

**GOLD**  
HOME  
OF THE YEAR

DUAL WINNER

**GREEN**  
HOME  
**GOLD**

**VITAL STATS**

**SYSTEMS DESIGN  
& INSTALLATION**

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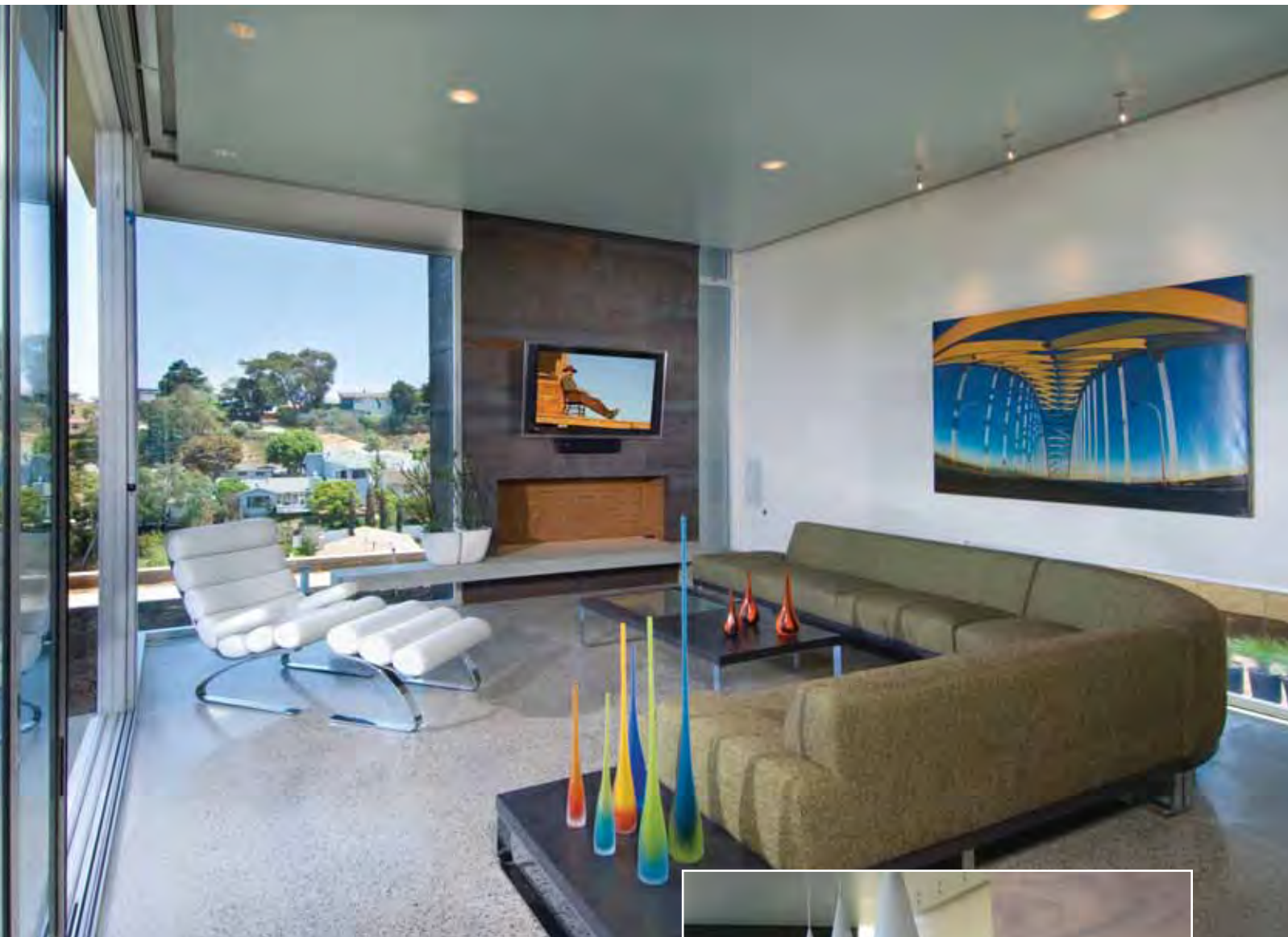
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# ecoEasy

Being green and high-tech looked like a challenge, but it wasn't very hard in this striking, modern home. *by Steven Castle, photography by David Harrison*





How green are this home's electronics? An on-wall keypad from Control4 in the kitchen (right) allows the family to enact preprogrammed lighting scenes that bring only those lights needed for certain activities, such as dining or cleaning, and at preset dimming levels that also help to save energy. Lutron Sivoia QED (for Quiet Electronic Drive) shades automatically roll down from the slots in the ceiling (above) to keep the area cooler during the day. Even the 52-inch Sony 1080p LCD HDTV in the family room is Energy Star-rated for using less than 1 watt of power in its "off" state. It's accompanied by Klipsch surround-sound speakers and an in-wall subwoofer (above, right corner).

