Sandy's Solar Water Heater
One Year Update

Summary:

The system worked well in its first year of operation (August 2010-September 2011), achieving a solar fraction of 49% while displacing approximately 165 litres of fuel oil. I estimate that our daily demand for domestic hot water is about 45 gallons. The only servicing required was to top up the water in the tank once, occasionally clean the collectors or brush the snow off them and adjust the slope of the lines (had one freeze up because it sloped slightly up for a few feet after entering the house...this was easily rectified). I improved performance by adding a third collector in March and cutting down some overgrown trees to the east and west which were shading the collectors, though shading from remaining deciduous trees due south of the collector significantly reduced output from November through the end of February. The collector is also shaded in late afternoon during the summer months by the roof overhang and this shuts down the pump as early as 2:30 p.m. when the effect is at its greatest on the summer solstice.

Illustration 1: Some "minor" tree trimming :)

Illustration 2: The "wind" trimmed this one : (

The Third Collector:

I added another 4 ft. X 6 ft. Collector in March. It is a "hizer" model like the first two, but I spaced the horizontal "risers" (an oxymoron) closer together on this one (5 inch centres) to improve fin efficiency. I also used slightly thinner lumber (i.e. 1 x 4s instead of 2 x 4s) to shave 20 lbs off the weight of the collector so it would be easier to move. The panel was sited beside the first two so it can run off the same differential controller. I bought a cheap submersible pump from Ebay to feed the collector, but it failed after a week of operation so I built another u-tube and installed a Swiftech MCP 350 pump. In late March, the system recorded its record daily tank temperature gain of 35 F degrees, aided by reflection from the snow. The third collector should reduce the pay back period, as its $450 cost (collector, pump, u-tube lines etc.) is proportionately much less than the cost of the the first two panels plus tank setup ($1800). It should yield almost 50% more output with only a 25% increase in total system cost.

Illustration 3: March 2011: Third collector sited on patio.

Performance:

The solar fraction chart reveals considerable seasonable variation in output. The poor results for November through February are caused by tree shading, shorter days, cloudier weather, lower angle of the sun and cooler weather. I believe that tree shading is the most significant factor. Summertime output was good but could be enhanced by insulating the feed and return lines (which are 30 ft each) to the first two collectors. The low solar fraction in May was owing to unusually cloudy weather.

