

Modeling Smart Homes in Florida

When Solaris Home Systems was founded in Chicago in 2003, our main focus was home automation systems—lighting, HVAC, security, entertainment, and so on. We quickly realized that home automation systems could do more than just turn things on and off; the systems could also enable a house to become “smart” about its energy use. A home automation system can lower south-facing blinds in the summer when the house is vacant, saving cooling energy; automatically turn off vents, fans, or lights a couple of minutes after a room becomes vacant, saving electrical energy; monitor water usage and send an alert to a homeowner’s computer if it senses a sharp increase, which may be caused by a leaky pipe or toilet; and increase a family’s overall awareness of energy use in their home.

At the end of 2005, we decided to relocate the company to Florida and focus more on integrating environmentally friendly controls into our home automation system. We partnered with Cribb Construction in West Palm Beach to build two model homes in Jupiter, Florida, and are expecting to give tours and use the houses as a showcase by the time this article goes to press. Cribb is making sure that all aspects of the home are sustainable and healthy (bamboo flooring, low- to non-off-gassing paints, and so on). The wall systems for the homes are provided by e-Walls in Sarasota, Florida; they consist of poured concrete between a water-resistant exterior board and 2 inches of polystyrene. Stucco is applied to the exterior board, and furring strips and drywall are attached to the interior polystyrene. This setup withstands wind in excess of 250 mph, is water resistant, and has an R-value of 14. The use of reflective metal roofs, with Icynene

spray-in foam insulation, gives the model homes an efficient, conditioned air space in the attics. The air handlers and ducts are located in conditioned spaces. The two home models will be inspected and certified energy efficient through the Florida Power & Light Company (FPL) BuildSmart program, as both companies are FPL BuildSmart Partners.

Building Smart

BuildSmart is Florida Power & Light’s energy conservation program for residential new construction. Since BuildSmart went territory wide in 1997, FPL has inspected and certified over 17,000 Florida homes. The objective of the BuildSmart program is to encourage energy conservation that cost-effectively reduces FPL’s coincident peak load and its customers’ energy consumption through the building of energy-efficient residential new construction.

The BuildSmart inspection and certification process is very simple. Experts review the builder’s plans and run the energy calculations for that model. If necessary, the reviewers then recommend ways to make the home more energy efficient. As the home is being constructed, BuildSmart inspectors visit the site several times, in order to monitor the construction. Once the A/C equipment is in place and the home has power, they arrange to do the final inspection, which includes the ceiling and wall insulation levels, SEER ratings for HVAC equipment, air handler locations, energy factors for water heaters, tinted or low-e glass windows, and so on. Last of all, the A/C duct system is tested to make sure that the ducts are sealed properly. Any failures are reported to the builder and BuildSmart

inspectors reinspect the home once the repairs are complete. When the home passes inspection and is sold, the homeowner is given a BuildSmart Certificate.

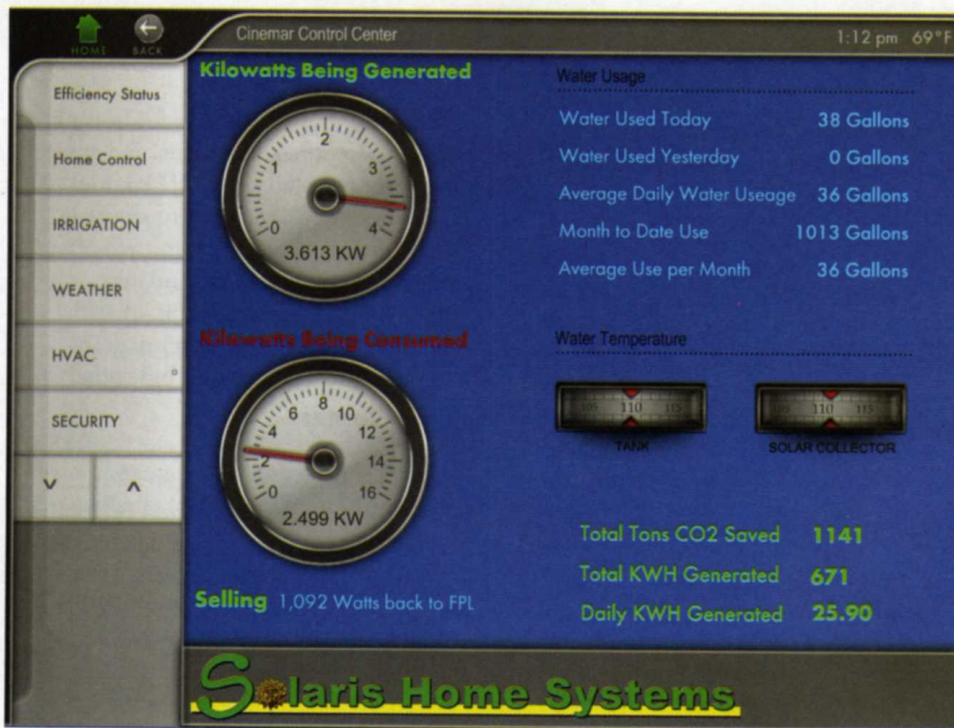
The BuildSmart program offers concrete benefits to home buyers, home builders, and the environment. Homeowners get a comfortable home, long-term savings on their monthly energy bills, healthy indoor air, and peace of mind from knowing that their home was inspected and certified through an objective third-party. Homeowners can also feel good about using less energy and conserving natural resources.

