

# Home Additions and Renovations

## Part 2 — ecoENERGY Program Provides the Opportunity to Go Green

By Thom Mills



Home additions and renovations are typically triggered by the homeowner wanting to address an issue related to space, whether to reconfigure existing space or add more. When thinking green, one may be considering sustainable flooring, no-VOC paints, etc. The homeowner should realize that his or her project is also the perfect opportunity to improve the efficiency of their heating and cooling systems and lower their utility bills. In the planning stage of the GreenHomeTV Home Addition Project, we recognized this opportunity very early.

### UPGRADE SUGGESTIONS AND INCENTIVES

We started our own process by looking at the Government of Canada's ecoENERGY Retrofit grant program. From its website (find links to Web and video references made in this article at [www.greenhometv.org/builderarchitect/](http://www.greenhometv.org/builderarchitect/)), we located a certified energy advisor that came and performed a pre-retrofit evaluation of our home and made upgrade suggestions detailing the grant values available for each option. Many provinces, including Ontario, are matching these grants dollar for dollar, doubling the value of the ecoENERGY grant values.

The pre-retrofit evaluation produced an energy-efficiency evaluation report, making suggestions the evaluator deemed best for our home, but did not include all possible upgrade options. For a complete list of all available upgrades covered by the program, we downloaded the ecoENERGY Grant Table Document. We would recommend that anyone who also makes use of this pro-

Suggestion	Federal Incentive Value	Total Incentive Value (Province matching Federal Incentive Value)
Increase your exterior wall insulation by a minimum of RSI 1.8 (R-10).	\$1,875	\$3,750
Increase the insulation value of the basement walls by a minimum of RSI 4.2 (R-24), full height.	\$1,250	\$2,500
Seal all of your basement header area and increase all of its insulation value by a minimum of RSI 3.5 (R-20).	\$125	\$250
Replace your space heating equipment with a CAN/CSA-C448 compliant ground- or water-source heat pump for heating and cooling.	\$4,325	\$8,750
Increase the insulation value of your attic from the current level of less than or equal to RSI 2.1 (R-12) to achieve a total minimum insulation value of RSI 8.8 (R-50).	\$750	\$1,500

gram get their own copy as well.

In our case, the report recommended the following:

The ecoENERGY system uses the EnerGuide rating system. This system determined that our house had a rating of 55 (out of 100), higher than the average of 44 for a house of this age. By implementing all of their suggestions, we could improve our rating to 82. This house would then be in the top 5%.

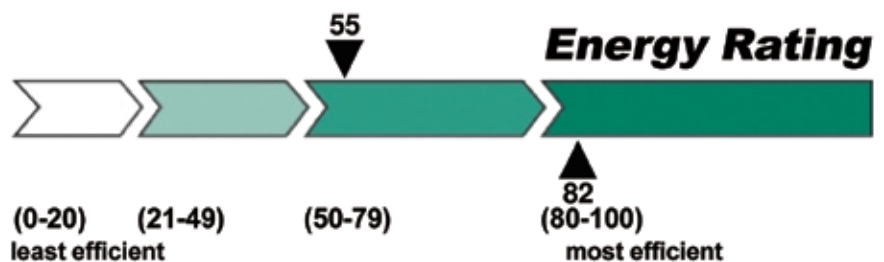
It is worth noting that while the report recommended an action, there was no indication of how we should implement the

suggestion or the cost associated with it. The report simply recommended that we contact a contractor to do the work. We had to take each of these recommendations and evaluate the capital cost of doing the upgrades, accounting for the rebates that we'd receive and assess the net payback.

By looking at all our options, we were able to develop a strategy that worked best for us.

### ORIGINAL HEATING PLANS

Early in the planning of the GreenHomeTV Home Addition Project, it became clear



that our additional 2,000-square-foot space would require either its own heating plant or a replacement to handle the whole house (approximately 4,000 square feet).

Based on the ecoENERGY energy efficiency evaluation report and our early research, it appeared that geothermal (using a ground source heat pump) would be a good option for us. It also appeared that the house afforded the perfect setting for a geothermal system. The property is large, with space for ground source horizontal loops. Plans were drawn up to accompany our building permit application. These included a geothermal system distributed by air ducts for the addition, with a separate unit retrofitted for the original portion of the house with a loop sized to handle both units.

## HEAT SOURCE OPTIONS

When John Godden of ClearSphere joined the project team, he raised some serious questions about geothermal's suitability for our application. Working with Godden through an analysis process (to be detailed in a future issue), we decided instead to use a modulating/condensing boiler as the primary whole home heating system, which would also provide complete domestic hot water heating.

Based on the ecoENERGY report we received, we thought we'd be covering this complete cost, until we realized that a condensing gas boiler with a 90% AFUE or higher is included in the program, providing a value of \$750 (plus provincial match). In fact, as we looked over the document further, we realized that integrated mechanical systems (IMS) that have an overall thermal performance factor of 0.90 or higher are accounted an even larger value of \$1,625 (plus provincial match). These systems provide both space heating and domestic hot water as a complete system. Had we not looked over the complete grant table document, we would not have been aware of this option.

To complement the boiler, we decided to include a solar system for domestic hot water. Such a system will provide an annual solar contribution covering about 60% of our annual domestic hot water load, from a low of about 35% from December to February to a high of 95% from July to September. Again, we went looking in the grant table, and it indicated that such a system is accounted a value of \$1,250 (plus provincial match).

