Hot Water

If a watched pot never boils, then the Solar Decathlon organizers have quite the task on their hands for the Hot Water contest. Teams must bring 15 gallons of water to at least 110°F within ten minutes during 16 separate draws throughout the competition. The rules say this task is designed to simulate a typical home's demand for hot water to bathe and shower.

The SCU team has chosen innovative ways to reach their hot water goals. The water system consists of a 1500-gallon domestic water tank that feeds into a custom-designed energy storage tank. That might seem like an overly large tank, but it is designed to accommodate all the water the team will need for the two-week competition. The energy storage tank connects to a single solar thermal panel to preheat the water to reduce electrical energy costs. This heat is stored more efficiently because the tank is coated with a phase-change wax that takes in heat during the day and solidifies at night to release the stored heat and preheat the water in the tank to use the next morning. It was developed by a graduate student at Santa Clara, and although electrical water heating will still be necessary, it does take advantage of the available thermal power of the sun.

One issue the team faced with the solar thermal panel was how to mount it on the roof. The solar thermal panel is situated above the mechanical room, which has a flat roof, unlike the rest of the home, which is sloped at the ideal angle for the photovoltaic panels. Solar thermal panels also work best when tilted, but the team chose to lay their panel flat on the roof so it would not stand out. This was one instance of the team choosing an elegant design rather than an efficient one. Each of these emphases has its ethical benefits and drawbacks. More efficient solar thermal power would reduce the dependence on photovoltaic power and allow the house to consume less electricity. However, a more aesthetically pleasing design could help visitors

realize that solar technology and impressive architecture can indeed coexist, encouraging visitors to consider adding solar panels to their own homes. The solar thermal decision illustrates an ongoing problem in the renewable energy sector of how to make renewable energy both attractive and effective.

With many technical components, like the hot water system, ethical issues were not a dominant influence because options were relatively limited. Most hot water systems follow this traditional model of storage followed by pump-aided heating. Santa Clara still managed to make the system more efficient than average by using the phase-change tank and choosing an ultra-efficient Daikin Altherma heat pump, but besides those innovations, there are really not many other ways to make the system more ethical.

Water usage itself, however, is an ethical issue. While hot water is important to the function of a home, the amount of water wasted throughout the competition is concerning. Each of the twenty teams will contribute 240 gallons of water over the duration of the two weeks, for a total of 4800 gallons, at minimum. This does not include other water demands, such as the eight loads of laundry and five loads of dishes the teams must wash and the six times they must vaporize five pounds of water on the stove. The frequent trials take place to ensure the home could functionally support the average lifestyle, but it still seems excessive to require sixteen hot water draws. The waste is further increased because teams must request the amount of water they will require during the competition months in advance. Many teams, including SCU, are requesting much more than they anticipate to ensure they will not run out of water. Hopefully, unused water will be saved after the competition ends, but if not, this is a further source of waste.

With the Decathlon held in arid Irvine, California, the issue of water consumption should have more relevance. Irvine only obtains 48% of its water locally, with the rest being imported or

recycled. While this is only a short competition and the water usage of the homes will not visibly affect the California water supply, the competition could do better in promoting its mission of sustainability by cutting down on the number of water draws to avoid waste.