

Now House™ Retrofit Could Result in Annual Energy Bill of Zero



On September 10, 2008, Now House™ celebrated the opening of its first near zero energy retrofit project in Toronto. Now House™ has retrofitted a 60-year-old WWII house built in 1946 into a near zero energy home – one that produces almost as much energy as it uses on an annual basis.

“This is an older home that will now cost next to nothing to operate,” said Lorraine Gauthier, president of The Now House™ Project Inc. “We’re predicting that the result of this retrofit will be an annual energy bill of zero. We’ll be monitoring the home for 12 months to see if we hit our goal.”

There are an estimated million similar wartime houses branding every community in Canada. These houses were commissioned by Wartime Housing Limited in the early 40s to provide housing for munitions factory workers employed in the war effort and for veterans returning from the war. The Now House™ team, made up of designers, architects, engineers, researchers and contractors, plans to start with one house, then a community of houses, followed by a million wartime houses across Canada. At last count, they had 16 more Now Houses in the works.

Now House™ is one of 12 winning teams in Canada Mortgage and Housing Corporation’s (CMHC) Equilibrium Sustainable Housing Demonstration Initiative, and the only project among the winners focused on the renovation and retrofit market. Other winning teams are building new homes.

Now House™ was partially funded by CMHC with platinum sponsorship from RBC Royal Bank. Several product manufacturers provided product free or at a discounted cost for the benefit of being in the first near zero retrofit project in Canada and to assist the homeowner who is on a disability income.

“Improving existing houses is one of our biggest environmental problems,” said Gauthier. “In Canada, our homes account for 17 per cent of total energy use and 16 per cent of the country’s green house gas (GHG) emissions. In Toronto, that number is higher with the residential sector contributing 25 per cent of our GHG.”

From major insulation improvements, new windows, radiant floor heating, new Energy Star appliances, and solar energy production, this little wartime house has experienced a makeover, but nothing is bleeding edge. According to the team, the challenge is working out what elements work together to give you the best results and then continuing to reevaluate them through the retrofit process. They will measure results against both the baseline of the original house and the design model.

Integrated design and collaboration

The team used an integrated design process from the outset. That meant the designers, architects, engineers, contractor and homeowner discussed the approach to the retrofit together. They took a whole system approach to design and construction and modeled appropriate changes to reach near zero energy use at an affordable cost. Throughout the project, any changes were considered by the entire team to ensure they would contribute positively to the overall system’s design and performance of the home.

Insulation, insulation, insulation

Most energy waste in older homes is caused by inadequate insulation and air leakage. Built in the 1940s at a time of wartime conservation, Now House™ had some insulation in the form of gypsum board, asphalt paper and paper faced Rock wool R-8 insulation. The team made major improvements to the home’s envelope by insulating the foundations walls, basement, attic, roof, and exterior walls.

Insulating the exterior foundation walls allowed for damp proofing and foundation drainage. The team excavated around foundation walls, replaced old weeping tile, painted the walls with water sealer and added two layers of Owens Corning Celfort 200 pink rigid insulation, bringing the basement walls up to R-25. The same insulation was used under the basement slab. Before replacing the cement floor, radiant floor heating was installed which will be heated

Small house – Big results

Now House will:

- Achieve an annual energy bill of zero.
- Reduce GHG emissions by 5.4 tonnes annually.
- Reduce electricity use by 59.8 per cent.
- Reduce heat loss to achieve an EGH of 84 (EnerGuide for Houses is a measure of a home’s energy efficiency used in Canada).
- Produce energy from solar power to increase our EGH to 93.7 (just short of net zero which is a score of 100).
- Use minimal new resources.
- Produce minimal waste.
- Improve the health of the interior environment and air quality.
- Be replicable.

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Now House™

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by a solar thermal system. The combination of insulation and radiant floor heating will greatly improve the comfort of the basement and reduce the amount of energy required to heat the home.

The exterior walls, attic and roof were also insulated using BASF Canada's WALLTITE ECO™ insulation/air barrier system.

"It's like wrapping a 5 ½ inch cozy blanket around the entire house," said Gauthier. "This spray foam product provides a continuous air barrier creating a tight, lasting seal by expanding into every crevice no matter how small. When your goal is net zero energy use, you don't want to lose heat through even the tiniest gap."

The exterior walls were finished with HardiePlank™ from James Hardie for both the traditional look they provided to this wartime bungalow and their 50-year warranty. This is a fibre cement siding that resists deterioration from water, heat, cold and UV radiation, not to mention fire and insects. The old aluminum siding was recycled.

Windows and Roof

New windows and a new metal roof are part of the overall Now House™ envelope improvement.

"With the single pane aluminum windows we started with, we might as well have had a hole in the wall," said Gauthier. "Windows that are labeled Energy Star are twice as efficient as the average windows manufactured just 10 years ago."

Now House™ installed new InLine Fiberglass windows that are injected with an inert gas between the layers to provide insulation. They are made of Low-E glass – low emissivity glass treated with a microscopic metallic oxide spray that reduces the amount of UV passing through the glass.

The new roof is a steel roof Vicelite panel provided locally by Vic West from their Stratford, Ontario plant. Although the homeowner chose a charcoal colour, the roof has a solar reflectance index of 30, which surpasses LEED re-



quirements for a steep sloped roof and contains 30 per cent recycled content. The roof will have a lifecycle three times longer than asphalt.

Reducing Electricity Use

"Every watt counts when you're trying to hit a net zero energy use," said Gauthier. "We are expecting to reduce electricity use by almost 60 per cent."

The Now House™ team made changes that will minimize the electricity needed to live comfortably in this home including: replacing appliances with Energy Star appliances from Whirlpool Canada, named 2008 Energy Star "Participant of the Year" for its leadership in manufacturing energy efficient appliances. Now House™ retrofits also include replacing lighting with compact fluorescent light bulbs, reducing phantom loads by using kill switches and replacing kitchen and bathroom appliances with low flow fixtures.

Producing Energy from the Sun

Just like a typical house, Now House™ is connected to and uses energy from the local electrical utility. However, unlike typical homes, Now House™ produces en-

electricity to heat water. Two Apricus Evacuated Tube Solar Collectors from Generation PV provide hot water for domestic use and for radiant floor heating system in the basement floor. This system works all year round using a cylindrical collector enabling it to take advantage of the sun all day, not just when it's overhead.

Solar PV

Sixteen solar photovoltaic panels from Day4Energy were installed to convert sunlight into electricity. The solar array is connected to a synchronous inverter that converts electricity to alternate current that can then be used by the grid. In this case, all PV power will be fed into the grid for use by other utility customers, and under the Ontario Standard Offer, the Now House™ homeowner will earn 42 cents per kilowatt-hour of production.

Changes to HVAC

"Next to improving insulation, improving a home's HVAC system can produce the biggest energy reduction and energy savings," said Gauthier. "Now House will benefit from a modern energy efficient HVAC system with all elements designed to work together to achieve near zero energy use."

The HVAC system includes: a high efficiency air handler with a variable speed motor that will cut en-

ergy costs and improve comfort level in the home; a heat recovery ventilator (HRV) to exhaust cooking smells, humidity and stale air from the home, capturing the heat from the air before expelling it; a Latento hot water storage tank that takes

heat from the solar collectors and the PowerPipe grey water heat recovery system and stores it until distributing to the home's heating and hot water system and a tankless water heater.

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