Working with Neighbors

Owners
Alan & Andrea

The Building
26 Harvey Street, North Cambridge. Built in the 1880s, presumably as a single family residence, perhaps with a storefront at various points over the years, it is currently divided into two condominiums with separate utilities. The system was installed on the shared roof at the expense of one family for the benefit of one family with the permission of the other family.

Installation Date
November 2012

Motivation
The owners have been attracted to alternative energy for years but couldn't rationalize the cost of the long payback. The combination of multiple tax incentives and rebates changed that.

Project Goals
Maximize the solar energy benefit on a constrained site. The property is not ideal for solar gain due to orientation, hence the decision to go with a thermal system rather than photovoltaic.

The Installation Process
As a condo association, the co-owners had already had an energy audit performed and followed its basic recommendation, which included additional insulation and changing several fixtures and all bulbs.

Dan Covey of SunBug Solar did an assessment of the roof surfaces, solar orientation, adjacent buildings and trees. Substantial spending on support systems and related infrastructure would be necessary to install many panels, which would only work well during a portion of the year. Upon discussion of the alternatives, the decision was made to go with a more modest, two-panel thermal hot water system, in particular because it functions well despite some shade.

The owners also agreed to perform the carpentry repair work themselves that was needed after the roof penetration and pipe installation were completed down to the basement. As a result, the total price for the system and its installation was just over $10,000, including:

- 2 Schuco Performance Collector Panels
- 1 Schuco 75 Gal Hot Water Tank, with backup capacity
- Installation and related hardware, including flexible, insulated piping
- Sensors, additional internet connection and software for constant monitoring

Two substantial rebates for thermal systems were available at the time of installation:

- After verification by the installer, the Massachusetts Clean Energy Center sent a rebate check of $3,912 to the home owners
- After verification by the installer, the City of Cambridge sent a rebate check of $2,000 to the home owners.
- The home owners have yet to do their taxes, but expect to receive substantial credit against their federal and state income tax liability as well

The other condo owner was given the option to invest in a similar system at the same time but declined.

Therefore, acting as a single condo owner in a tight shared space, it was important to minimize disruption of existing systems (electric, plumbing, insulation) and to negotiate the acceptability of an additional, large water tank in the common area of the condo basement.

It was fundamental to the success of the project to minimize these factors, understand them and estimate them in detail in advance, and then take the time to communicate them with the building's co-owner. There was a lot of consultation with SunBug by the owners before the project was authorized.

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The system is based on a glycol solution circulating through an array of two collectors on the roof and back down to the tank in the basement through an insulated, flexible pipe installed under the roof and through the walls of both units.

Cambridge city water enters the system on average at 52°F and circulates through the solar system's heating tank before entering the conventional hot water heater, which uses natural gas.

When the sun shines, the glycol circulates up to the roof, captures heat and brings it down to the pre-heating tank. When the sun doesn't shine, the glycol doesn't circulate, but the pre-heated tank remains insulated, ready to feed warmer water to the conventional heater, which "finishes off" the heating process as determined by its thermostat.

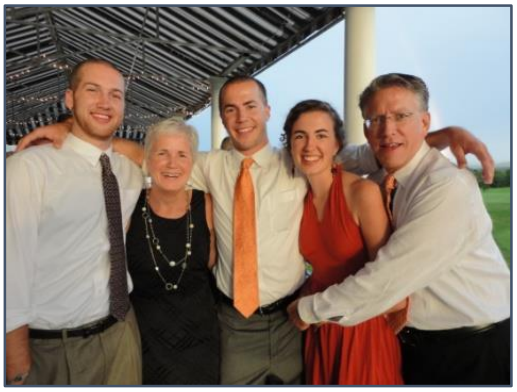
The existing conventional hot water tank was able to remain in place with simply a new source of incoming, warmer water. This tank was estimated to be over 20 years old with an unknown useful life. The option was available to purchase a solar pre-heating tank that also has the capacity to "finish off"

what the sun can't always do. The decision was made to install the tank with this optional backup capacity, so that some day, when the conventional tank dies, it will not need to be replaced.

Results

It is anticipated that in the summer months the solar system will have excess capacity for domestic hot water, but in the winter months the gains are modest due to ambient temperatures and solar angle. The data collection systems have only been in place for a couple winter months. The chart above is indicative of what happens on a bright sunny day in February.

The real question will be the long-run reduction in natural gas consumption, and it will be difficult to assemble conclusive data. As an "empty nest" family of five, with three 20-something children residing at home sporadically, the year-to- consumption of hot water will be erratic. Also fundamental will be the long run temperature patterns which make it difficult to compare one year to the next.



At this point, it is has been confirmed that the system is operating as intended and was well installed. The availability of web-based monitoring data, as shown, contributes dramatically to the satisfaction and involvement of the owners and their immediate network. Without it, the system would be invisible and more forgotten, as it cannot even be seen from the street.

Lessons Learned

- Individual condo owners can make an individual investment in solar systems which rely on use of common areas, both on the roof and in the basement. One key to such an arrangement is to minimize the system features, and another is to communicate detailed estimates of time and disruption in advance.
- Locations with constrained solar potential become attractive when there is a multiplicity of overlapping rebates and tax incentive