NEWS & VIEWS

Saving Green Building Green

Can a house in cold Edmonton produce as much power as it consumes? Environmentalists are trying

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It's a cold February morning, with the temperature barely nudging -25C. Inside a Mill Creek home shared by Conrad Nobert, his wife Rechel Amores and their two young children, it's cool but comfortable. Very comfortable, in fact, if you take into consideration their home doesn't have a furnace.

The Nobert-Amores home looks like any other from the front, but if you go around the back — where you'll find a garden and the three different fruit trees in the summer months — you'll see more than 30 solar panels, some on the roof, others on movable awnings. It's all part of the Nobert-Amores family's efforts to make as small an imprint on the planet as humanely possible, and as a hedge against the future.

It's what is called a net zero home, one of only two in the city, with more in the construction and planning state.
A net zero building is one that produces all of its own energy for heating, lighting , appliances, and hot water on site over the course of a year. To do this, the house might draw on the power grid during the cold winter months, but sell back to the grid during the summer or warmer winter days. The net result, if all goes well, is zero.

Whether the Nobert-Amores home — or the first Edmonton net zero home in Riverdale — has achieved actual net zero is not entirely clear. Nobert has been scrupulously gauging his energy production and use this year, and so far it looks promising. Nobert expects they might be able to achieve net zero from the period of October 2010 to October 2011.

SAVING YOUR POCKET BOOK

But even if it doesn't achieve the net zero effect, you have to be envious of his power bill, which is about $25 a month, all of which is service charges. And, thanks to the absence of a furnace, there is no natural gas being used, resulting in a remarkable level of savings. To gauge how much, just look at your gas bill for a month like January, and imagine that entire bill, with its laundry list of incomprehensible riders and usage fees, all gone.

Raised by parents who taught him the value of conservation, Nobert is a dedicated environmentalist (he doesn't even own a car). He and Rechel did everything you can do with their previous house, just a few doors down from their current house, like replacing windows and improving insulation.

Still, that wasn't enough.

"I realized that it was still consuming a huge amount of energy," says Nobert. "We don't really have a good idea, because it just comes in from a pipe in the basement. But the amount of energy used was massive."

Worried about climate change, and the potential for energy scarcity — one day, he warns, there will be no natural gas left — he and his wife decided to go big and go home, and the easiest way to do that was to start from scratch. Net zero, or even coming close to it, isn't just a matter of improving insulation and using energy-efficient appliances. The net zero effort begins, literally, from the ground up.

In 2008, he "deconstructed" a house that stood on the site of his current net zero home, saving the fir and maple flooring, the brickwork and the interior doors for use in the new house.

Now with just a hole in the ground, they planned a house that would "push the envelope" of energy conservation, aiming for a net zero house.

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This is not the kind of project that one undertakes without expert help. And this is where Peter Amerongen comes in.

Amerongen has been designing energy efficient houses since the early 1980s. His company, Habitat Studio & Workshop, has designed, built or renovated about 400 housing projects across Western Canada, and is responsible for designing Edmonton's two attempts at net zero homes, first in Riverbend and now in Mill Creek.

He acknowledges that the net zero homes in Edmonton have yet to reach that elusive goal of being a fully net zero, but then, nobody has tried to build a net zero house this far north.

"We were overly complex with the first one, but we've been able to simplify quite a bit as we've gone through it. In all of them, aggressive conservation has been the starting point."

So what's the difference between a new home, no matter how energy efficient, and the net zero home? There are three key design decisions made for the net zero home, which could apply to any new home being built, if the owner wants it.

First, the walls are 16 inches thick, filled with blown-in cellulose fibre insulation that is made with recycled newspapers. A critically important insulation decision involved pouring the concrete slab over a five-inch layer of insulating foam.

"It's like a big, foot-and-a-half inch sweater around the house," says Nobert.

Second, the house is sealed tight as a drum.

"It's like living in a plastic bag," Nobert says. (Naturally, a house sealed that tight needs improved air circulation, which comes courtesy of a heat recovery ventilator, or HRV. Both the exhaust and outdoor air streams pass through HRV, and the heat from the exhaust air is used to pre-heat the outdoor air stream. An HRV is able to recover 70 to 80 per cent of the heat from the exhaust air and transfer it to the incoming air.)

Third, the windows are the best you can buy. They have three panes of glass and are coated for maximum energy efficiency. As Nobert explains, these windows are as energy efficient as a wall in some houses. Indeed, they are quite warm to the touch.