To meet these product requirements, we looked for a company that could provide a completely integrated solution for both the boiler and solar. That company was Viessmann. Using the Vitodens 100 wall hung boiler, their Vitocell 100 dual-coil heat exchange/storage tank and their Vitosol 200 flat plate solar panels, Viessmann provided us with the complete package. All of their products exceeded the specifications required and provided the whole home heating solution we were looking for.

The original house was heated with an oil-fired forced air furnace. As our plans now moved to an IMS based on a hot water boiler, we needed to find a way to get the heat from the hot water into the existing duct work. We looked for an air handler/heat exchanger that would convert the hot water to hot air as well as provide us with heat recovery ventilation (HRV) capacity.

As the original portion of the house

becomes more insulated and airtight, we will increasingly depend upon an HRV to bring clear air into the original house and send "dirty" air out. An HRV will allow us to do that while not losing the heat contained in the dirty air. Turning back to the grant table, we found the installation of an HRV to have a value of \$375 (plus provincial match). LifeBreath (by Airia Brands) produces the Clean Air Furnace, which meets all our criteria. It will heat the air from the boiler while exchanging that air with clean air from outside.

## INSULATION SUGGESTIONS

The ecoENERGY report also suggested that we add insulation to the house to improve its thermal performance.

The report's first suggestion of upgrading the exterior walls to a value of R-10 was great in theory. In practice, the implications were much more problematic. Most of the house is a brick structure (indeed, three courses of brick, or 13" thick) built around the 1840s. The brickwork is still visually striking and a great example of construction from the era. In the late 1960s, the house was gutted and the interior completely redone. At that time, 2" of fiberglass batt insulation was installed between the brick and drywall, providing an R-8 value. To insulate these exterior walls further would require covering up the brick on the outside or gutting the inside again, adding more





insulation and re-drywalling. At this point, both of these options were impractical, the outside due to aesthetic reasons and the inside simply due to the cost of redoing the complete interior of the house.

The other suggestions were very doable. In the average home, a large percentage of the heat escapes through the roof, so increasing the insulation value made good sense and was easily done. Capstone Insulation of Newmarket blew in about 12" of cellulose insulation to add to the material already there, providing a total attic insulation value of R-50. The ecoENERGY value for this upgrade is \$750 (plus provincial match).

The basement of the house was unfinished and completely available to insulating. This was another location, though, where the implications of implementing a simple idea became rather complex.

The basement walls are made of mortared fieldstone with a total thickness of 2' (yes, 24"! ). We had experience with these walls when we did the excavation for the addition. We started to remove the earth from the walls slowly, while monitoring the stonework to see how well everything stayed together. The walls remained solid during the process and we were able to proceed without any problems.

When we started consulting with different insurance companies about insulating the inside of these basement walls, many concerns were raised that we needed to seriously consider. Because there was no waterproofing on the exterior of the wall and due to the nature of the old mortar, it was possible, and even likely, that water

would make its way into the 2' wall. Should this moisture in the wall freeze during the winter, it would start to break apart the wall over time. Because the wall was not currently insulated, the heat from the inside of the house had been able to move through the stones and keep the wall above freezing all winter. The ideal solution would be to excavate the outside of the wall, insulate and waterproof. However, such a process would result in a substantial cost that our analysis showed would not have an acceptable payback period. This meant that if we were to insulate the wall from the inside, we would need to do so in a way that retained heat inside while allowing enough to escape to keep the wall above freezing. To do a permanent insulation, virtually all the insulation companies wanted us to have an engineering company do an analysis and provide a recommended R-value for which the engineers would take liability. The cost of this was in addition to the insulation and did not have an acceptable payback period.

In the end, we decided to insulate to an R-14 value using batt insulation without boarding over it. This way we will be able to gain the heat retention while monitoring the wall's condition and temperature during the winter. We did this work ourselves, keeping the total cost of the materials and installation very low. The R-14 insulation meant we'd get a rebate value of \$625 (plus province match), easily covering work while meeting the compromise of structural integrity versus insulation value. It should be noted that if we insulated to R-24 or greater, the value would have increased to \$1,250. This was one instance where we

did not do the work to the recommended level due to the structural factors.

The other area of heat leakage was the basement header area. In our case, these were the areas above the 2' basement fieldstone walls and between the 10' beams (on average) that support the first floor. In these areas, the backsides of the 13" brick wall were clearly visible, indicating the complete absence of insulation, creating a substantial heat loss through the brick. These areas of the wall are completely above grade, so moisture is never retained in or against it, thereby allowing us to completely insulate these areas. This we did with batt insulation to R-28. This job was very easy and again performed by us. Accordingly, the grant table allocates a fairly small value of \$125 (plus province match).

## CONCLUSION

The ecoENERGY program proved to be a great asset to us, giving some direction while providing rebates back on the cost of the upgrades. This process, including the pre-retrofit evaluation, will get a homeowner started in the right direction, but it is by no means the last word on what should be done or how it should be accomplished. I can't stress enough how important it is for the homeowner to download or get a copy of the grant table so that all their options are known.

For our project, our grants totaled \$4,750. Adding the provincial contribution gave a total of \$9,500 — a significant value in any renovation or home addition project. It should also be kept in mind that the Home Renovation Tax Credit is also applicable for all these items in this project, which will add up to an additional \$1,350 in rebates.

*Follow the GreenHomeTV Home Addition Project plus coverage of other green building projects at [www.greenhometv.org](http://www.greenhometv.org). For links to specific people, companies and other references made in this article, please go to [www.greenhometv.org/builderarchitect/](http://www.greenhometv.org/builderarchitect/). ■*