The Scorpacudas' Eco-Expo

10 November 2007

FLL Team #609 http://www.scorpacudas.com

Research Project



- Brookline is a residential community with very few commercial or government buildings
- The biggest impact to energy change in Brookline is modifications to lifestyles and energy sources of homes
- We decided the best project is to inform the residents of Brookline of types of alternative energy that are available to them.
- Several houses were audited but the results apply to all houses in Brookline. We then examined the viability of alternative energy for Brookline
- This presentation is a less detailed version of a one hour presentation given to the residents of Brookline

Vision Statement

 Brookline can be a proactive community and a local leader in adopting alternative energy use for residential communities, thus reducing the negative consequences of the world's current excessive use of non-renewable fossil fuels.

Activities

- Met with Don Edison, a geothermal consultant
- Met with Dr. Peggy LaBrosse, Hollis-Brookline High School, and learned about her off grid house
- Toured the Broad Street Country Store which is completely heated and cooled by geothermal
- Discussed with the Brookline Conservation Commission town laws that could affect the uses alternative energy sources and tax implications
- Hosted an information night for residents of the town of Brookline presenting energy alternatives
- We were involved in several projects and models to learn about wind energy and solar cells
- Created a web site http://www.scorpacudas.com

Geothermal

Geothermal Energy uses heat from the Earth as an energy source.
Below ground, in New Hampshire, the temperature is a constant 55 degrees.



Geothermal Designs

Designs can be horizontal trenches or vertical wells or even utilize ponds.
Designs can be open or closed loop systems.
All designs are based on the concept of a heat pump.



Geothermal Tour

 We visited the Broad Street Country Store in Nashua.

The whole 10,000 square foot building, including freezers, is heated and cooled using a Geothermal System.
 The building is totally energy efficient.





Solar

- Solar energy is powered by conversion of energy from the Sun, photons, into useable energy.
- The energy can be used directly to heat water or converted into electrical energy by using photovoltaics.
- In 2006, 5.7 gigawatts of energy worldwide were capable of being produced using photovoltaic cells







Solar in New Hampshire?

We in Brookline live in a microclimate with about 300 or more days of sun per year.
Solar can be expensive but is surprisingly efficient in New Hampshire.
Small, inexpensive units, around \$200, can be purchased to provide exterior lighting and attic ventilation.

Bio-Fuels

- Bio-fuels are created from the biomass, plant matter, and can be used as an alternative to fossil fuels.
- Bio-fuels can be used to heat homes, run cars and trucks, create hot water, generate electricity, etc.
- Common uses of bio-fuels are bio-diesel, pellet stoves, burning either wood or corn, and ethanol.



- Bio-fuels can reduce CO₂ emissions by up to 70%
- Several companies currently deliver biofuels for home energy use in the Brookline area

Wind Power

- Wind Energy is when the Earth's natural wind is harvested and converted into energy.
- Wind turbines usually need about 13 mph wind speed to operate well.
- Wind turbine farms are being installed in New Hampshire by power generating companies. That power is added to the grid.
- Wind power is not cost effective for an individual in Brookline.

Local Wind maps



100 Meter

| Wind Resource | | | |
|---------------|-------------|-----------|--|
| | Mean Speed | | |
| | mph | m/s | |
| | < 12.3 | < 5.5 | |
| | 12.3 - 13.4 | 5.5 - 6.0 | |
| | 13.4 - 14.5 | 6.0 - 6.5 | |
| | 14.5 - 15.7 | 6.5 - 7.0 | |
| | 15.7 - 16.8 | 7.0 - 7.5 | |
| | 16.8 - 17.9 | 7.5 - 8.0 | |
| | 17.9 - 19.0 | 8.0 - 8.5 | |
| | 19.0 - 20.1 | 8.5 - 9.0 | |
| | 20.1 - 21.3 | 9.0 - 9.5 | |
| | > 21.3 | > 9.5 | |



Even at with a 100 meter tower height, Brookline does not receive enough wind energy to make wind turbines cost effective.

Tax Credits and Rebates

Federal tax credits are available to:

- Increase the efficiency of existing home
- Buyers of hybrid or alternative fuel vehicles
- Home solar water heating and photovoltaic systems.
- New Hampshire failed on November 8th a program to provide up to \$6,000 in rebates for home owners who install renewable energy sources. It will be revised.
- PSNH has a net-metering program that allows small generators to supply electricity back onto the power grid.
 New Hampshire does allow local property tax exemptions for renewable energy

Towns near Brookline with Property Tax Exemptions for Renewables as of 2006

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| yes | no | no |
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Conclusions 1

- Geothermal heating and cooling is viable for residents of Brookline. Payback time is 5 – 10 years and could be less if oil and gas prices continue to increase
- Solar is a good supplemental energy source and can be used to help people reduce their electric and oil bill. Payback time is on the order of 3 –5 years, depending on total generation capacity
- Bio-fuels are possibilities of helping reduce dependency of foreign oils and lowering greenhouse gases. They currently are not cheaper than conventional fossils fuels.

Conclusions 2

- Wind is not viable for individuals in Brookline, but small wind farms could service a small subdivision
- The town of Brookline needs to implement a tax exemption for home owners with renewable energy resources
- Everyone needs to decrease their energy use by adding insulation and reducing waste

Thank you

Thank you for your time listening to our presentation
 Any questions?