heliodyne
SOLAR HOT WATER

The drawbacks to over sizing a system:

1. Realistic Expectations. Solar performance at 90% or above in the real world is almost next to impossible, because more than 10% of the water load will be drawn at instances where solar is not available. For instance, if there is a 3-4 day storm that goes through the area, the solar storage tank will be depleted, and the boiler will have to kick on.

2. Exponential size increase. System sizing does not increase linearly. The solar fraction gain per additional collector drops. To increase your system from a 50% to a 60% SF, you will maybe have to add 10% of your total system size. However to from a 80% to a 90% Solar Fraction will most like increase your size by 40%. As you add more solar collectors, the other items of the system (storage tanks, pumps, heat exchangers, piping, etc) will also exponentially increase in size and price as well.

   This exponential increase is because:

   a. Solar collectors decrease in efficiency at higher operating temperatures. If trying to achieve a 90% solar fraction, you are increasing the average operating temperature of your collectors. Therefore, for example, a system of 60 collectors operating at 90% overall SF, might have the same energy output as a system of 50 collectors operating at 50% SF because of the lower temperature of the solar liquid. That means that the smaller, 50 collector system,

   b. To get high solar fractions, the system will have a high probability of stagnation during the hotter summer months. If the system is stagnating (meaning the tank has reached its high temperature limit while the sun is still shining,), the solar collectors physically cannot give more energy to the system. That means as you continue to add solar collectors to a system that stagnates in the summer, these additional collectors do not work in the summer months, resulting in 0% gain for 3+ months out of the year, making another reason why the solar fraction change is so small at high solar fractions.

3. Stagnation. More stagnation = more wear on glycol. More wear on glycol = faster drop in Glycol pH. This can lead to pipe corrosion causing leaks in the system, or the glycol inhibitors breaking down and the system fluid turning into a gel, breaking the pump and fouling collector tubes. A system with little to no stagnation can have glycol last 10+ years. A stagnating system might have to change out their glycol every 5 years or less. (This also goes with the cost increase w/ the additional maintenance required to change out glycol)

4. Cost. Ties in with all points above. Becomes financially unfeasible to aim for these high solar fractions. Makes much more sense cost-wise to aim for a smaller solar fraction and decrease the payback period.

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