Home builders can offer prospective home buyers energy savings of up to 30% compared to what they will get when purchasing a traditionally built home. Builders receive ongoing training and technical advice on energy issues, as well as objective, third-party certification of their work—a big plus with home buyers. Builders also get added exposure and recognition through FPL’s promotion and marketing of the BuildSmart program.

Solar Energy Plus an Efficient Home

We equipped the two model homes with Solar Energy Systems solar hot water systems. The system features a 4 inch x 10 inch collector, an 80-gallon highly insulated tank, and a pump that is energized by its own PV panel. There is also a backup electrical heating element in the water tank. Sensors in the solar collector and tank measure the temperature of the water in both locations and a flowmeter in line with the water source measures how much water is being used currently and historically; it can shut off the heating element in the tank automatically when the home is vacant for a long time.

We installed a grid-tied 4,080W PV system on each house to offset peak grid electricity demand. Sensors will allow the homeowner to see in real time how much electricity the PV system is generating, and how much electricity the home is consuming.



The touchscreen monitor in this home lets the homeowner know that he or she is selling energy produced from the home's PV panels back to the utility!

Our goal was to install the solar hot water and PV systems on efficient houses, so all appliances in the two model homes are Energy Star rated, the air conditioners are 17-SEER or above, and lighting will be provided primarily by CFLs and LED lights. A lighting system by Vantage controls the lights, fans, and motorized blinds. This is tied into another system that controls the HVAC and phone, sends announcements throughout the house, and provides voice control functionality and touchscreen interfaces. There are two touchscreen displays in our model homes, one in the transition room as you enter the house from the garage, and one in the kitchen. We installed a tiny one-gang speaker in each room. The system can be set to announce any event that the homeowner chooses. Some popular ones are "Someone has entered the driveway," and "This is a security check. The east garage door is open." The system also announces who is calling on the phone.

We made the homes "aware" of their inhabitants by putting magnetic sensors in each door and window, as well as motion and awareness sensors in each room and entryway. The system can be set to automatically turn on

the hallway light as soon as someone enters the house, turn on the front entryway lights when the front-door is opened, or send a security alert or announcement if a specific window is opened during a specific time (for example, a child's bedroom window at night).

Home owners can also control the ceiling fan and lights in a room and lower or raise the blinds in a room automatically; if a window is open, and the A/C is on, the house will announce which window needs to be closed—likewise if the A/C is on, and a door or window has been left open for a given number of minutes. If the home automation system detects motion after midnight, it can turn on appropriate lights at 25% brightness; this keeps homeowners from blinding themselves during nocturnal trips to the bathroom.

We also made it easy for the homeowner to put the house into an "away" mode. This is useful not only for extended vacations, but also for every day, when the occupants leave for work or school. Once the Away Mode is set, the house will announce that it has been set, and will start counting down the number of minutes

new construction

you have to exit before the security system is set. It will also turn off all lights and fans, let you know if any door or windows are left open, lower all blinds, and raise the thermostat by a couple of degrees—this is in Florida, where raising the thermostat a few degrees can save a lot of energy while the power grid is experiencing peak electricity demand. Thirty minutes before you told the house you would be home, the thermostat will go back to its original state. If you come home early, the thermostat will automatically go back to its original setting at that time.

To enhance security, we added a weatherproof Web-based camera at the front door, and another one by the mailbox, looking back at the house. Not only is it nice to have the Web cam video feed automatically pop up on the touchscreens whenever someone enters the driveway or rings the doorbell, but it is great to be able to log into these cameras over the Web when you are away from home.

I'm sure that I'm forgetting some systems or some cool examples of things that these houses can do, but the point is that once you have everything integrated and talking to each other, you can pretty much do anything, including being more environmentally friendly. We hope that as we show these BuildSmart and Solaris Home Systems-equipped homes to other developers, it will give them ideas as to how we can help them with their homes. The pieces are pretty modular and almost infinitely customizable.

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—Aaron Ewerdt

Aaron Ewerdt is the vice president of technology for Solaris Home Systems.

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For more information about Florida Power & Light's BuildSmart program, visit www.FPLBuildSmart.com.