CAPITAL SUN GROUP
The brightest ideas under the sun

July 6, 2007

The following comments on Energy Star water heaters are submitted on behalf of Capital Sun Group, Ltd. Capital Sun Group is a solar energy company that installs solar thermal and photovoltaic systems. While the company's primary market area is in the Mid-Atlantic, Capital Sun has sold and installed systems as far away as Arizona and designed and sold equipment for export. The company also provides water and energy conservation and efficiency consulting, as well as analytical, marketing, and policy services.

Capital Sun Group applauds DOE for taking action on the relative merits of water heating technologies and suggests that DOE's efforts in this area be coordinated with the Department of Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA), both of which have Energy Star programs underway. Their missions would be affected by Energy Star designations and DOE should consider closer collaboration with these two agencies when it comes to promoting solar water heating and Energy Star water heaters. Capital sun Group also suggests that DOE consider actions beyond Energy Star, tailored to water heating.

As people search for ways to reduce their energy consumption, the drawbacks of whole-house tankless water heaters have been drawing increasing attention. The biggest drawback for electric tankless is the need to add electrical capacity to the house, and often to the neighborhood as well. Capacity problems can also arise for natural gas. Another important drawback is the increase in water that must be drawn before hot water reaches the tap. This makes tankless better at the tap. When counseling a consumer about tankless water heaters, Capital Sun will advise against electric units and advocate solar water heaters or heat pump water heaters as a much sounder choice, economically and ecologically.

A case can be made for tankless gas water heaters being installed as a back up for solar water heaters because in the U.S. no manufacturer makes a gas water heater that is designed for connection to solar panels. A case for combining tankless and solar can also be made where a tankless water heater has already been purchased and found to be inadequate. Solar heating can provide almost all of the heat in summer and about half of the heat in winter, thereby increasing the capacity of the system and usually shortening the time it takes for hot water to arrive at the tap.

Tank manufacturers are not hurt by growth in heat recovery or by solar or heat pump water heaters, as these technologies are also auxiliary to conventional water heating, and with system integration, can be auxiliary to tankless plus solar as well. Thus, if water heating were optimized for annualized costs rather than first costs, all sectors of the water heating market would benefit, as would the environment. It is only energy consumption that would decline.

Although Capital Sun Group is not a member of the national Solar Energy Industries Association (though it is active in the local SEIA, "MDV SEIA"), we support SEIA's long-held position that Energy Star could be useful in promoting solar water heating and that DOE should continue its policy of promoting solar water heating. Capital Sun Group also agrees with SEIA and the

SRCC that solar energy is not a fuel, and that promoting solar does not violate DOE's policy of being "fuel neutral." Capital Sun Group also agrees that it ought not be necessary for a system to provide a 50% solar fraction in order to qualify for an Energy Star rating. To repeat, in our view any solar water heating system that contributes to reducing fossil fuel use is a "Star." The 50% solar fraction idea is not beneficial to anyone.

Suggestions

1) DOE should develop standard methods for comparing renewable technologies to each another and to non-renewable technologies. DOE should designate all SRCC-certified solar water heaters as Energy Star because, as part of an integrated system, they vastly outperform the fuel efficiency of all stand-alone conventional and tankless water heaters. DOE also needs to provide information on the relative merits of technologies that recover heat from waste-water piping and heat pump water heaters. The goal should be to help consumers make the best use of energy. For a meaningful comparison, embedded energy plus operating energy should be compared with energy captured for use. Costs and cost savings should not be part of the Energy Star designation because: 1) energy savings is a more beneficial goal, especially when one considers future generations, 2) costs vary greatly with location and time and cannot be captured accurately, 3) consumers will have more accurate cost information for their own options than DOE can provide them.

2) DOE should recognize the important role that plumbers play in the choice of water heaters and should seek a way to reach that audience effectively. DOE should consider methods, in addition to Energy Star designation, to promote "energy smart" behaviors. Perhaps EPA's recently announced best practices guidelines for the public would be suitable starting point.

3) DOE should somehow make it known that every time a natural gas tankless water heater is turner off, the system is purged of unburned natural gas, a potent greenhouse gas more forcing than carbon dioxide. The trade-off between saving energy by eliminating tank losses and the increase in greenhouse gas emissions for these units should be compared.

There are 4 broad policy questions that need to be addressed as part of this endeavor.

1) What is the appropriate federal role in the water heater marketplace?

2) What is the primary purpose of this endeavor? Whose interests are to be served?

3) How should location-driven differences be handled?

4) What are the leverage points in the marketplace for heating water and how can they be utilized to bring about energy smart behaviors in the US?