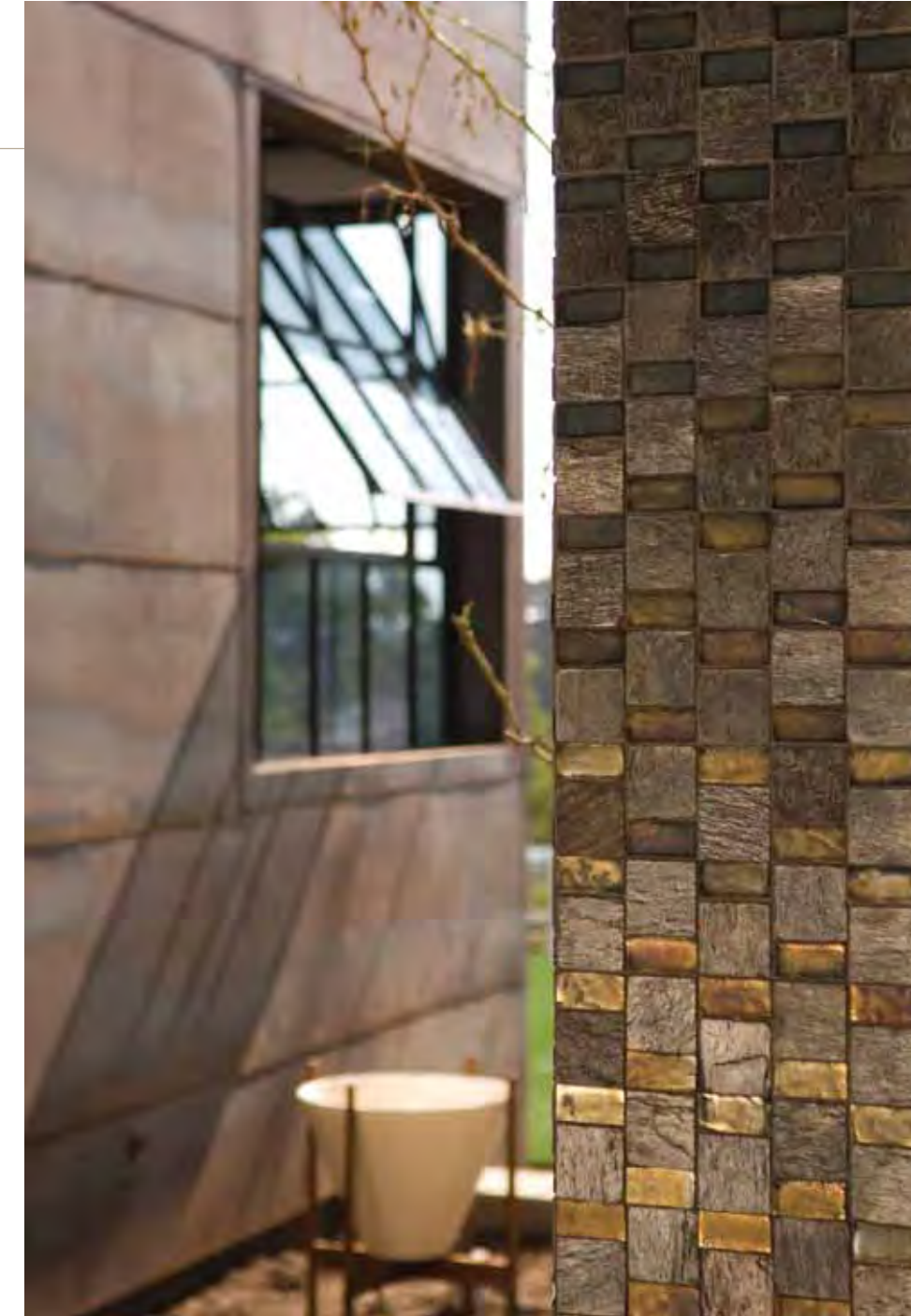


**A** green home? For *Electronic House's* Home of the Year? Yes and you bet. For the first time, our grand-prize winner is an energy-efficient, sustainable home that's made largely from environmentally friendly materials. And yes, it has plenty of electronics. In fact, the home's control system, lighting and shading systems help to save energy.

