



Better Choices  
Better Homes  
Better Lives

# Eco-Solar Home Tour – 2011

Saturday, June 4, noon to 4pm

## Site #1: Mills Geothermal and Solar House Retrofit

**Address:** 10821 79 Avenue, Edmonton  
**Hosts:** Andrew and Karen Mills (homeowners)  
**Parking:** available on street  
**Rating:** EnerGuide 79

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www.mec.ca



Climate Change Central

www.climatechangecentral.com



www.solaralberta.ca



www.cmhc.ca

### A. Geothermal and solar electricity – what a combination!

- 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!"
- "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."
- "On September 2<sup>nd</sup> 2010 Edmonton's Solar-Electric Pilot Program came out and we applied the next day. It was pretty close but we managed to get our system installed and inspected by Dec 31<sup>st</sup> with just a few hours to spare."  
→ You can see lots of photos of this house at [www.thz.ca](http://www.thz.ca).

### B. Geothermal – using ground-stored solar energy!

- "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. They convert low-temperature heat from the ground (about 5°C) to higher-temperature heat that can be used to heat air and water in your house. Electricity runs the heat pump as it pumps heat between house and ground.
- A ground-source heat pump can work in all seasons:
  - Winter: extract heat from the ground and pump it into the house.
  - Summer: extract heat from the house and pump it into 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 been high in Alberta because the price of electrical energy has typically been several times higher than the price of natural gas energy. With electrical energy prices in recent years now only from 2 to 4 times more expensive than natural gas energy, these systems are now getting much more interest.



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

(Continued on other side)



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(Continued from other side)

### 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 an old house can go from a 39 to a 79 EnerGuide rating.
- To show that a house can be operated in Alberta without natural gas. Eliminating the natural gas line gets rid of one set of utility service charges and allows you to then select green electricity options that can dramatically reduce your carbon dioxide footprint.
- To show two solar electric installations; grid-connected on the house and 12 VDC off-grid in the garage.
- Detailed posters explain the different features of the house including 10 years of operating costs.

### D. See heating and electricity technologies

- See how the ground-source heat pump connects into existing ductwork, how to make it work in a tight space, how it operates and how 500 metres of geothermal pipe can fit into a 10-metre wide lot. See the water lines in and out, a separate electricity-monitoring meter, and 4 thermometers showing system performance.
- See the solar-electric system installed on the house. See micro-inverters where one inverter serves each solar module. See how one set of solar modules tilts from vertical (winter) to an angle in the summer to generate more electricity. Discuss the factors around shading of solar modules in old neighbourhoods. See the small 12 VDC independent solar system that runs yard lights.
- Ground-source heat pumps use the term "COP", or coefficient of performance, instead of "efficiency". Typical COPs are 2.8 to 4.5. This means for every 1 kWh of electricity used to run its pumps and fans, another 1.8 to 3.5 kWh of solar heat is extracted from the ground (2.8 to 4.5 kWh of heat in total). The ground heat is free. A heat pump on an average-insulated house roughly doubles electricity consumption.
- See a number of LED lighting ideas including a brightly lit kitchen.

### 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.
- Connections to future solar domestic water heating system.
- The natural gas line was removed, and now saves \$510 per year in service charges.



### F. Features that save on emissions

- The house uses clean wind electricity from Bullfrog Power, [www.bullfrogpower.com](http://www.bullfrogpower.com). Using clean electricity and producing some power makes this house *almost* carbon neutral to operate.



### G. Features that save on water

- ❖ Two 3-litre button-operated low flush toilets and a hot water meter to monitor hot water use.
- The front yard was xeriscaped with drought tolerant plants, drip irrigation, a landscape fabric and cedar mulch. It is six years old now and looking very good.