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Net Zero Energy: The Future of Housing in Canada

Canada's Building Industry Steps Up to Climate Change

Imagine living in a comfortable, contemporary home that produces as much energy as it consumes - and avoiding expensive electricity bills.

That is the objective of the Net Zero Energy (NZE) home project, a made-in-Canada partnership between Natural Resources Canada, Owens Corning Canada (makers of Fiberglas insulation), leading technical experts in home energy efficiency and five innovative residential builders across the country: Mattamy Homes, Reid's Heritage Homes, Minto Communities, Construction Voyer and Provident Development.

The goal of the project is to demonstrate that Net Zero Energy homes are achievable, affordable, user-friendly (for consumers and builders) and market-ready on a production housing scale. Rather than creating one-off designs, the five residential builders have recently completed 26 NZE homes in five communities - in Alberta, Ontario, Quebec and Nova Scotia - using off-the-shelf technologies, and paying for the cost of materials and production.

In terms of energy efficiency, these NZE homes are about fifteen years ahead of where the building industry is today – at least seventy per cent more efficient than homes constructed to the current building code. Their systems and equipment are elegant and available, featuring the latest in heating, cooling, ventilation, high-efficiency triple-pane windows, superior insulation and air tightness. Solar panels will generate enough energy for occupants to live comfortably, without any drastic behavioural changes.

The participating builders are presenting their NZE houses as demonstration or model homes, to be sold to the public. Beyond this project, they will offer Net Zero Energy ready (NZEr) homes as a standard or an upgrade for their next subdivisions. These homes will feature energy efficiency equivalent to full NZE houses, with an impressive seventy per cent reduction in energy costs compared to similar houses built to code. Photovoltaic (PV) solar panels to make them full NZE will be offered as an option.

The first builder to complete a NZE home in Canada was Reid's Heritage Homes who, on September 11th, 2015, held a launch event in its Westminster Woods community in Guelph, Ontario. Fittingly, a brand new Tesla electric car was parked in the driveway. (Reid's plans to offer the Tesla Powerwall battery as an energy storage option for its NZE homes.)

At the event, Reid's announced that all single family homes in its new developments will be Net Zero Energy ready before the end of 2017. Bob Finnigan, Vice President of the Canadian Home Builders' Association proclaimed the project as key to moving Canada's residential building industry forward, adding, "We love our homes. Net Zero Energy homes love you back."

On October 8, 2015, builder Minto Communities launched its first NZE "Killarney" single family home in its Arcadia community in Kanata, near Ottawa. Four other Minto NZE model homes are nearing completion, with four NZE-ready town homes scheduled for launch this spring. "Our Net Zero Energy home speaks of Minto's forty-year legacy in sustainability and innovation," said Minto Senior Vice President Brent Strachan. "We're proud to introduce this high performing home that blends technology, design and materials to create better places for people to live."

Although the NZE Killarney model will feature an array of thirty-six solar panels, Minto's Manager of Innovation Derek Hickson notes that the future Killarney models will be NZE ready as a standard. Solar PV panels, varying according to homeowners' electricity use, will be available as an option.

"We did a study of our existing town home residences and found a broad range of daily energy usage – typically from 12 to 24 kilowatt hours (kwh) per day, with 8 kwh at the low end," Hickson said. "Achieving Net Zero Energy really depends on matching your solar panels to your lifestyle." That being said, Hickson emphasizes that the NZE ready Killarney homes will offer exceptional energy performance. "On a typical Ottawa winter day, they're designed to stay above 16 degrees C for 24 hours in the event of a power outage."

On November 2, 2015, builder Provident Development Inc. launched its version of NZE in Bedford, Nova Scotia – a NZE ready 2,070-square-foot, three-bedroom plus loft den home with a solar panel-ready roof. Canada's fourth NZE home launched in Calgary's Cityscape community on November 25th.

Built by Mattamy Homes Calgary, the "Iris" single family show home and four "spec" homes will be slightly different from other NZE buildings across the country, offering a tighter building envelope with enhanced levels of exterior and interior insulation to compensate for Calgary's colder winters. As with Reid's, Minto and Provident, Mattamy plans to offer NZE-ready production homes as the next step in its commitment to Net Zero Energy.

Mattamy Calgary Vice President of Sales and Marketing Warren Saunders sees his company's NZE efforts as a good fit with its commitment to sustainability. "Our Net Zero Energy homes will allow us to showcase the technologies in Alberta," he says. "Recognizing that this type of building will be important in the future, we will show leadership in the field by applying our learnings from the project to our future production homes."

Canada's fifth NZE project, a condo six-plex in Laval, Quebec, was completed on February 23, 2016. Built by Construction Voyer, it features 148 roof and wall-mounyed solar PV panels producing 48,800 kwh of electricity annually.

From the street, NZE homes look very much like others in the neighbourhood, with the obvious exception of solar panels on the roof. Inside, they are contemporary in every respect, complete with granite countertops and stainless appliances. Even the sophisticated mechanics in the basement have been carefully designed and selected to keep the running of the home as simple and worry-free as possible.

One of the primary objectives of the project is to allow the technology to work its magic while homeowners focus on enjoying life in their new homes. Today, NZE homes still cost more up front but in return, buyers will have a home that is always comfortable, secure from weather extremes and more economical to operate, with improved air quality.

"To be more accurate, there aren't any Net Zero Energy homes, only Net Zero Energy occupants," says Michael Lio, President of buildABILITY Corporation, the national project manager and lead consultant on the NZE project. "The biggest opportunity for change is to enable consumers to conserve energy use without sacrificing lifestyle comfort and convenience."

