

Getting to net zero energy

“Commercial and residential buildings use almost 40% of the primary energy and approximately 70% of the electricity in the United States...Electricity consumption in the commercial building sector doubled between 1980 and 2000, and is expected to increase another 50% by 2025.” (Energy Information Administration 2005)

With numbers like this, how can we possibly reduce energy use and emissions?

The 2030 Challenge, endorsed by the U.S. conference of Mayors, the American Institute of Architects, the EPA and many others nationally and internationally, is tackling the problem. They are calling for a commitment for buildings to be 50% more energy-efficient now, and to use zero-net energy by 2030.

Does it sound like an idea from the radical fringe? Fortunately, it’s looking more and more achievable. In fact, the U.S. Dept. of Energy has the goal of creating “...the technology and knowledge base for cost-effective zero-energy commercial buildings (ZEBs) by 2025.” They are aiming for “commercially viable” zero energy homes by 2020.

But what does “zero-net energy” really mean?

The definition matters. Some who have claimed zero net energy are actually zero net *electricity* – still a worthy achievement. A zero energy building, or ZEB, as the DOE likes to call them, uses clean alternative energy to produce as much energy in a year as it uses. A building like this is still connected to the power grid, essentially using the grid like a giant battery, charging it up when producing more energy than needed, and pulling energy from the grid when the on-site power doesn’t meet demand. The goal is for the on-site generation to meet or exceed the building’s energy needs over the course of the year – an “on-site ZEB.” The DOE defines an “off-site ZEB” as a building which uses off-site renewable sources, such as remote wind power or biomass, for example, to achieve its zero (fossil fuel) energy goals.

So how do we get there from here? One step at a time – and if you can do it – jump to alternative energy!

The first step in achieving a ZEB is to reduce the need for power in the first place, by building a passive solar, day-lit, ultra-energy-efficient building. The National Energy Laboratory demonstrated this in a ZEB Habitat for Humanity house in Denver in 2005. A super-insulated building envelope drastically reduced the need for heating and cooling, making it much easier to fill the energy need with solar hot water and electricity. Some buildings, such as the Lewis building at Oberlin, combine geo-thermal for space heating and cooling with a passive solar design, solar hot water, and PVC panels for electricity.

Homeowners can take steps toward greater energy-efficiency. The Energy Star website is a great place to start. Conduct an energy audit yourself online (<http://hes.lbl.gov/> is one of the best), or hire an energy consultant to walk through your home and prioritize improvements. First Energy is now offering to pay up to \$125 of the cost of such an audit, which makes the homeowner eligible for rebates on improvements. Federal tax credits are also still available for energy efficiency improvements in 2008. Once you’ve made your home as efficient as possible, you can take the jump to solar hot water. The final step in a true ZEB is to provide all your heating, cooling and electricity with on-site renewables such as geo-thermal, solar and wind. Burning biomass (wood or crop residue) is another possibility, although not as “low-carbon” as the other options.

For commercial and institutional applications, think what it would mean to have a stable, much-reduced energy bill (because of the required stand-by charge for back-up electricity, the bill won't disappear altogether). A few companies have even become net producers of alternative energy to the grid. In Abu Dhabi, United Arab Emirates, construction has begun on the Masdar Headquarters, the world's first "Positive Energy" mixed-use building. Interesting that an OPEC country would construct the first alternative energy net-producer building...

Only in the desert, you say? Not so. There are some great incentives in place in the U.S. for businesses to go solar, and energy prices are making them look better all the time. Imagine knowing what your utility costs will be five years from now. The Melink corporation, here in Ohio, built a Gold-certified LEED building, and is adding solar panels to meet the goal of being net-zero electricity by 2010. Ferreira Construction in New Jersey claims the title of the first zero (electric) energy commercial building in the U.S. The 200-employee, 42,000 sf facility utilizes solar hot water as well as 223 kilowatts of electricity from solar PV panels. An increasing number of colleges and universities are also exploring what it will take to be net zero energy users – and many have made the commitment and taken action to reach that goal.

Zero-net energy buildings are the wave of the future. Why not here?

Be sure to visit the Green Alliance booth at Carnation Days in the Park – bring a recyclable item to enter a drawing for a free home energy audit, valued at between \$200-\$400, or a bicycle from B&B Bikes.

Check it out:

Zero Energy Buildings: A Critical Look at the Definition, Torcellini, Pless, and Deru, National Renewable Energy Laboratory; Crawley, U.S. Dept. of Energy, 2006

<http://www.nrel.gov/docs/fy06osti/39833.pdf>

A Cold-Climate Case Study For Affordable Zero Energy Homes, Norton and Christensen, National Renewable Energy Laboratory, 2006

http://www.eere.energy.gov/buildings/building_america/pdfs/39678_cold_climate.pdf

<http://zeroenergybuilding.org/>

The 2030 Challenge: <http://www.architecture2030.org/>

The Net-zero Energy Buildings Conference, New York City, October 7-8, 2008:

<http://www.brainiumevents.com/emails/InnovationConference/>

Home Energy Saver, Lawrence Berkeley National Labs: <http://hes.lbl.gov/>