Net-zero energy: The future of homebuilding

Reid's Heritage Homes is building affordable homes in Guelph that produce as much energy as they consume

By Barry Gunn
Photography • Dean Palmer

This show home, on Goodwin Drive in Guelph, produces as much energy as it consumes over the course of a year. Photography • Reid's Heritage Homes

WITH ITS MODERN TAKE on traditional craftsman-style architecture, it looks like a typical house in south-end Guelph's Westminster Woods subdivision. However, step inside and you'll soon learn that this three-bedroom back split is anything but typical. In fact, it may represent the future of homebuilding.

Beneath the façade of brick, stucco and vinyl siding is a net-zero energy home; featuring some of the latest innovations in building technology, the house is designed to produce as much energy as it consumes over the course of a year. Unveiled in September, it is the first of five net-zero energy homes being built in Guelph by Reid's Heritage Homes as part of a national demonstration project intended to prove that affordable net-zero energy homes can be built on a community-level scale.

"Net-zero homes have been around for a while, but they've only been available as custom — and often expensive — one-off projects," says Jennifer Weatherston, director of innovation at Reid's Heritage Homes. "What makes this project so exciting is that it is geared toward the mainstream homebuyer."

The initiative was inspired by the American Institute of Architects' 2030 Commitment, which calls for all new buildings and developments to be carbon neutral by 2030. Owens Corning Canada took up the challenge and launched the demonstration project with $1.9 million in support from Natural Resources Canada's ecoEnergy Innovation Initiative. Overall, 25 net-zero homes are being built as part of the project involving five builders in Ontario (Reid's and Minto Communities), Quebec (Construction Laval), Nova Scotia (Provident Developments) and Alberta (Mattamy Homes).

"We wanted to demonstrate the ability of production builders to build affordable net-zero homes in a community setting. This has never been done before in Canada," said Andy Goyda, marketing development manager at Owens Corning Canada.

Goyda said Reid's was selected to participate based on its leadership in the sector — for example, building Canada's first LEED (Leadership in Energy and Environmental Design) Platinum home in Guelph in 2007.

"We knew that if we didn't have the right builders on board — innovative leaders in the industry — there's no way this would work," he says.

Reid's is also a member of the Canadian Home Builders' Association Net Zero Energy Housing Council, formed in 2014 to encourage the industry to adopt net-zero construction. The council includes other Guelph-area companies offering net-zero homes such as Sloot Construction and WrightHaven Homes.

"Guelph is a hub of innovation, and southwestern Ontario in general is leading the pack when it comes to energy efficiency," says Weatherston. "To have this many builders in one region who understand how important this is and the opportunity that it represents is inspiring and motivating."

In addition to developing new techniques to make net-zero building cost-effective, a key component of the project is industry education. From the outset, the Guelph net-zero homes have attracted attention from builders across North America looking for more information. Many have travelled to Guelph to see it for themselves.

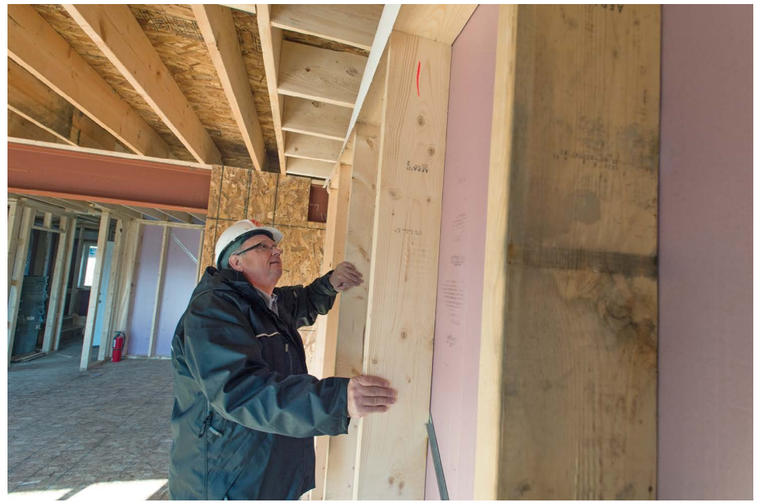
Reid's Net Zero Discovery Home is the show home for the remaining four houses being built on adjacent lots along Goodwin Drive. The second house was for sale and ready for finishing touches in December while the other three will be on the market this spring. The show home won't be on the market for another couple of years.

