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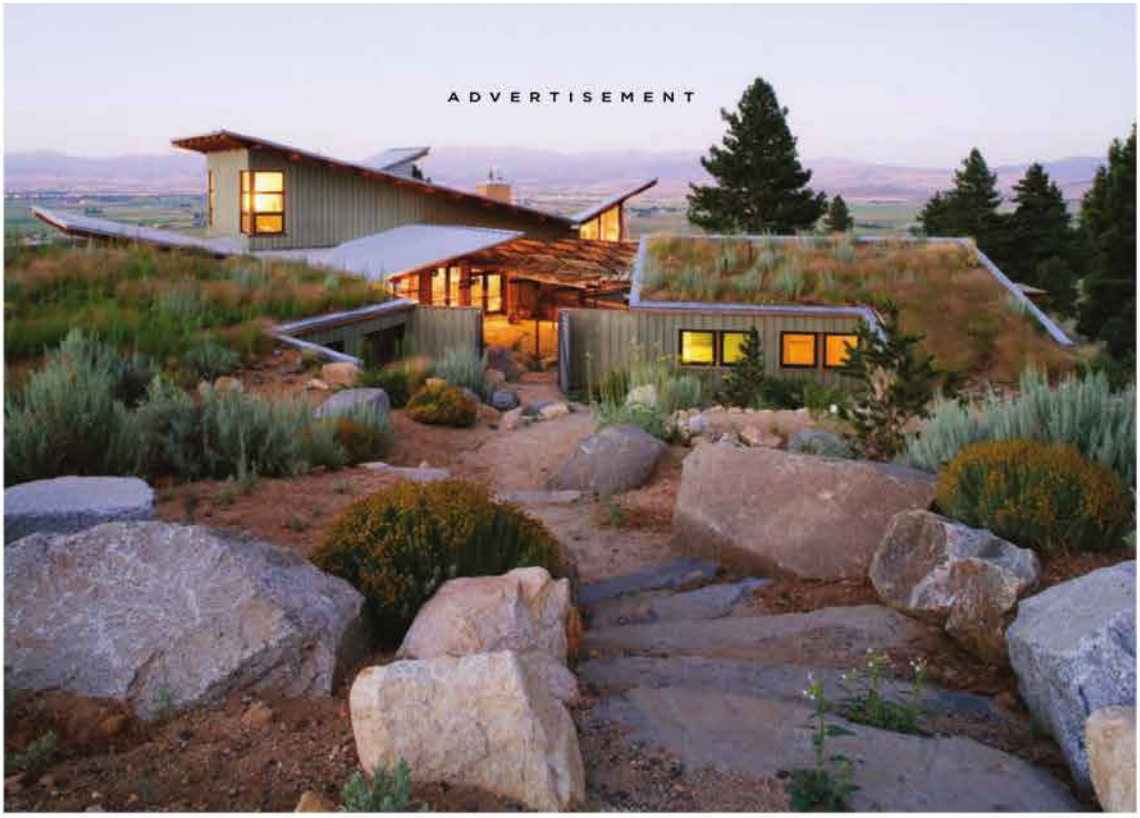

Smart Style

More and more Americans are seeking out sophisticated homes that protect their wallets and the environment – without sacrificing livability or beauty.

Shine On

Not long ago, solar panels on a roof were a rare sight. Today, though, the picture is decidedly different. As David Arkin of Arkin Tilt Architects in Berkeley, Calif., pointed out, solar energy remains the most basic energy-saving system for the home, in part because it is the most readily adaptable to the majority of building sites, including those in urban settings. Other renewable energy systems such as wind, hydro and geothermal require proximity to steady wind, water or ground excavations. "Most of us have a rooftop," Arkin said, "and a roof, partially covered with photovoltaic panels, can easily produce enough electricity for one house."

These days, both passive and active solar energy systems can be integrated into an overall energy plan for the house. But before specifying solar panels, savvy architects start with logic-driven design decisions — such as realistic square footage, site orientation and layout — to reduce energy demand. The low-tech options are too often overlooked, said Peter Pfeiffer of Barley|Pfeiffer Architecture in Austin, Tex., who has helped his clients save energy for more than three decades. "Before you get wrapped up in complicated technical systems," Pfeiffer said, "pick the low-hanging fruit first."

Start With Siting

Proper orientation can go a long way toward savings in both heating and cooling. Pfeiffer suggested that the most energy-efficient lots are on streets that run east-west, since most of the home's windows will face north and south — an ideal orientation to avoid the hottest afternoon sun. Ample roof overhangs on southern exposures provide even greater economy, he said: "In summer, when the sun is higher in the sky, roof overhangs can provide shading for the windows and reduce air-conditioning."

Location of rooms is also a factor in saving energy. Pfeiffer advised that putting all bedrooms on the second floor can save 30 to 50 percent on utility bills. This way, he said, "at night, you're heating or air-con-

ditioning only one floor, and by day, only the other floor."

