Eco-Solar Home Tour – 2009

Saturday, June 6, noon to 4pm

Better Choices
Better Homes
Better Lives

Site #4: Mills Geothermal House Retrofit

Address:
Hosts:
Parking:

A. <u>500 metres of geothermal pipe fits into a 10-metre wide lot!</u>

- The homeowner says: "It is our experience that the most effective way of meeting your neighbours is to back a drilling rig onto your front lawn!"
- "After 11 years of living in this gem of a house it was time to upgrade the mechanical systems. The furnace was worn out, the water heater was dead, and we had ice dams on the roof and draughty old windows."
- "In the summer of 2005, we set out to add a geothermal heating system to our house. The first step we did was to go on the 2005 Eco-Solar Home Tour! Then we got started. We had a heat loss calculation done that showed us that we had to add insulation to the main floor walls, fix the drafts, upgrade some windows and doors, and fix the roof (removing leaky old skylights). Then we upgraded the electrical system capacity and started drilling. Once drilling was done, we started xeriscaping the front yard. In two months, the heat pump was installed and we had completed most of the work."

➔ You can see lots of photos of the renovation at www.thz.ca.

B. <u>Geothermal – using ground-stored solar energy!</u>

- "Geothermal" means, "ground heat". 46% of the sun's energy is absorbed by the top 150 metres of the earth's surface. Geothermal systems in houses typically use ground-source heat pumps (GSHP) to extract this energy.
- Ground-source heat pumps are electrical appliances much like refrigerators that convert low temperature heat from just below the earth's surface (about 5°C) to higher-temperature heat that can be used to heat air and water in your house. Electricity is used to run the heat pump as it transfers the heat between your house and the earth.
- A ground-source heat pump works both in the summer and in the winter:
  - Winter: It extracts heat from the ground and pumps it into your house.
  - Summer: It extracts heat from your house and pumps it to the ground!
- We all have heat pumps in our houses already. Refrigerators and freezers are small air-to-air heat pumps, as is a house air conditioning system.
- Interest in GSHPs has not previously been high because the price of electricity was several times higher than the price of natural gas. With electricity now only 3.6 times more expensive than natural gas (average 2008 prices, but which changes monthly), these systems are now starting to become economically attractive to more people.

(continued on other side)

People who say it cannot be done should not interrupt those who are doing it.

George Bernard Shaw

Note: Items with a "➔" symbol here are presented on the Tour. "❖" will not be presented. "•" are information points.

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C. Why this house is on the Eco-Solar Home Tour…

➔ To show the steps in recycling a 1949 house and retrofitting it with energy efficiency upgrades and a geothermal heating system. To show what a ground-source heat pump looks like, how it operates, what are the components, what is involved, and how one family has retrofitted it into and old house house.

➔ To show that this technology uses ground-stored solar energy to reduce natural gas consumption, heating bills, and greenhouse gas emissions. To increase our awareness of the environmental damage (air, water, soil, habitat and health) caused by the way we find, extract, process and burn natural gas.

D. The technology of ground-source heat pumps (GSHP)

➔ A ground-source heat pump is like a "furnace" in the basement. It consists of three main components: a ground loop, the heat pump itself, and a heat distribution subsystem (ductwork or in-floor heating, and an optional domestic hot water tank). The key component is the heat pump's compressor.

➔ See how the ground-source heat pump connects into existing ductwork, how to make it work in a tight space, and how it operates. See the water lines in and out, the electricity meter to monitor its performance, and the thermometers to show how the system works.

- Ground-source heat pumps use the term "COP", or coefficient of performance, instead of "efficiency". Typical rated COPs are 2.8 to 4.5. This means for every 1 kWh of electricity used to run its pumps and fans, it extracts an additional 1.8 to 3.5 kWh of solar heat from the ground to give you 2.8 to 4.5 kWh of heat for your house. The ground heat is free. 1/4 to 1/3 of your house heating comes from the electricity used to run the heat pump. A heat pump on an average house roughly doubles its electricity consumption.

E. Features that save on heating costs

- The ground-source heat pump was purchased and installed in the summer of 2005 for $16,000.

❖ The house envelope was also upgraded with insulation, draft-stopping, windows, doors, and a ventilated roof.

➔ After the energy efficiency upgrade and the GSHP addition, "Our heating costs are now 50% of what would have been paid for natural gas". Graphs and calculations are available for review on posters at the site. The house went from an EnerGuide 39 rating to EnerGuide 79.

➔ Connections to future solar domestic water heating system

- The natural gas line was removed, saving $400 per year in connection fees.

F. Features that save on emissions

➔ The house uses clean wind electricity from Bullfrog Power, www.bullfrogpower.com who will be on site to describe their services. Using clean electricity makes this house *nearly* carbon neutral.

➔ See the recently added solar PV modules that power their LED landscape lighting.

G. Features that save on water

❖ Australian 3-litre button-operated low flush toilet

➔ The front yard was xeriscaped with drought tolerant plants, drip irrigation, a landscape fabric and cedar mulch. It is four years old now and looking very good.

Our Eco-Solar Contacts and Services List of web sites and companies can help you find information and resources for your own eco-solar actions… Download from (www.ecosolar.ca/links.html).