Energy efficiency and sustainability are important to many of us today, and this home proves that you can be a good steward of the Earth while enjoying the benefits of the latest electronics. This graceful home combines a beautiful, environmentally responsible design with technology that makes it even more ecologically friendly. That is why it is our clear choice for the *Electronic House* 2008 Home of the Year.

"We're trying to use our house holistically, so it doesn't use as much of our resources," says Kevin deFreitas, the homeowner, architect and general contractor.

The contemporary 4,200-square-foot *Casa Futura*, as it is known, is powered in part by 26 solar panels, two of which provide heat for the home's hot water needs. It has water-saving features such as low-flow, dual-flush toilets and smart irrigation systems that water plants



only when they need it. The home is constructed largely of recycled materials, with concrete radiant-heated floors and an efficient metal roof. Walls contain extra blown-in insulation, and the windows reflect heat and harmful ultraviolet light. Motorized blinds automatically shade the large windows to keep the rooms cool, and natural ventilation reduces the need for air-conditioning. All the appliances are Energy Star-rated for better efficiency, from the front-loading clothes washer to the low-water dishwasher. Highly efficient and long-lasting LEDs (light-emitting diodes) are used in several rooms as accent lighting, comple-

Peering around an entry wall of recycled glass tiles (above) reveals architect Kevin deFreitas' studio, which employs windows recycled from a former industrial complex in San Diego. Near the front entrance is also a Sonance rock speaker (upper left in corner), to greet guests with music from a whole-house audio system.



menting energy-saving compact fluorescent lamps (CFLs) and traditional incandescent bulbs on dimmers for energy savings. And a whole-house control system ties together the lights, shades, thermostats and other electronics into one easy-to-use system. The house is so efficient, it has achieved Gold-level LEED (Leadership in Energy and Environmental Design), the de facto green building rating system of the U.S. Green Building Council.

DeFreitas estimates that the home is 60 percent more efficient than is required by

California's already stringent Title 24 standards for energy efficiency in new homes, with the solar panel array alone saving his family of six 50 percent to 70 percent in electricity costs, depending on the season. The system is "tied to the grid," effectively selling power to the utility on all those sun-filled San Diego days.

While deFreitas doesn't consider himself a high-tech guy, he did want some entertainment and convenience features for himself and his family. So the surround-sound systems in the family room and kids' playroom use



Energy Star-rated LCD monitors. Other entertainment options include a whole-house audio system with speakers inside and out for the enjoyment of deFreitas' extensive jazz collection. There are iPod connections, computers and security cameras as well.

"Lighting was the biggest thing for me, because that changes the quality of the space in a big way. And music was really important to me, because I listen to it from the time I wake up to the time I go to bed at night," the homeowner says. DeFreitas' architectural

studio is in his home.

DeFreitas got in touch with the electronics systems contractors at San Diego-based ONteriors, who showed him how he can store all his music on an 80-GB hard-drive server and distribute it throughout the house via Klipsch in-wall and in-ceiling speakers. The family even enjoys sounds in the courtyard from outdoor speakers. "Kevin wanted technology that's affordable and that met his objectives in energy management," says Dan Merrill of ONteriors.

Floors on the lower level are concrete, with a terrazzo finish and containing radiant heating tubes below the surface that warm the concrete into an efficient thermal mass. The heat comes from a Viessmann solar thermal system. Upstairs in the bedrooms (left), are recycled carpeting and black walnut cabinets from a sustainable forest.



The kitchen boasts Energy Star-rated appliances from KitchenAid and Whirlpool, including a low-water-use dishwasher. In the bath (opposite), there's a Toto EcoPower automatic faucet that recharges itself when water runs through it, a dual-flush Toto toilet and a recycled glass partition with grass sandwiched between the plates.

The home entertainment systems and lights are operated by a Control4 home control system, allowing certain preset "scenes" that turn on only the lights needed for certain tasks. In addition, a built-in astronomical clock helps turn on some lights and exterior lights a half-hour after dusk each day.

These automated presets and the dimming of incandescent bulbs save a significant amount of energy, but deFreitas and ONteriors didn't stop there. Occupancy sensors in the rooms trigger an ENERGY MISER scene that shuts off lights and reduces heating and air conditioning when family members leave the room. That scene also shuts off electricity to some televisions, laser printers and personal computers to eliminate parasitic energy loads—

also called standby, phantom or vampire power—that many electronics consume even in their "off" states. (Any electronics with a remote control, clock or soft touchpad will consume a small amount of power when turned off but plugged in.)

