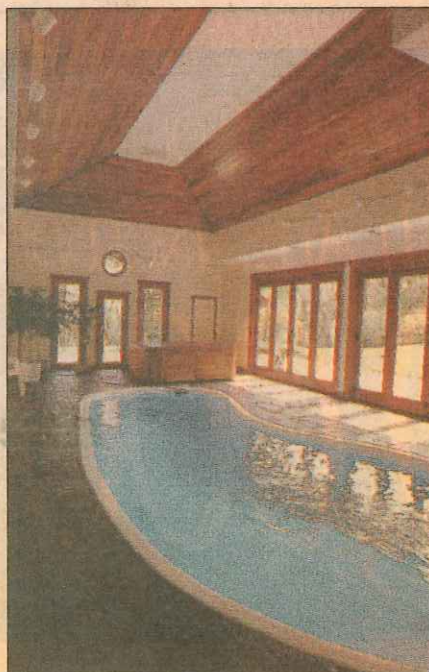
Cost may not be the only consumer concern about energy-efficient or passive-solar houses.

"A lot of solar projects in the 1970s were ugly," said Paul Macht, a Rydal, Montgomery County, architect who has been designing passive-solar houses for 20 years. "They didn't even look like houses. Some of the ideas in each house were a little harebrained, expensive and redundant."

Now, however, energy-saving designs, construction methods and techniques are much more efficient and aesthetically pleasing.

What's even more unusual is that while mainstream buyers are worried about cost, the affordable-housing industry is making in-

See **ENERGY EFFICIENCY** on R11



This Macht-designed home in Birchrunville, Chester County, has an indoor pool. The windows and door open fully to set up a crosswind over it.

Making homes more energy-efficient

ENERGY EFFICIENCY from R1 creasing use of energy-efficient technologies to boost homeownership.

"We learned a lot from our experiences in the 1970s because it was a boom time for trying things out," Macht said. "One thing that I've learned is throw out formulas and computer-generated designs and, instead, assimilate information and have a broad understanding of concepts involved in energy-efficient design.

"You aren't designing a machine," he continued. "Every project has to be dealt with individually. There is a need for a comprehensive strategy and design."

The key to Macht's designs for new houses and additions is "tightness." The vapor barrier on the warm side of the insulation, which protects the cavity, keeps moisture out and prevents decay of materials over the long term, he said.

Because of this tightness, most of the homes Macht designs don't need furnaces. Instead, a line is run off the water heater, which is, in turn, fueled by natural gas or propane.

Such tightness really calls for an air-heat exchanger, which can cost \$1,000 and which many buyers rule out because of the added expense. Still, as Macht points out, these ventilation systems, which draw and expel spent air inside the house and bring in fresh air, which is then heated by propane and redistributed inside the house, cost practically nothing to operate and the payback is almost immediate.

"Even a mechanical ventilation system employing a low-velocity fan can bring in heated fresh air every minute of the day for just six cents a day," Macht said.

The time it takes to recoup the cost of an investment in energy efficiency is the key to what will and won't be done. Macht points out that Americans own houses for a shorter time than do people in other countries, so a payback on such an investment needs to be relatively quick. Four years is what he shoots for.

Census statistics show that Americans move every seven years.

Most of Macht's houses and additions are traditional stick-built houses, although Allen Entrekin, the contractor with whom Macht has been working, has recently begun using factory-made wood panels instead of 2-by-6s in construction.

Ron Bailey of Drexel Hill decided to travel another route to energy efficiency, using an "ice-block" system, in which the exterior walls are made of stacked polystyrene forms filled with concrete.

This form of construction creates thermal mass (using thickness of walls to reduce the use of heating and cooling systems), a technique used almost exclusively in residential building in the Southwest, where Bailey had been a contractor.

What does thermal mass achieve?

Basement walls with insulation value of R-38 and values of R-36 on the first-floor and second-floor walls, Bailey said.

"The major issue was cost," said Bailey of his new home in Chester Springs. "Although the ice-block system involved extra engineering costs, we'll save about \$20,000 to \$22,000 in labor costs because, once the concrete cures, the interior is ready to drywall and the exterior is ready to stucco or side."