From the outside, the bank of 33 solar photovoltaic (PV) panels that line the roof and covered back porch, plus the hybrid air-source heat pump mounted on the side wall, are the only outward signs that something is different about the Discovery Home. The PV panels from Guelph's Bluewater Energy generate electricity to run the house and feed into the grid. A

net-metering system tracks the amount of power sent into the system and calculates a credit toward the home's electricity costs.

The homes range in size from 1,400 to 2,200 square feet and each is built with thicker walls than a standard code-built home to allow for more insulation in the exterior and interior walls, as well as in the attic and under the foundation slab. Exterior walls are built with the CodeBord air-barrier system developed by Owens Corning, which dramatically reduces the amount of air leakage of the homes. High-efficiency, triple-pane windows provide additional insulation and quiet comfort, while advanced heating, cooling and ventilation systems plus other features like LED lighting and water-conserving plumbing round out the list of special products that make net-zero homes 67 per cent more efficient than a standard house built to meet the Ontario Building Code.

All those features come at a price. A two-storey, 2,000-square-foot net-zero home will likely cost about $60,000 more than a conventional house of the same size. Solar panels would account for most of the additional outlay. But energy savings of $3,000 to $5,000 a year would appeal to homeowners seeking to insulate themselves from the rising energy costs — the average hydro bill, for example, is expected to increase more than 40 per cent over the next few years.



It all starts with making the building envelope as airtight as possible, says Goyda.

"If the home isn't insulated properly, then all the other things you do with high-efficiency mechanicals or solar panels or LED lighting aren't going to make much difference," he says, adding that it's more economical to find better ways to conserve energy than develop new systems to generate it. "The tighter you can make the house, the better."

Weatherston says the builders learned a lot during construction of the Discovery Home — for example, shifting from using two-by-six-inch wall studs to two-by-eight as a more cost-effective way to build thicker walls to accommodate more insulation. Plus, the Discovery Home features a lot more "bells and whistles," such as a bank of batteries to store energy produced by the solar panels, which aren't being offered with the other houses. The idea was to showcase new technologies but with an emphasis on "off-the-shelf" products that are readily available to the average builder.

"We've worked hard to ensure that the construction processes and products selected are builder-friendly and trades-friendly," she says.

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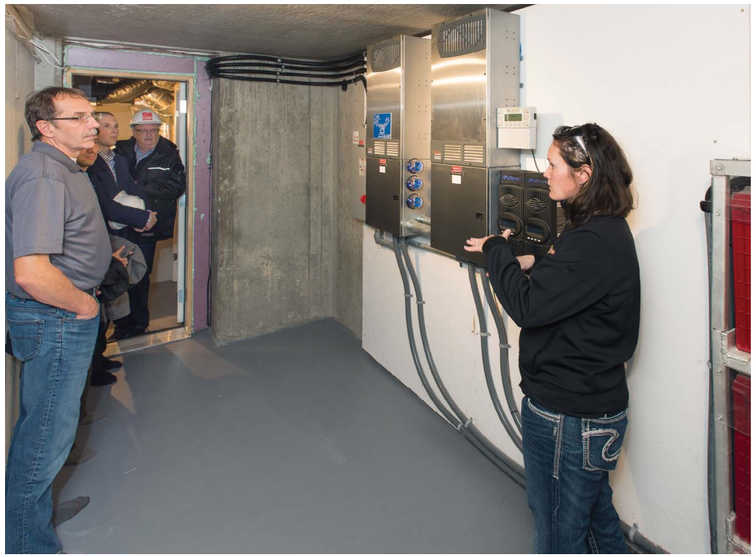
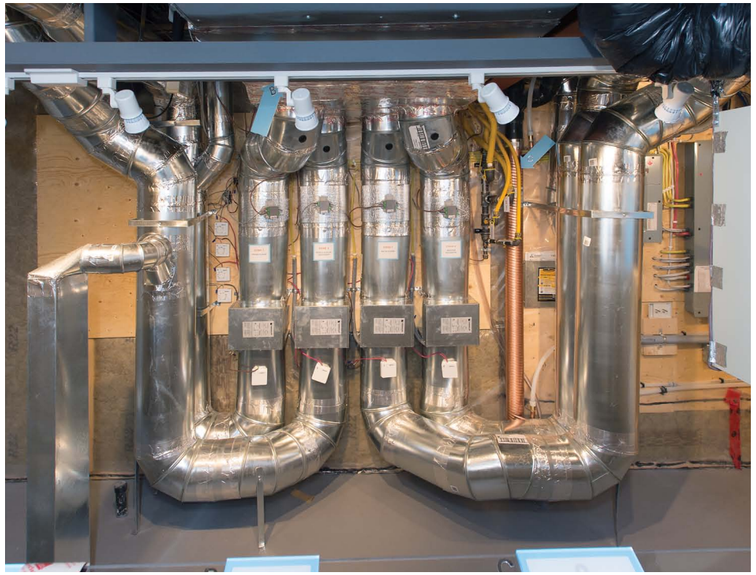


