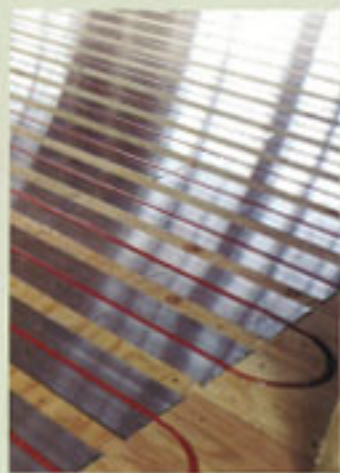


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A Home That Never Needs Heating

The BrightBuilt Barn stays warm in the winter without a heating system

BY TUX TURKEL



Byroni C.O. Best Photography photo



▲ The prototype BrightBuilt Barn is a 700-square-foot office and studio in Rockport, Maine.

Who wants an affordable house that's easy to expand and stays comfortable in the winter without a furnace? The developers of the BrightBuilt Barn figure plenty of people will want a house like that today, in an era of diminished wealth and volatile energy prices.

This winter will test the design assumptions of a new net-zero building in coastal Maine, one that's engineered to

generate more power over the year than it consumes. A growing number of green builders are striving for net-zero designs these days, but many of their homes are custom built and use expensive technology. Instead, the BrightBuilt Barn features off-site modular fabrication and what its developers call "state of the shelf" design, as well as proven materials and systems more likely to lend themselves to easy living, rather than research and development.

The goal of this demonstration project is to create all this in a small home package that's priced at roughly \$200,000, minus land and utilities.

Some of the techniques being used in the home include the following:

- To produce heat and power: south-facing orientation, plus 30 photovoltaic panels for electricity and 60 evacuated solar-thermal tubes for hot water

- To keep heat in: R-40 foam insulation in the walls, floor and ceiling, and triple-glazed, high-performance windows

- For indoor air quality and expandability: heat recovery ventilation, plus 4-foot modular panels with electric wiring running in baseboard chases, not walls.

Although the focus is on easy replication and tried-and-true technology, the designers did take a few steps closer to the leading edge. One example was the decision to enhance daylighting through the use of panels with Duo-Gard's Nanogel, an innovative, translucent polycarbonate window glazing that blocks heat loss, but admits light.

The prototype structure was built last fall in Rockport, Maine, to serve as an office and studio. It is 700 square feet on a 42-by-18-foot foundation. The building includes a kitchen, bathroom, artist stu-



online at the BrightBuilt Barn site (see sidebar).

Onsite, an array of LED lights installed around the lower perimeter of the building are programmed to glow colors, based on energy consumption and production. On a sunny day, the light skirt should glow green, as the solar panels crank out kilowatts and hot water. Over the course of a year, the designers expect the home to generate more power than it consumes, and essentially repay the carbon debt incurred during the construction of the building.

In making these calculations, the developers are projecting the space-heating load of a 700-square-foot building in Maine's cold climate to be the equivalent of 310 gallons of heating oil. That assumes a winter design temperature of negative 10 degrees Fahrenheit.

This calculation also assumes that the super insulation and the building's tight, modular construction will allow occupants to be comfortable with just sunlight, the incidental heat from people and appliances, and a small fan blowing across the coils of the heat recovery ventilation unit.

For backup, though, they have also installed an air-to-air heat pump. The heat pump also could be useful for summer air conditioning, although that's not often needed on the Maine coast. But the developers are adding redundancy because they want to test systems that

dio and office, and could easily be converted to a one- or-two bedroom house. Because of its modular design, it could also be expanded into a larger home by connecting modules together.

Easy-to-Assemble Homes

A handful of New England green builders and designers, led by Kaplan Thompson Architects of Portland, Maine, and Bensonwood Homes of Walpole, N.H., collaborated to create the BrightBuilt Barn. In

designing the structure, their goal was to incorporate existing building techniques to create reasonably priced, easy-to-assemble homes that use a fraction of the energy commonly consumed in conventional housing.

To see how things are going, they've wired the project with meters to track real-time energy use, kilowatt-hour production and carbon dioxide savings, as it relates to global warming. These meters can be monitored

▲ Off-site fabrication of the home's components and efficient on-site assembly help reduce construction waste and keep costs down.

will make the BrightBuilt Barn work in any climate.

Right Place, Right Time

Not surprisingly, the designers chose to seek LEED (Leadership in Energy and Environmental Design) Platinum designation for the project, the highest rating possible from the U.S. Green Building Council's energy and environmental certification program. Off-site fabrication in Bensonwood's innovative timber frame factory held one of the keys. Computer-controlled cutting for each piece of lumber keeps material waste to less than 10 percent, a fraction of what can wind up on the scrap heap at a conventional build-

ing site. Efficient construction can also help hold down the cost of replicating the home.

On the topic of cost, the recent global financial meltdown may help enhance market timing for the BrightBuilt Barn. A backlash against expensive, oversized housing that's difficult to heat and cool is feeding interest in smaller, high-performance homes. The developers could have a product that's in the right place at the right time.

One variable, though, is the solar component for the BrightBuilt Barn. In mid-2008, when the equipment was purchased, the developers paid more than \$30,000 for the solar electric and hot water systems. That's

a big chunk of the total project cost, leading to questions about how to balance zero-energy goals with affordability. Stronger federal and state tax incentives for renewable energy could improve the cost equation, decisions that await a new government in this new year.

Tux Turkel writes frequently about business and energy issues. He's based in Portland, Maine.



► The home's super insulation and tight, modular construction will help keep occupants comfortable with just sunlight for heat.

► Duo-Gard's Nanogel, a glazing that admits light but blocks heat loss, is one of the innovative technologies the designers are testing in the home.



Fast Facts: BrightBuilt Barn

- Ninety percent of the building is pre-fabricated at Bensonwood Homes, a New Hampshire-based timberframe company known for its energy-efficient panelization process.
- Thanks to a continuous R-40 envelope (floors, wall, ceiling), this mid-coast Maine building requires no furnace.
- The BrightBuilt Barn will generate more electricity over the course of a year than it uses.
- Solar thermal systems generate electricity and hot water for use in the house.
- The BrightBuilt Barn is on track to receive a LEED Platinum rating from the U.S. Green Building Council.
- A large energy meter on the building's front facade will simultaneously show current levels of energy use and consumption, and energy use information will be continuously monitored online, via the BrightBuilt Barn's blog.

For more information:

BrightBuilt Barn: www.brightbuiltbarn.com

Bensonwood Homes: 877-203-3562 or

www.bensonwood.com

Kaplan Thompson Architects: 207-842-2898 or

www.kaplanthompson.com

Duo-Gard's Nanogel panels: 800-872-4404

or www.duo-gard.com