Comparative Performance Measurement

Capital Sun Group would like to address Performance Measurement in more detail.

The first cost of solar hot water systems is more than conventional water heaters, though operating costs and overall life-cycle costs are much less. It is important to have a standard basis for comparison. As debate over net-energy gains of fuel ethanol have demonstrated, it is difficult to produce renewable energy without any non-renewable inputs. Further, it is difficult to agree on how to compute and quantify the real energy inputs and waste outputs as well as the real value of "externalities" such as health, environmental and security costs. Although it will not necessarily be easy, we think it would be useful if DOE, together with EPA, developed a new yardstick that could be called the " Coefficient of Renewable Energy " or "CORE".

The CORE would be a ratio. The numerator would be the net energy captured and the denominator would be annualized energy consumed. The denominator would be the sum of all of the non-renewable energy used in manufacturing, distributing, and installing a water heater divided by the useful life of the system, giving the annualized energy expended plus the inputs of fuel or electricity per year. (The useful life could be a standard multiple, say a doubling, of the warranty period to avoid delays inherent in basing the useful life on testing.) The numerator would be the average annual energy captured under standard conditions (conditions to be determined). Conventional and tankless water heaters would always have CORE numbers that are less than 1. Better performing solar water heaters would have numbers larger than 1.

Unless generation losses and transmission losses were taken into account, electric water heaters would appear environmentally superior to natural gas water heaters, whereas in fact, the reverse is true. Further, the environmental advantages of running electric water heaters on wind power would be lost. Therefore, for electric water heaters, the CORE numbers could be calculated separately for typical wind, photovoltaic, solar thermal electric, coal, natural gas, hydro, and nuclear generation. The consumer would narrow his or her choices to find out or decide which CORE would apply to his or her circumstances.

For a solar water heater that uses photovoltaic collectors to power the pump, then the embedded energy of the photovoltaic panels would be added to the annualized embedded energy (denominator). If the system is a passive or thermosiphon design that doesn't require a pump or a controller, then no pumping load would need to be included in the computation.

A variation on this approach would be to recognize the impact, as well as the variability, of the energy that is required to distribute the solar components, leaving that term out of the calculation and expressing the CORE with the location of manufacture, such as "CORE 3.5, Baltimore, MD." A company with more than one manufacturing site would label each panel according to its site of manufacture and the energy embedded at that site. In this way, there is some awareness of product transport distance provided to the consumer who is trying to "buy green" by buying local, thus reducing the energy required for distribution. This solution will also be imperfect since, when a system is assembled, the components typically come from all around the world. This same geographical transportation resource factor should be applied to conventional water heaters as well so that consumers can make more valid comparisons.

For CORE ratings to be truly useful, they should also be determined for various combinations. For example, those wishing to be as green as possible would like to know whether solar plus natural gas tankless plus heat recovery is better than solar plus heat recovery plus heat pump water heater. Those on a tight budget may want to know if solar is better than heat pump recovery. And so forth.

Solar thermal systems should be designed for optimum year round performance that is matched to the load of the household or business. Best financial performance is obtained when a solar hot water system is fully utilized, i.e., when it provides near 95 to 100% of summertime peak needs. Designing for even greater annual capacity is not cost effective at current energy costs, but will grow to be so as these costs rise and environmental emission reductions become more and more valuable. However, if this greater capacity is not utilized in the summertime (e.g., for cooking, absorption cooling, dessicant drying, or other uses, it results in the creation of "heat islands" when heat must be rejected from the system. Any information materials that are developed (i.e., the Energy Star tag) would note that the CORE assumes near 95 to 100% fossil displacement performance in the summertime.

Although the most well-known attribute of solar hot water heaters is the reduced need for fuel or electricity, another important attribute is that, where tankless water heaters are installed and proving disappointing because of capacity limitations and slower response times, installation of a solar system will greatly increase overall capacity and will often provide faster response times.

Overall **Perspective**

Energy Star can be a means for reducing greenhouse gas emissions and other environmental, health and security impacts. At the same time, Energy Star needs to be placed in proper perspective while it is promoted. The benefits of conserving hot water and of heat recovery technologies should be given prominence as part of the promotion of Energy Star labeled water heaters.

The water heater market is complex and varies from locality to locality, even within a state or a city. If superior renewable and energy efficient technologies are going to take their rightful place, then DOE should have a goal in mind and approach the interrelated issues of public education, building codes, environmental regulations, emissions trading, etc. as a complex system requiring analytical techniques of systems engineering.

Thank you for the opportunity to submit comments. Please feel free to call me if I can be of further assistance.

Sincerely,

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