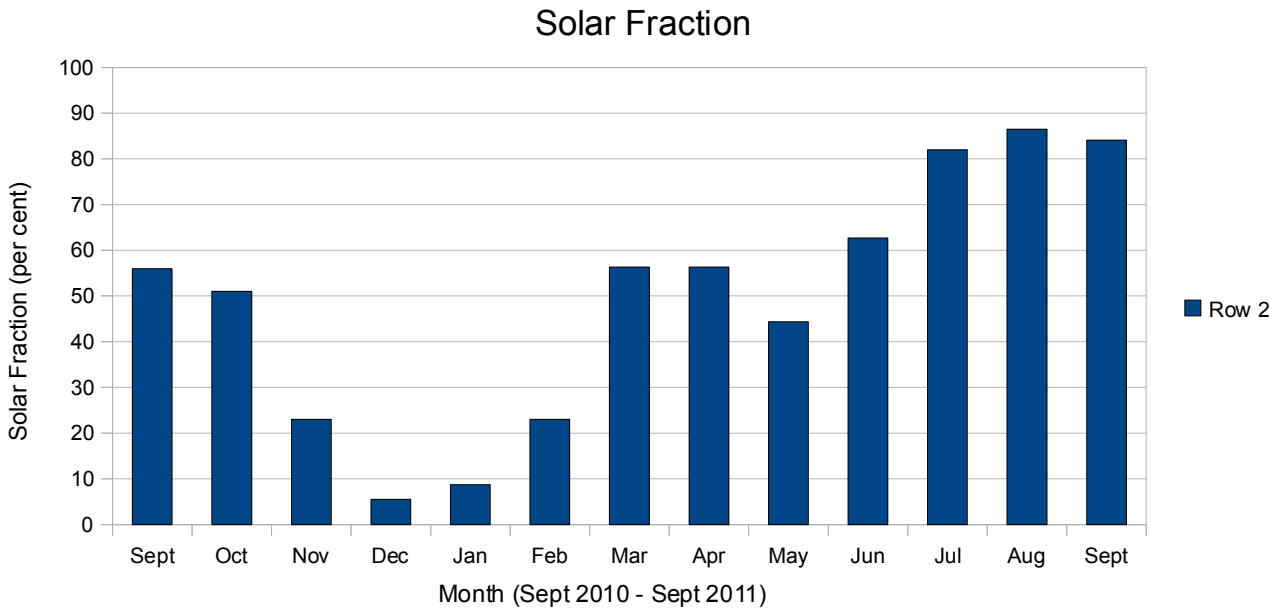

Illustration 4: Solar fraction is good spring through fall

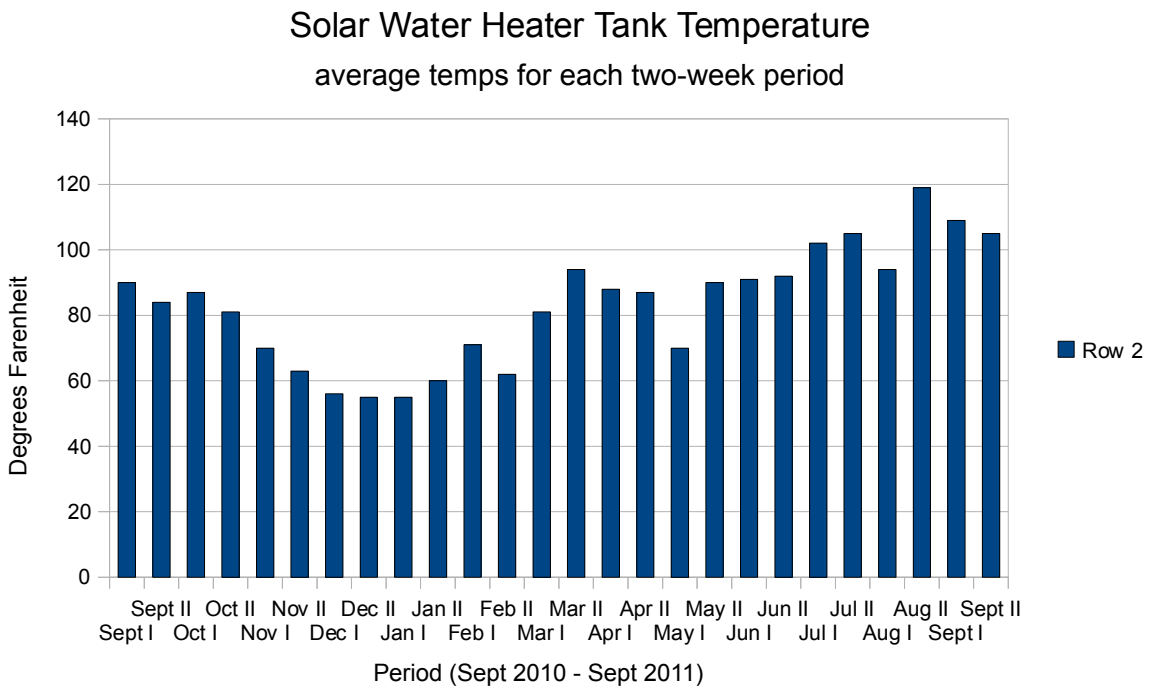

Illustration 5: The extra output from the third collector is evident in the higher tank temperatures in Sept 2011 vs. Sept 2010.

Conclusion:

Although I had expected that the system would achieve a higher solar fraction, it works reliably, and overall, I am very pleased with it. If all goes well, the simple payback should be less than 14 years. I am considering moving the third panel off the patio and integrating it into a larger array behind the garage, which would include slave panels to increase collector output. If I were starting over from scratch, I would also have built a larger tank (maybe 300 gallons) to provide more capacity to get through cloudy spells.

Illustration 6: Note addition of second pump and u-tube to run the third panel

Illustration 7: Looking forward to summer.