The Control4 system also operates the Lutron Sivoia shading system over the large windows, and the thermostats. The motorized shades roll down automatically at certain times so rooms don't get too hot and require air-conditioning, for instance.

### Green on Green

Neither green nor high-tech was on deFreitas' early radar. "I thought energy efficiency was great, but sustainability wasn't something I



focused on," he says. "We bought this little 1950s house and planned to tear it down. And the AIA [American Institute of Architects] was pushing sustainability, so it was a goal through the membership to reduce greenhouse gases and increase energy efficiency [in the buildings and houses they designed]. Then we learned we could expedite the permit process through the city's building department if we saved 15 percent in energy usage, and we thought that would be worth doing. We also thought it would be fun to do a modern structure."

The architect set out to plan his somewhat efficient modern house, thinking it would be difficult, and what he found surprised him. "A lot of what I thought about energy efficiency was totally false. It was much easier to get to 15 percent than I thought, and I wondered how far we could go. We got to 40 percent without any significant sacrifice. Then we decided to build the house as a showcase home with local magazine *San Diego Home/Garden Lifestyles* and do as much as we could."



The home's blend of eco and electronics start at the exterior entry, where guests are greeted with a Trex recycled lumber walkway, a recycled glass tile wall and a Holovision door station that includes an intercom and camera, so the family can see who is arriving on a computer or TV screen.

The house was designed to save energy and resources in three ways: with efficient design; efficient insulation, windows and mechanical systems; and efficient technology. Start with the design, or what some call "passive solar," using the placement and orientation of the house to optimize sunlight for lighting and ventilation from prevailing breezes. The main part of the house rests on an east-west axis, stretching 80 feet and measuring only 18 feet wide, thereby taking advantage of light with huge windows in some areas. Other windows against corners or floors optimize the reflectivity of the light on surfaces perpendicular to the windows. According to deFreitas, you can generate 30 percent more light in a room by placing windows this way. In one case, a 2-foot-tall window comes right off the floor, which helps reflect more light into the room. "We tried to design it so we wouldn't need lights on during the day," he says.

The house is only one-room wide, with windows on both sides of each room, and windows at each end create ventilation from the prevailing westerly breezes. This helps cool the house and cut down on air-conditioning costs. In addition, long overhangs on the south side help block the hot summer sun from the windows, also helping to keep the house naturally cool.

This efficient "passive" design cuts down on the amount of energy required for lighting and ventilation simply by precluding its use. In this case, prevention was the best medicine.

Next, deFreitas concentrated on the use of efficient insulation, glass and mechanical systems. Some windows are dual glazed, Low E2 (the E for emissivity), which means there's a surface between the panes that reflects heat and ultraviolet rays, while trapping any interior heat and preventing it from escaping.

Walls on the hotter south and west sides were built double-wide (2 by 8 inches) to blow in a mixture of glue and efficient formaldehyde-free chipped fiberglass insulation, which deFreitas says is also great for sound control. The floors, too, are green. The lower level's floor is the home's cement slab, with a terrazzo finish and containing radiant heating tubes that slowly warm the concrete into a thermal mass. Concrete is a great retainer of heat, releasing it slowly into a space. The cement floors are also a boon to one of the deFreitas' daughters, who has asthma, which can be aggravated by particles that get trapped in carpeting and then released.

The mechanical systems are where *Casa Futura* creates its own energy. Two Viessmann solar panels on the roof are used to heat a 90-gallon tank to between 125 and 155 degrees, providing all the home's hot water needs, as well as the heat for the radiant-floor system on the lower level and a forced-air system upstairs. For the second-floor heat, a heat exchanger taps the heat from the hot water and blows the warm air at a low velocity. If there's not enough hot water, a Viessmann tankless boiler burns nat-

## EQUIPMENT LIST

## WHOLE-HOUSE SYSTEMS

Control4 IP-based home control system  
 Control4 interface to radiant heating and thermostats  
 Control 4 lighting system with wireless dimmers  
 GE Concord security system  
 Lutron Sivoia QED shading systems (4)  
 Buffalo Terabyte NAS  
 CELabs HDTV/audio distribution amplifier  
 Control4 wireless contact/relay extenders (2)  
 Control4 media controller  
 Control4 multichannel amp  
 Cox Communications DVR  
 Middle Atlantic pullout rack  
 Panamax surge/line conditioner  
 Sony 5300 ES AV receiver  
 Sony 777ES 400-disc DVD changer  
 Holovision door station  
 Viking door entry system module

## MECHANICAL/SOLAR SYSTEMS

Fronius solar system inverter  
 Kyocera photovoltaic panels (24)  
 Viessmann Vitosol solar hot water system  
 Viessmann Vitocell hot water tank  
 Viessmann tankless gas-fired boiler  
 WeatherTrax automated irrigation system

