net-zero energy houses

As the name suggests, a net-zero energy house is focused strictly on energy consumption. By definition, these houses produce as much energy as they use over the course of a year, resulting in "net-zero" energy consumption.

Net-zero houses can be built in any architectural style, but they all have a number of common characteristics:

They're very well insulated, far beyond what current energy codes require, resulting in very low heating and cooling loads. Insulation values of R-60 in the roof and R-40 in the walls are common.

Air leaks in the building envelope are very carefully sealed and checked with a device called a blower door.

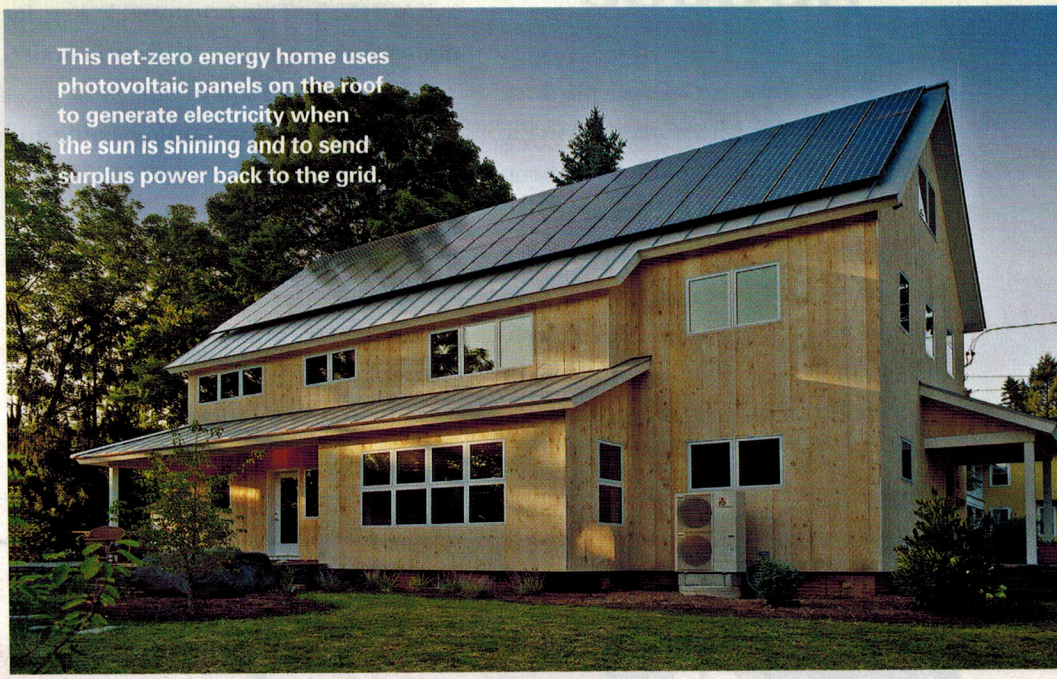
Houses are usually oriented to take advantage of solar gain in the winter, and to block it in summer.

Houses are often but not always all-electric, with no fuel-burning appliances for heat or hot water.

They have some means of generating electricity, usually in the form of photovoltaic panels but sometimes with wind generators.

Domestic hot water is often produced with solar panels.

Sources of renewable energy are key, and net-zero homes are almost always connected to a utility grid via a two-way meter. When the house produces more electricity than it consumes, the power flows into the grid. When the house doesn't produce enough energy, it taps into the grid.



This net-zero energy home uses photovoltaic panels on the roof to generate electricity when the sun is shining and to send surplus power back to the grid.

Coldham & Hartman photos by Ethan Drinker Photography

After weighing times of excess against times of need, the net sum is zero.

In effect, the utility becomes a storage bank for electricity produced at the house. Without this net-metering option, banks of deep-cycle batteries must be included in the design and net-zero performance becomes more elusive.

Defining net-zero is simple on its face, but it can get very complicated in the details. For example, suppose a net-zero house has a gas space heater. With very high levels of insulation, fuel costs would be very low, but to meet the strict definition of net zero, the energy content of the fuel (in BTUs) would have to be weighed against the energy output of the house (in kilowatt hours). Moreover, you might factor in differences between "site energy" and "source energy," which reflect the differences in efficiency between power produced on site and at some distant power plant.

Net-zero houses can certainly be expensive, but ground-breaking work by the National Laboratory for Renewable Energy, Habitat for Humanity, the Oak Ridge National Laboratory and others shows it doesn't have to be. Trading high-cost building materials for high-performance is one strategy. For example, designs that minimize heating and cooling loads with high levels of insulation (an added cost) probably won't need conventional heating and cooling equipment (a cost savings).