"The real challenge here is building homes that people want and can easily manage," Lio adds. "People want a house with lower energy bills. But we also need to be able to produce a house that doesn't require an engineer to operate it properly. As with a smart phone, the challenge is to create a really sophisticated product that anyone can use."

Candice Luck, Director of Strategy and Programs at buildABILITY calls Net Zero Energy an "emerging technology". "As electricity prices go up and solar PV panel prices go down, people will increasingly adopt these measures," she says. "This project promises to debug the adoption process so that future measures can be implemented seamlessly. In a sense, we are helping to build a road through uncharted land so that others can drive through effortlessly."

In Canada, housing accounts for fifteen per cent of all greenhouse gas emissions. This statistic prompted Natural Resources Canada (NRCan) to include the Net Zero Energy Home project as part of its ecoENERGY Innovation Initiative (ecoEII), a program introduced in 2011 to look for long-term solutions to help eliminate air pollutants and greenhouse gas emissions from energy production. NRCan is contributing almost $2 million towards the project.

The project began when Owens Corning Canada and building consultant buildABILITY Corporation submitted a proposal for the NRCan initiative. Owens Corning manufactures the industry-leading CodeBord Air Barrier System, which

provides a continuous, super-tight envelope – the first step in achieving Net Zero Energy efficiency.

"As part of our proposal, we approached Canada's most innovative builders to join us, and they gladly came on board," says Andy Goyda, Owens Corning Canada Marketing Development Manager and Canadian Builder Lead for the project. "All it takes is for leading builders to adopt the technology. Others will follow."

The energy savings from NZE homes are impressive, but will people buy into them? "The biggest hurdle in adopting NZE is not on the technology side, but on the marketing side," says Goyda. At this stage in their development, NZE homes complete with solar PV panels will cost about fifteen per cent more than conventional new homes; NZE-ready homes (minus solar panels) will cost about 9 per cent more. The current estimated price tag for solar PV panels is $25,000 to $50,000, depending on anticipated energy consumption. In time, as these homes become accepted by builders and home buyers, the additional costs will come down.

The Canadian Home Builders' Association (CHBA) recently commissioned a cross-Canada survey to find out which attributes of a home are important in people's buying decisions. Sixty-four per cent of respondents named overall home energy efficiency as a "must have" feature in a new home.

In its quest to advance innovation and create a market advantage for builders and renovators who embrace NZE technologies, the CHBA established a Net Zero Energy Council to guide its efforts. Part of this is a pilot, two-tiered (NZE and NZE Ready) labelling program to recognize CHBA builder and renovator members for their NZE homes.

All builders involved in the current NZE project will be enrolling their houses in this program, meaning that all they will receive government recognition as well as third-party industry performance verification of their homes. To build market demand for these homes and address the additional up-front costs, the Council is developing marketing communications initiatives and exploring innovative financing options.

According to Sonja Winkelman, the CHBA's Director of Net Zero Energy Housing, NZE and NZE-ready homes are still more expensive than conventional homes, but the extra premium is offset by big energy savings. "Significant strides have been made over the past ten to twenty years by industry innovators," she says. "This has reduced the additional costs of NZE homes by as much as fifty per cent. In many cases, we're now able to achieve neutrality when operating costs are considered, meaning that the extra cost of these homes can be offset by the monthly energy savings."

Speaking of costs, Winkelman adds that the CHBA is considering connecting with Canada's new Prime Minister and encouraging him to set an example of

sustainability by retrofitting or re-building 24 Sussex Drive to Net Zero Energy. According to the National Capital Commission, the Prime Minister's residence requires $10 million in repairs alone.

What is on the horizon for Canada's Net Zero Energy efforts? As the NZE standard and technologies are adopted by more builders and widely accepted by consumers, the costs of building homes to this level will become more affordable. In the near future, we may see whole NZE communities generating, sharing and storing clean and renewable electricity to heat, cool and power their homes. The technology is here. All it takes is for people to embrace it.

Sidebar:
What Makes a NZE Home Tick?

- Increased insulation throughout the house - roof, walls and basement – keeps the home warmer in the winter and cooler in the summer.
- Super-tight air-sealing "envelope" reduces air leakage and heat loss.
- Triple-pane windows provide increased insulation and reduce outside noise.
- LED lighting throughout the house.
- Energy-efficient appliances, including induction cook tops.
- Appropriately-sized heating/cooling systems or air source heat pumps heat and cool the home.
- An air-source hot water tank uses energy from the heat pump to pre-warm water.
- An energy recovery ventilator (ERV) pre-warms or pre-cools incoming fresh air.
- Solar PV panels supply electricity to the home. On cloudy days, electricity from the grid is used. Utilities in many (but not all) parts of Canada will accept privately generated solar power to offset electricity costs. In some cases, battery storage can be used.
- An energy monitoring system keeps homeowners informed of their electricity use and production.

Sidebar:
Net Zero Homes from Coat to Coast

Bedford, Nova Scotia: Working within the constraints of the Atlantic market, Provident Development builds five affordable NZE ready homes.

Laval, Quebec: Despite the challenge of limited roof space and mechanical storage area, Construction Voyer builds a six-unit stacked NZE condo equipped with enough solar power for six households.

Guelph, Ontario: The first to break ground and the first to complete, Reid's Heritage Homes builds five NZE homes and announces that all of its future single family homes will be NZE ready.

Kanata, Ontario: Minto Communities builds five NZE homes across a price range including a luxury "Killarney" model and four affordable townhouse models. Minto will offer NZE ready as standard for all Killarney homes and as an upgrade for homes in other subdivisions.

Calgary, Alberta: Mattamy Homes Calgary builds five NZE homes with enhanced levels of air tightness and insulation to compensate for Calgary's cold winters.