Secondary spaces, such as laundry rooms, storage areas and walk-in closets can provide a barrier between living spaces and severe weather. "In Austin, where we need eight to nine months of air-conditioning, I always put the garage on the west side of the house as a thermal buffer between the afternoon sun and the living areas," said Pfeiffer. "You're not just saving energy; you're making the house more comfortable."

Catch the Breeze

For centuries designers have known that cross-ventilation is effective in making interior temperature levels more tolerable in the summer months, and a ventilated stairwell enhances natural airflow through a house. Toward that end, Pfeiffer puts operable windows at the top of his stairwells. When you open the stair windows as well as the windows that face the prevalent breezes, fresh air blows through the house, taking the hot air out through the stairwell. A bonus effect of stair windows is the daylight they can bring into the center of the house.

Heating a Pool

Pfeiffer also employs mechanical systems to increase performance. Using his own home as a laboratory, he designed an innovative water-source air conditioning system that uses the family swimming pool as its heat sink. With a water-source heat pump, a heat exchanger channels the exhausted heat into the pool, extending the days in the spring and fall

OPPOSITE: The striking multiple roofs of this home in the Sierra Nevada mountains are optimally angled for year-round collection of sunlight.

TOP: Architect David Arkin integrates salvaged and reclaimed materials whenever possible.

ABOVE: Photovoltaic panels on the roof convert sunlight into electricity, and solar hot water panels heat enough water for the owners' domestic use.

Photos: Edward Caldwell (edwardcaldwell.com) for Arkin Tilt Architects

when the pool is used. "It makes sense to take the waste from the air-conditioning and have it do the job of another appliance," he said. For homes built on a lake, the natural body of water could serve the same function as the pool in Pfeiffer's setup.

Geothermal heat pumps draw heat from the constant temperature of the earth (ground-source) or from large bodies of water (water-source). At a depth below freezing level, both the earth and lakes maintain a constant 53-degree temperature. Water, when circulated through a network of tubing buried in the lake or ground, also reaches 53 degrees. When connected to a geothermal heat pump, the pump requires less energy to increase the 53-degree water to 65–72 degrees than if it were heating winter air. An air-source heat pump requires a great deal more energy to reach a comfortable indoor temperature during seasonal extremes in outdoor temperatures. Ground-source heat pumps, because of the excavation necessary to bury tubing, are considerably more expensive to install than water-source pumps on a lake.

Handsome and Livable

With his design for a home in the extreme climate of the Sierra Nevada mountains, Arkin ably demonstrated that an energy-saving house could also be handsome and livable. The home's dramatic multiple roofs are at an optimal angle for year-round collection of sunlight. Photovoltaic panels on the roof convert sunlight into electricity for the house, which is tied into the power grid, allowing the owners to buy electricity from the local utility at peak times and, at other times, sell excess electricity back to the utility — substantially reducing their annual cost.

Solar hot water panels on the roof heat enough water for their domestic use. During the winter, surplus hot water is directed through tubing installed in a sand bed beneath the concrete floors, where it is stored. "Through the course of a night or a week," Arkin explained, "the heat radiates up into the house." In addition to creating sensual luxury via warm floors, the radiant heat contributes to space heating, though it sometimes needs to be supplemented by another heat source.

The methods he used on the mountain house are just as effective at reducing energy costs for a suburban home in the Bay Area community of Belmont, Calif. Set on a corner lot with two large coastal oaks, this attractive home hints at its solar design with panels on the roof (photovoltaic and solar hot water collectors). The south-facing windows direct the winter sun onto thermal mass walls that temporarily hold the heat, releasing it throughout the chilly evenings. In the summer, trellis-like panels shade those same windows as well as the operable windows on the stairwell tower. The design and smooth integration of the panels make them appear to be simply distinctive detailing.

Reduce, Reuse, Recycle

As with the mountain house, Arkin used salvaged and reclaimed materials wherever he could. Trusses and ceiling decking, wall and bookshelf framing all enjoy their second lives here. The roofing shingles are made of recycled auto tires, reflecting Arkin's commitment to a broader green building standard. Yet Arkin said that the greenest thing about the home is where the owners chose to build it and how it fits their lifestyle, which includes walking and bicycling to all of their services. They are two blocks from public transportation and the farmer's market and two blocks from Belmont's downtown shops. "This project," Arkin said, "shows that you don't have to have 40 acres in the country to build a solar house."

OPPOSITE: Catching the southeastern prevailing breezes makes for comfortable outdoor living spaces — such as this screened-in porch, or "sleeping porch."

BELOW LEFT: Integrating the site orientation into the design from the outset reduces energy usage. Siting the structure along an east-west axis orientation allows the home to take advantage of passive solar effects.

BELOW RIGHT: Incorporating the swimming pool as a heat sink extends the pool's use by months and reduces the work the air conditioner has to do.

Photos: Roe Osborn (roeosbornphoto.com) for Barley|Pfeiffer Architecture