

## Portland Press Herald Maine Sunday Telegram

### 'Green' to the extreme: House may cut energy costs by 90%

By TUX TURKEL, Staff Writer

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Gordon Chibroski/Staff Photographer  
Waterproof, insulation-grade heavy wallboard is meant to keep heat from escaping through the ceiling and attic.

BELFAST — What does it take to build the most energy-efficient house in Maine?

Probably lots of leading-edge technology, and a pile of money.

The farmhouse-style house rising in an old field here will likely become the state's most energy-frugal home, its builders say, using 90 percent less fuel than a typical new home.

This structure is so airtight and heavily insulated, and so well oriented to the sun, that the builders are leaving out any real heating system. And thanks to solar panels on the roof, the owner won't pay anything for heat or hot water. Not ever.



Gordon Chibroski/Staff Photographer  
Alan Gibson shows the single entry point for the utilities embedded in the insulated concrete floor of the Belfast home he's helping build.

But what makes this project even more noteworthy is that the three-bedroom, 1,500-square-foot house is expected to cost roughly \$225,000, minus land. That's on par with typical custom-built homes in Maine. And costs could drop, the builders say, if the techniques being used here are adopted in mass production.

"It's tricky to bring together good design, high performance and affordability in one package," said Alan Gibson, co-founder of G.O. Logic LLC of Belfast.

Volatile energy prices have Mainers keenly interested in green building. But the term has become an almost meaningless marketing prefix to describe nods to clean energy and the environment.

Gibson and his business partner, Matthew O'Malia, are creating a prototype that may help usher in the next generation of green homes in Maine. Their project integrates construction standards developed in Germany with American home-building practices, and a touch of Yankee ingenuity.

When the house is finished early this winter, it will serve as a proving ground for whether Gibson and O'Malia can achieve the desired energy performance and cost savings. Also in question: Will buyers be put off by homes so airtight that they need special ventilation systems?

Both men have a keen interest in energy-efficient construction. O'Malia has designed environmentally friendly projects in the U.S. and Germany. Gibson has years of experience in carpentry and green building science.

He was a lead contractor on the BrightBuilt Barn project last year in Rockport, a small demonstration building designed to generate more power than it uses. Lessons from that job, Gibson said, are helping him lower costs on the Belfast venture.



Gordon Chibroski/Staff Photographer  
Matthew O'Malia of G.O. Logic LLC stands in the natural field at the energy-efficient home being built in Belfast. The owner of the house — expected to cost about \$225,000, excluding land — will not pay anything for heat or hot water, the developers say.

Also guiding the project is a German green-building certification program called Passivhaus. The Passivhaus standards specify superthick insulation and high-tech windows and doors to create a nearly airtight shell.

So little heat escapes that the building can be warmed by sunlight, appliances and the people inside. To maintain healthy air quality, a special ventilation system exchanges clean, cold air from the outside for warm, stale air, recovering much of the energy in the process.

To some degree, these techniques are embodied in the U.S. Green Building Council Leadership in Energy and Environmental Design program, which is more familiar to Mainers. This house is designed to meet the highest level of the LEED program, but it will be the first in Maine built to Passivhaus standards, the men say.

The first thing you notice is the walls. They're 24-foot plywood panels, assembled in a factory and filled with a 6-inch sandwich of dense foam. The sections are sealed tightly together. When interior studs are added for gypsum board and insulated, the wall will have an R-value of 45, twice the standard for Maine.

The south wall is largely open to accommodate windows. But the glazing won't come from a local home improvement store. O'Malia used his German connections to get wholesale prices on triple-glazed, gas-filled windows that he says are tighter than any made in North America.

The truss roof also was factory built. Deep rafters will hold 22 inches of cellulose insulation, creating an extreme R-80 cap.

Typical frost-wall foundations are expensive to build in Maine, and they're hard to air seal and insulate. O'Malia and Gibson set the home on an innovative slab that combines a shallow, insulated frost wall, a gravel and concrete pad and 6 inches of foam insulation.

A concrete floor poured atop a thick vapor barrier will create a thermal sink that, in winter, will store the sun's warmth streaming through the large, south-facing windows. That should help the home stay warm on cold, cloudy days.

These measures are meant to save both money and energy. The lack of a basement or full frost wall saves up to \$10,000. No central heat cuts several thousand dollars. For backup, the home will have a small electric baseboard or two.

"This is our take on how to achieve Passivhaus numbers in Maine's climate, for a reasonable cost," Gibson said.

Gibson and O'Malia could stop at that and have a very comfortable, easy-to-heat home. But they also plan to add a modest array of solar panels to generate electricity and heat water. Taken together, these solar additions will offset any money spent using the electric baseboards, creating what's called a net zero home.

Homes that generate as much or more power than they use – net zero – are the rage in some corners of the housing industry. But for the concept to have wide appeal, it has to be accessible to middle-income buyers, according to Matthew Power, the Portland-based senior editor of Green Builder magazine.

"You're really trying to change the market," Power said.

Homeowners would love a house with no heating bills, he said. But builders need to become comfortable with sustainable construction methods and be able to communicate with customers who wonder if an airtight house with no heating system will really work for them.

"That's the builder's job," Power said, "and to be honest, only one out of 10 can explain that."

A good example is heat recovery ventilation, the technology being used in Belfast to maintain good indoor air quality.

"Everybody asks the question about air quality," said Patrick Coon, a co-owner of ReVision Energy in Portland. "There's a lot of misinformation. A lot of builders say, 'I like to let my house breathe.'"

ReVision is working with G.O. Logic to supply the solar equipment. Poorly sealed new houses remain common today and waste lots of energy, he said. That won't change until mainstream builders are convinced that properly designed, super-snug homes won't create mold and other indoor air problems.

"The line is, 'Built it tight and ventilate it right,'" Coon said.

Gibson and O'Malia say they are aware of this learning curve, both for builders and customers.

"People say a building that's airtight is like living in a picnic cooler," O'Malia said. "Who wants to live in a cooler?"

Thousands of Passivhaus homes have been built in Europe in recent years, and several are springing up around America.

But to get Mainers comfortable with Passivhaus, Gibson and O'Malia plan to rent out the Belfast house for two years, use it as a show house and monitor its performance. They also hope it will serve as a model for homes in a nearby sustainable community that's starting to take shape, Belfast Cohousing and EcoVillage.

Their pitch will go something like this: We can build you an affordable, comfortable house that will never have a heat or hot water bill.

"It's hard to sell that," O'Malia said. "That's why we wanted to build this house, to show people in Maine what can be done."

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