These three design decisions cost them less than $25,000, and got them 80 per cent of the way towards their net zero goal.

The next big step, and the most complex and costly, is solar power.

The house has 32 solar panels — 20 on movable awnings, and 12 on the roof — that generate electricity when the sun is out. When they are snow covered, solar panels are useless. But any amount of sun melts the snow, and the panels are at such an extreme angle that most the snow falls off.

The panels are in the back of the Nobert-Amores house, with an unobstructed south view allowing for maximum sunlight. You can do the same in a regular house, but that much sunlight coming in will heat up a house to sauna-like temperatures during the day. The solution to that, Nobert says, is the use of thermal mass — in this case, 2 1/2" of concrete floors, using 10 tonnes of concrete. In October, when the sun is low and streaming into the house, the concrete acts as a heat battery, absorbing the heat during the day and releasing it at night. The house has a wood burning stove, the heat from which would be absorbed by the concrete floor.

A solar hot water heater, which is not "super effective" in the winter, supplies the house on a summer day with almost 100 per cent solar heated water.

Of course, even the best built house needs some artificial heat during an brutal Edmonton winter. And while they have no furnace, the house does have electric baseboard heaters in all the rooms, each with its own control so there is no heating up an empty room. (During my visit, he turned off the baseboard heating because the day's sun will heat the house.)

Even energy efficient windows, super insulation and solar panels aren't enough, house designer Amerongen points out.

"The only way that it is remotely possible is to drastically reduce the amount of energy you're using. There just isn't enough space on the average urban lot for enough collectors to even begin to get all of the energy used by a typical house."

There is no escaping the use of electricity, but there are ways to reduce its usage. For example, the Nobert-Amores don't have an electric dryer; they've been hang-drying their laundry for a

decade.

While most of us wait till we get our monthly power bill and gasp in horror at how much we owe, Nobert uses a web program that measures how much electricity is house is using — or redistributing to the grid — in real time.
"Yesterday at work I was watching this, and thinking, cool, it's -30 out, and we're feeding to the grid."

The house is "smart enough" that it knows when to convert electrons from the sun for use in the house, so only surplus power is redistributed to the grid. All of this, of course, adds to the cost of the house. Producing your own energy on site is quite expensive — the solar panels cost about $50,000 — so they only pay off about two per cent.
"But compared to an SUV, the payoff is amazing," he's quick to add.

Aside from the long-term cost savings, Nobert is comforted by the fact he has "energy security.
"In 40 years, these (solar panels) are going to be a financial asset still. They will be generating most of what they generate now. I don't think you can get that safe of an investment anywhere."

THE EDMONTON MARKET

So why aren't there more net zero or near net zero houses?

"The conventional building industry doesn't have the time, and consumers aren't demanding it because they don't know to. A lot of houses look nice, but they don't know they're buying an energy pig."

Amerongen wishes consumers were more knowledgeable about their choices when building new home. For anyone thinking of building a house today, the key is a higher level of insulation and air tightness throughout the building, and that includes the best windows you can afford.

"I think there is really a need for more consumer education. On a cost basis, going to net zero is not something you can justify on today's energy prices. But building a cost on today's energy costs is short sighted."

His clients are not just looking at cost savings, but are willing to spend the money because it's the right thing to do. Super insulating a home under construction can add about $15,000 to the cost, but if you can achieve EnerGuide level of 86 (the max is 100), you'll get a $10,000 grant from the government. That makes the payback on energy costs very short.

(The federal government has produced an EnerGuide listing for houses, similar to that seen on appliances. New House build to building code standards should have an EnerGuide of 65-72; a new house with some energy-efficiency improvements should reach 73-79; and energy-efficient new house 80-90; and a house requiring little or no purchased energy, like a net zero house, rates 91-100.)

There is tremendous interest in net zero housing in Edmonton, Amerongen says. His firm has another net zero house under construction and two more under construction.

"I've also been involved very peripherally in an apartment building that has the potential to achieve net zero. Our company also has another 10 ultra energy efficient houses finished or under construction."

He also knows of four other net zero houses under construction.

"From discussions with people from across the country I'd say that there is more net zero and near net zero activity in Edmonton than anywhere in the country. We should be proud as heck."

Amerongen says he's building energy efficient homes not just for the present, but for the future.

"I'm worried about looking my kid in the eye in 30 years when things are all going to hell. I want to be able to tell him I did what I could."

You can follow Nobert's posting about his attempt at a net zero lifestyle at www.greenedmonton.ca

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