But the walls aren't all. Bailey, who now works as a psychologist, will heat the 3,400-square-foot house with a German-made oil-fired boiler that costs about \$1,800. The first level will have radiant floor heat, the second floor, conventional baseboard — and he expects to recoup the cost in a year.

The hot water in a separate Horti-Cell water-heating system cools only two degrees an hour, and if the heater is placed on a timer, even that loss can be prevented inexpensively.

The washing machine is a Swedish import manufactured by Asko. Bailey said that while the front-loading washer costs \$800 — more than twice the price of a conventional American-made model — it uses one-third to one-quarter less water and only half the soap.

Including the 4½-acre site, Bailey's house, which also includes design elements to enhance energy efficiency, will cost \$325,000. The bank said the property, when completed, will appraise at \$470,000, Bailey said.

"We did a lot of research," he continued. "It paid off. Not only did we get an energy-efficient house, but one that can be easily expanded."

And as far as obtaining approval for what in these parts might be considered an unusual house, Bailey said there was no problem.

"The local building official said that as long as the house met code, he didn't care what it was made of," Bailey said.

Despite what appears to be a slightly higher up-front cost, energy efficiency is being linked more and more with affordability. In late April, Bradley Builders & Developers, of Philadelphia, and AvisAmerica, a Pennsylvania producer of manufactured homes, unveiled a 2,180-square-foot factory-built demonstration home, the Solar Pennsylvanian, that featured photovoltaic modules that supply electrical power, solar thermal water heating, and passive design.

The design features reduce energy consumption by 90 percent compared with a typical home of the same size. The homeowner's annual estimated utility costs will range from \$350 to \$450 a year — \$200 to \$250 a year for supplemental gas heat and \$150 to \$200 a year for supplemental electricity.

Thermal storage is integrated into the design of the houses, which, unlike the 1970s' versions, look like houses. Dark-colored tiles are installed in the floors adjacent to the south-facing windows to provide ad-

ditional thermal storage during the day; they then release the stored heat at night.

According to Macht, photovoltaic-cell technology is one of the fastest-growing technologies in energy conservation today. But it's not the only one. Geothermal heat pumps, which tap the energy of the Earth to heat and cool a house, are requiring less and less space. While they still require an initial investment of about \$15,000, they represent a technology that is finding its way into more new houses.

This, too, is a technology suited to affordable housing, especially affordable housing built in quantity. Jim Harrell, president of Geothermal Systems Inc. in West Chester, expects to sign an agreement in June to hook up 470 units to be built at the Southwark Plaza public housing site in South Philadelphia to a geothermal heating and cooling system.

This kind of system will add \$1,500 to \$1,800 per unit to the construction cost, Harrell said. However, Harrell expects an annual saving of 30 percent on each family's heating and cooling bill, so the payback will be relatively rapid.

Energy efficiency can be even more nuts and bolts than photovoltaic cells and geothermal heating. Rudy DeFinis, who has been selling windows and doors in Northeast Philadelphia since the aluminum-clad 1960s, said wooden windows and wood doors are fast becoming an anachronism.

"Pretty soon, you won't be able to buy a wooden door," DeFinis said. "Most of the new ones these days are steel and highly energy-efficient."

And how do we pay for all this? In the late 1970s, Freddie Mac and Fannie Mae, the quasi-public corporations that repackaged mortgages for the secondary market, and the Department of Housing and Urban Development and the Veterans Administration began mortgage programs for energy-efficient homes.

Nineteen states (Pennsylvania, New Jersey and Delaware are not among them) have home energy-rating-system organizations in place.

The concept of these energy-efficient mortgages is simple. Buyers of homes with reduced monthly energy costs can afford more expensive houses, because they have more disposable income than if they bought less efficient homes. This also would increase the number of potential home buyers, because people could qualify with lower incomes.

Also, with such mortgages, energy improvements of up to 5 percent of the value of a home loan were allowed to be added into a borrower's loan if the improvements could be justified in an appraiser's analysis of comparable sales.

For More Information

■ The Home Energy Rating Systems Council, 1511 K St. NW, Suite 600, Washington, D.C. 20005, phone number 202-638-3700, provides data on energy-efficient mortgages and energy rating systems.