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## **Solar decathlon projects generate cutting-edge technology**

**Once the competition is over, teams consider mass-market opportunities for their innovative ideas.**

**By Lauren Hunter**

If necessity is the mother of invention, the U.S. Department of Energy's Solar Decathlon is the cradle of green building creativity.

Since its inception in 2002, collegiate teams from around the world have convened on the National Mall in Washington, D.C., to share and show off their innovations in residential green building and design. While students' efforts to create sustainable, net-zero-energy buildings often consume several years leading up to the biannual competition, many industrious teams continue their design and product development research well beyond the event, which runs through Oct. 18.

### **meeting of the minds**

In planning for their concept homes, Solar Decathlon teams enlist the help of corporate sponsors. In addition to considerable monetary and in-kind donations of materials, some teams have cultivated knowledge-sharing partnerships with their industry partners.

"Two years ago I received a phone call from a professor at Santa Clara University that said they were working on Solar Decathlon, and I immediately wanted to know how we could help," says Paola Rutledge, vice president of the panels and veneer division of bamboo materials manufacturer [Teragren](#).

For its 2007 competition house, Team California—including students from Santa Clara and the California College of Art and Design—worked side by side with Teragren to develop structural bamboo I-beams. "We wanted to use bamboo because of its sustainability, and also for its strength," explains Santa Clara junior Alison Kopf, project manager for Team California's 2009 RefractHouse. "Because it's stronger than traditional framing lumber, we would be able to use less material without sacrificing the

structural integrity of the house. Also, bamboo looks nice, so in 2007 we used the I-beams and left them uncovered, which added to the aesthetic we were going for."

Before 2007, Kopf says little structural bamboo was available, but the category is emerging now thanks in part to product development for Solar Decathlon. Since then, Team California and Teragren have continued to share research and development insights to move the bamboo I-beam concept forward.

"This year, we both wanted to take the next step and make an even better product," Rutledge says. "We're taking the knowledge we gained to see how we can approach structural bamboo and make it something viable for an engineered structural product line in the future."

Team California's 2009 house features a modified version of the bamboo I-beam with a web design that allows builders to run conduit along the beam for structural wiring.

### **partner with the pros**

The University of Illinois at Urbana-Champaign also benefitted from some professional assistance. The team partnered with [Homeway Homes](#), a modular-home builder, as a study in mass marketability.

"Part of our goal was to build a house that regular people would buy and find marketable," says Dr. Patrick Chapman, one of the team's faculty advisors. "There's a tendency at Solar Decathlon for architects to push the envelope when it comes to design. We didn't want to design a 'plain old house,' but we did want something that had its own genre while still being very livable."

As a result, Illinois' Gable Home is a passive house that features a range of green technologies under a traditional Midwestern gable roof (complete with a solar array). During both construction and deconstruction (prior to moving the house to Washington), the team took advantage of Homeway's expertise in building homes that are easy to disassemble and transport.

In addition, Homeway's proficiency in creating modular homes leaves the door open for the university to consider creating a version of the house on a marketable scale.

"We've batted around the mass-production idea with Homeway, and it comes down to math and having a clear business plan," Chapman says. "If Gable Home is something that can make a profit, they may consider selling it."

He adds that Homeway representatives have said that, even though the firm strives to create energy-efficient modular homes, the Solar Decathlon stretched it. "For mass marketability, we'd like to work with them again on a house that would probably be more efficient than what they normally construct, but probably not as extreme as was we've done for Solar Decathlon."

Mass market appeal was also a goal for the Michigan Solar "MiSo" House, the University of Michigan's Solar Decathlon entry in 2005. Although most of the students on the team have graduated, Dr. Harry Giles has continued research based around the house's systems and the opportunities they present. The house is open to the public in

the University of Michigan's Matthaei Botanical Gardens in Ann Arbor, Mich., and serves as a green education platform for visitors.

"There are a lot of people who come through the house on scheduled tours who say, 'I love it, where can I get one?'" Giles says of the MiSo house, which sports a design reminiscent of an Airstream trailer. "People who embrace a modern world and see the house as an opportunity for contemporary living love it. Those who are steeped in traditional values and want a house that has a Colonial look probably aren't going to change their minds for this."

But it's not just modernists and urbanites who are intrigued by the house's design. Giles recently was approached by investors interested in constructing several thousand versions for a housing development in Peru.

"We've been looking, mostly by word-of-mouth for an opportunity to engage the ultimate objective of getting someone to go forward with building the house," Giles says, noting that the Peru opportunity is an exciting one that has the potential of moving quickly.

Giles' focus in modularity, multifamily building, and customization, opens the concept to multi-level living as well. "The project has springboarded into another grant we've received for prefabricated modular housing for multifamily low-income development," the professor says. "That's the next generation in fabrication, concept, and development, and a lot of that involves the methods we tested and experimented with in the original MiSo House."

### **student ingenuity**

As a major sponsor of each event, [BP Solar](#) recognizes that technologies introduced at the Solar Decathlon represent the next generation of green building concepts—and green builders.

"You have a series of students that are becoming the future architects of this country," says Eric Daniels, vice president of technology and product development for BP Solar. "I can't conceive of a better way to bring about renewable energy, efficiency, and optimized living than to have students participate and then become the leaders that bring us into this new world."

Indeed, while some teams cooperate with product manufacturers and developers, others undertake the heady task of creating solar houses and all their components from scratch. This year, one such project is Iowa State University's Interlock House. The team fabricated both a liquid desiccant dehumidification system and a series of passive tracking louvers outfitted with thin film photovoltaics.

"We partnered with a firm called Power Film to incorporate their thin film photovoltaics onto our louvers, but the louver system itself was designed and built by students," says Eric Berkson, a senior architecture student and IT coordinator for the Iowa State Solar Decathlon team. "There's also nothing on the market in terms of a commercial system comparable to the liquid desiccant dehumidification system we have. We see more student-designed prototypes of the systems every year, so there's definitely potential for a product like that to enter the market in the future."

Daniels says the construction industry can learn a lot from the innovative student-developed technologies used in the Solar Decathlon, and he hopes the event continues to draw the attention it demands.

"The students have done a fantastic job, and I applaud them for the work they do," Daniels says. "I look forward to more and more users getting interested in this type of interaction with energy, especially with the ideas that it opens up for professional home builders, appliance manufacturers, and other companies that are on this low-carbon, energy-optimization journey."

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