

Hybrid Homes

New building technologies and innovative add-ons are making nearly-zero-energy houses a real possibility

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Imagine a community for the deeply green. Walls half-a-meter thick keep temperatures comfortable year-round. Windows are triple-glazed. A wind-driven ventilation system feeds fresh air into each house—and grabs the heat from stale outgoing air. Outsize conservatories face south to trap the light and warmth of the sun. Most of the energy-saving technology isn't flashy, though solar panels do provide enough power to run the community's pool of electric cars. The architecture is modish and even the most modest apartment has its own garden. Of course, residents enjoy an organic-vegetable delivery service, too.

This might sound like a limousine-liberal fantasy—the kind of high-tech oasis where the superrich can soothe their consciences deep in the woods. But it's actually an 84-home development, called BedZED, on the site of a disused sewage-treatment plant in an unfashionable patch of South London. Its residents aren't well-meaning ecozealots: many are tenants of a housing charity. But they are all at the forefront of a global trend toward reducing energy consumption in the home.

In Europe and America, buildings guzzle around 40 percent of all energy—about 10 percent more than transport—and create the same proportion of carbon-dioxide emissions. As the world adjusts to life without cheap hydrocarbon fuels, improving energy efficiency across the board is going to be essential. BedZED and other initiatives show that trimming excess energy consumption needn't be difficult or even high tech—just a matter of intelligent design. "People are sick and tired of environmental campaigners' presenting doom-and-gloom scenarios without offering solutions," says BedZED architect Bill Dunster.

The key is finding ways to maximize efficiency in the simplest ways possible: the "zed" in BedZED stands for "zero energy." Whatever little juice the London homes need after taking advantage of their built-in energy-savers comes from an on-site power plant, fueled by waste timber. Simple also means cheap; build 5,000 Zedhomes, says Dunster, and the economies of scale mean the cost is no more than that of constructing a normal home: the price of components tumbles as production numbers rise. It's no wonder such

ideas are gaining admirers. Over the past two years, BedZED has attracted thousands of visitors from as far away as India and China. In the fall, Dunster's company, ZedFactory, begins work on two separate projects elsewhere in Britain. In the United States, zero-energy communities have been constructed from Elk Grove, California, to Loudoun County, Virginia, spurring interest among forward-thinking builders and homeowners alike. "Once people know about it, they want to live there," says David Meisegeier, an energy-efficiency specialist at Virginia-based ICF Consulting. "Who wouldn't?"

The technologies could already be used much more widely. Things like triple-glazing windows to add extra insulation, tightening duct systems and using structural insulated panels for floors and walls are easy and cost-effective—and could cut the fuel consumption of the world's buildings by 20 percent by 2010. "You can accomplish a tremendous amount with the technologies that we have already," says Randall Bowie, a Swedish official working on energy efficiency for the European Commission in Brussels. Take today's domestic boilers, which are generally 30 percent more efficient than the previous generation—or new refrigerators in the U.S. market that use 75 percent less electricity than those from the 1970s. Even simple gadgets like programmable thermostats or light timers noticeably decrease energy use and costs. "This is about doing a lot of unglamorous stuff," says Andrew Warren of the European Alliance of Companies for Energy Efficiency in Buildings.

Major momentum for these ho-hum changes has come from European governments worried by threats to energy supplies and the need to meet energy-reduction goals agreed to under the Kyoto accords. They've started to issue grants and tax breaks for energy-efficient builders, as well as stricter regulations. The standards set by national building codes are ratcheting up, and an EU directive that takes effect at the end of next year will require house builders, landlords or sellers to show an energy-efficiency label, setting out how —well a building performs. A similar EU decree on energy labeling for household appliances has boosted demand for the top-rated items.

The U.S. government, too, has been doing its part. Through the Energy Star program, it has set tough regulations on everything from home construction to major appliances and consumer electronics. "Energy Star is transforming the market so that energy-efficient technologies become standard practice—and a moneymaker for companies, too," says Jennifer Thorne-Amann of the American Council for an Energy-Efficient Economy (ACEEE). Energy Star has also created brand recognition, prompting a flood of applications from companies. "Once you get one manufacturer onboard, everybody wants in," says Meisegeier. "And everyone wins because of the environmental impact."

There's also comfort to be taken in the growing cooperation between government, scientists and the environmental lobby. At the government-funded Lawrence Berkeley National Laboratory in California, Steve Selkowitz's windows-and-building-technology team has made incredible progress with such innovations as dimmable windows that can minimize hot sunlight while preserving the view; the windows could save homeowners thousands of dollars a year in air-conditioning costs. And in Europe, lavish grants from

Austria's provincial governments have spurred interest in so-called Passive Houses, which aim to expend only minimal energy and are forecast to account for a quarter of the country's new building by 2010.

Even more gee-whiz developments are creeping onto the market. Solar power is becoming more affordable, as are tankless water heaters, composting toilets and biomass heating systems like corn stoves, which heat homes by burning corn instead of declining resources like wood. In India, Development Alternatives, a New Delhi-based nonprofit devoted to sustainable development, has helped supply mini power stations—fueled by weeds and agricultural wastes like rice husks—to villages across the country. Beneath thousands of new homes in Sweden, a system of fluid-filled pipes taps the warmth of the surrounding earth and feeds it back to heat pumps inside the houses. And more and more houses are being built with microgenerators—hyperefficient power plants that can sit in the basement. A new mini-CHP—a Combined Heat and Power plant that's no bigger than a dishwasher—can double as a water heater and a generator with minimum wastage. Heat energy from the hot water is recaptured to power lights and run household appliances.

It's too early to know whether the public will embrace such measures fully. "From the marketing point of view, energy efficiency is still a very hard sell," says David Strong of Britain's Building Research Establishment. "Nobody makes television programs about insulating the loft, and people don't hold parties to show off their new boilers," adds the European Alliance's Warren. Although recent months have indeed seen some nasty price hikes, in real terms fuel prices have tumbled over recent decades. "Energy prices haven't quite reached a point where they hit the wallet," says ICF's Meisegeier.

Still, as governments, scientists and builders continue to provide the "market push" toward energy efficiency, says Meisegeier, the "consumer pull" will be stimulated. There won't be any one device that solves all the energy-consumption problems of homeowners. But each new development will push us closer to what one might call the hybrid home, in which energy is conserved through a combination of improved appliances and building techniques. "The technologies will be able to support each other," says the ACEEE's Thorne-Amann. "Solar panels, appliances, heat-pump water heaters—the synergy will improve the whole building." And our whole future.

With John Sparks in New York

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