## FAMILY ROOM

Sony 52-inch XBR5 Bravia LCD  
 Ornimount wall bracket  
 Klipsch RFX 42 LCR speakers (3)  
 Klipsch RW 5802 in-wall subwoofer  
 Klipsch R-5650-S surround speakers (2)  
 Control4 system remote

## LIVING/DINING ROOM

Klipsch 5650 W in-wall speakers (2)  
 Control4 POE Mini-Touch

## ENTRY

Control4 6-button keypad

## PATIO

Sonance outdoor planter speakers (2)

## MASTER BED

Sony 26-inch Bravia LCD  
 Sony CWS-IC150 in-ceiling speakers (2)  
 Sony CD WallStation  
 Control4 POE Mini-Touch and system remote  
 Control4 HC300 controller

## GAME/MEDIA ROOM

Sony 40-inch Bravia LCD  
 Ornimount wall bracket  
 Klipsch RFX 42 center-channel speaker  
 Sony DVD WallStation  
 Sony Sposato CWS-IC150T speakers (4)  
 Sony SAW2500 in-wall subwoofer  
 Control4 HC300 controller  
 Control4 system remote

## OFFICE

Sony 26-inch Bravia LCD  
 Klipsch 2650 in-ceiling speakers (4)  
 Klipsch RW5802 in-wall subwoofer  
 Control4 POE Mini-Touch

ural gas and is fitted with a catalytic converter to produce cleaner exhaust.

The 24 Kyocera solar photovoltaic (PV) panels on the roof comprise a 4.8-kilowatt system that feeds electricity to the grid and effectively spins the home's meter backwards during San Diego's sunny days. DeFreitas can monitor his PV system's performance on a device from Fronius that's tied to the inverter, which converts the solar panel's DC power to the AC used throughout the house. On the small box, he can check how much energy his home is producing and how much carbon dioxide the family didn't create by burning fossil fuels.

## Can Tech Be Green?

The solar panels are good news for the house's electronics systems. Because no matter how you cut it, electronics use energy. There are two surround-sound systems, in the family room and a kids' playroom, and the home has four Sony flat-panel LCDs, which are Energy Star-rated for not drawing more than 1 watt of power when turned off. The deFreitases can access their DVD movie collection on a 400-disc Sony disc changer via the Control4 system. Wall-mounted Sony WallStations with DVD/CD players are used to play music and movies in the master bedroom and kids' media room. The WallStations are connected to a PC to stream MP3 music files as well.

But the primary purpose of much of the electronics, such as the lighting, shading and home control systems, is to help make the house more efficient. "That's where I think the smart house is going, where it's doing things automatically while you're not there, like shutting off the lights or closing the blinds," deFreitas says.

The AWAY mode, for example, turns off all interior lights, arms the security system and engages the ENERGY MISER mode. Once inside, preset scenes can save energy as well. "You hit one button when you come in, and it disarms the security system and illuminates just

major circulation lighting to get you through the house," says Merrill. A bedtime scene arms the security system, turns off the music, changes the set point for the air-conditioning, lights a path to the bedroom and turns off all the interior lights after a five-minute delay.

Even the irrigation system is smart. DeFreitas gave up on watering a lawn and installed 900 square feet of artificial grass in the back, and he used landscaping plants that don't require much water. The system has bubblers only near the plants, and the setup is tied via the Internet to a WeatherTrax system that monitors local conditions, so if there's morning dew in the area, no watering is needed.

"Water is our biggest issue in San Diego," deFreitas says. "A lot of the reservoirs are way, way down. So there's less to begin with. And our water usage in this house has dropped dramatically."

What about electricity savings? "Without the audio/video, during the summer we were producing 100 percent of our own power," deFreitas says. "Then we hooked up all the electronics, and we were using 700 kilowatt hours a month," which is still below the average of about 900 kWh—and this for a family of six. "We use about the same amount of power as [we did in] our previous house, which was half the size," he says. "Now we have a house that is incredibly livable and fits our lifestyle. We're using way, way less power than if we had a traditional house or traditional office. To use the power that we use now seems pretty responsible."

This architect/homeowner may not be done yet. He has been working with ONteriors on small fixes to the automated programming. As the family lives in the house and become veterans of the green movement, they're seeing other ways they can be more efficient. "The whole discussion has changed, because green is no longer considered an alternative," deFreitas says. "Green has an enormous amount of cachet now, and the public accepts it as a good thing to do." **EH**