

Toward a Net Zero House – Case Study



My wife and I live in Cobourg Ontario. It has been our dream for some time to live in a net-zero house, a house that produces as much energy as it uses for everyday activities. By net-zero I mean producing as much power annually as consumed annually, though not at the same time. We are getting closer to this goal. This article is a bit of an account of what we have been doing, remembering this is a house with 2 adults in the household.

My wife and I built a new house a bit over 5 years ago (around 2,000 s.f.). When we built it, we tried to make the house energy efficiency.

Here is what we did:

- Structural insulating panel (SIP) walls (R-32)
- Rigid Styrofoam (blue board) insulation under the slab on grade floor (R-20)
- High quality windows (triple glazed with krypton gas)
- Lots of blown cellulose insulation in the attic (R-50)
- Good quality heat recovery ventilation (HRV) system
- Faced most windows south for passive solar heat gain
- Sealed the house fairly tightly (1.6 air changes per hour)
- Insulated all the water and heating pipes
- Insulated exterior doors, including double glazing and argon gas

In the last few years, we used typically around 1200 to 1300 cubic metres of natural gas for space heat and domestic hot water.

We have also tried to keep our electrical consumption down by doing the following:

- Compact fluorescent light bulbs everywhere
- Fairly efficient refrigerator (rated at 519 kwh per year)
- Efficient front loading clothes washer (rated at 126 kwh per year)
- No clothes dryer; dry all clothes on clothes lines, all year round
- Use power bars to shut off stand-by load for electronic appliances
- Turn off stuff when not in use
- No big screen TV

Typically we have used around 2700 kWh of electricity per year, until this year (I'll explain); We wanted to get off fossil fuels for our everyday household needs. We decided the first step was to switch to geothermal heating, for both space heat and domestic hot water. Our heat loss analysis indicated that our peak heat consumption was about 12,000 btu per hour. We found that the smallest Waterfurnace (brand name) geothermal system could meet all our heating needs. This is because of the energy efficiency we built into the house.

I estimated that the geothermal system would require about 3,760 kWh of electricity to provide the same heat that we had previously gotten from natural gas. I haven't run the geothermal system for a full year yet but the actual electrical consumption to run the geothermal is coming in at about 4% above my estimate. I now estimate that our total electricity consumption for both heat and power will likely be around 6,700 kWh this year (ending November).

So, to be net-zero with geothermal I need to produce 6,700 kWh of electricity annually. We found that we could put a 5 KW solar system on our roof. When we built the house we faced the roof south with about a 39-degree pitch. Based on various sources, I am estimating that this solar system can produce around 6,200 to 6,500 kWh of electricity per year. So, I am expecting that we will be just shy of our net-zero goal, unless we reduce our consumption. This is what we will try to do over the next few years. When we replace our refrigerator, we will try to buy a more efficient one. When we replace our compact fluorescent light bulbs, we will likely install LED light bulbs. And we will try to turn stuff off more consistently.

I will report back in 6 months or so and let you know how it goes.

Cheers,

Rich Tyssen, Cobourg, Ontario