Above: Andy Goyda, Canadian builder lead and marketing development manager for Owens Corning Canada, checks out the two-by-eight-inch framing, which allows for more insulation inside the home's wall cavity.

Left: Jennifer Weatherston of Reid's Heritage Homes explains how the inverters transfer electricity between the solar panels, the home's battery bank and the hydro grid. In the background are, from left to right, Edgar Rosales and Dale Verville from Qualico Homes in Winnipeg with Ryan Dennis and Andy Goyda of Owens Corning Canada.



Instead of a conventional furnace and air conditioner for heating and cooling, the net-zero house uses an air-source heat pump and an energy recovery ventilator to absorb heat from the outside air and release it inside the building. In summer months, the process is reversed to cool the home.

All that work has paid off. Starting this year, all new single-family housing developments brought to market by Reid's Heritage Homes will be net-zero ready.

Reid's commitment reflects a shift in the industry that has been underway for some time, says Andy Oding of Building Knowledge Canada Inc., a building science and energy consulting company.

Today's new homes have 50 to 60 per cent more insulation value than a typical house just 15 years ago, plus far more efficient heating and cooling systems. Last year, about one-third of new homes were Energy Star certified, which is 20 per cent more energy efficient than the building code requires. Many builders like Reid's already incorporate the Energy Star system as standard.

Other rating systems like R-2000 take home energy efficiency a step further, and net-zero goes further still.

"These are the healthiest, most comfortable homes Canadians can live in. From top to bottom, the temperature, humidity and air quality is consistent, plus they're incredibly energy efficient," Oding says, adding the industry has come a long way in making the technology user-friendly.

"In the last five years, the industry has evolved from where we had complicated utility rooms with intimidating-looking gadgets to solutions that are straightforward and can be installed and maintained with ease."

For builders, finding ways to cut energy consumption isn't just doing what's right for the planet, it's also good for business. In fact, energy efficiency may be the new granite countertop when it comes to selling a house. Last year, a survey of homebuyers' preferences by the Canadian Home Builders' Association found energy efficient appliances, overall energy efficiency and high-efficiency windows ranked in the top four of 10 "must-have home features." Only walk-in closets ranked higher.

As a result, it probably won't be long before all new homes are at least net-zero ready.

"I think you are going to see the market transformed before you see the regulatory bodies require it," says Oding. "And that's a good thing."

style panel

What features would you insist upon if you were having a house built for you?

INDU: I love to cook and entertain, so I would definitely want a walk-in pantry to store all my food, spices and produce and I would want an island in the kitchen with ample space for pull-up bar stools. It's so much fun to have everyone around the island so you can prep, cook and entertain while in the kitchen. I also find that our family tends to gather in the kitchen as a hangout place.

SUZANNE: Our home is over 100 years old, so I'd have to say insulation, closets, lots of natural light and electrical outlets. And a great front porch. Oh ... and heated bathroom floors.

DAVID: Without a doubt, a large walk-in wine cellar. We love buying a good bottle of wine when it's first released, trying it and deciding if it's one of those that will be a fabulous bottle in five or 10 or maybe 20 years. When we have one we believe will age well, we'll buy a case or two and tuck it away. Then over the next decade or more, we'll periodically try a bottle to see if it has hit its maturity. Sometimes we'll be drinking wine that, if it's even available, would be outrageously expensive to buy. ... Any time I'm in a home that I find out has a wine cellar, I definitely make sure I get a tour. It's an experience just to walk through one and see what other people have collected.

EMMA: Without a doubt, ample natural light. I particularly love homes with large bay windows, so it is necessary that my hypothetical new house have these. To me, nothing feels as warm and welcoming as natural sunlight beaming into a family room.