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Forward Thinking

By: [Lauren Hunter](#)

If necessity is the mother of invention, the U.S. Department of Energy's Solar Decathlon (solardecathlon.org) is the cradle of green building creativity. Since its inception in 2002, collegiate teams from around the globe have convened on the National Mall in Washington, D.C., to showcase innovations in residential green building and design. While their efforts to create net zero energy buildings often consume more than a year of time leading up to the biennial competition, many industrious teams continue their design and product development research well beyond the event.



In planning for their concept homes, many Solar Decathlon teams enlist corporate sponsors. In addition to considerable financial and material donations, some teams cultivate research partnerships with these industry manufacturers. "Two years ago I received a phone call from a professor at Santa Clara University (SCU) who 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 Teragren, a manufacturer of bamboo building materials.

For its 2007 competition house, Team California, which included students from SCU and the California College of Art and Design, worked with Teragren to develop structural bamboo I-beams. "We wanted to use bamboo because of its sustainability, and also for its strength," explains SCU junior Alison Kopf, project manager for Team California's 2009 entry, RefractHouse, which also uses the bamboo I-beams. "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."



Team California's entry in the 2009 Solar Decathlon, dubbed RefractHouse, builds upon research and product development initiated in conjunction with Teragren for the team's 2007 entry. Many teams partner with corporate sponsors to develop technologies that have real-world applications after the competition.

Kopf says little structural bamboo was available on the market before 2007, but the category is emerging now, thanks in part to

the product development initiated for the Solar Decathlon. Since the 2007 competition, Team California and Teragren have continued to share research and development insights to move the bamboo I-beam concept forward.

"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," Rutledge says. Team California's 2009 house features a modified version of the bamboo I-beam that allows builders to run conduit along it for structural wiring.

Partner with the Pros

The University of Illinois at Urbana-Champaign (UIUC) also has benefitted from professional assistance. The team partnered with Homeway Homes, a modular home builder with outposts across Illinois, for a study in mass-marketability.

"Part of our goal was to build a house that regular people would buy and find marketable," says Patrick Chapman, one of the team's faculty advisers. "There is 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."

Team California partnered with Teragren to develop a modified bamboo I-beam in 2007.

As a result, UIUC's Gable Home for the 2009 competition is a passive house with a range of green technologies under a traditional Midwestern gable roof (complete with a solar array). During 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 UIUC to consider creating a version of its 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 company works hard to create energy-efficient modular homes, working on Solar Decathlon has stretched what it had done up to now. "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 also was a goal for the Michigan Solar (MiSo) House, the University of Michigan's Solar Decathlon entry in 2005. Though most of the students on the 2005 team have graduated, professor Harry Giles has continued research based around the house's systems and the opportunities they present. The house currently is on display and open to the public at U-M's Matthaei Botanical Gardens in Ann Arbor, Mich.



"There are a lot of people who come through the house on scheduled tours that say, 'I love it, where can I get one?'" Giles says of the MiSo House, which is reminiscent of an Airstream trailer in design. "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

younger folks and up-and-coming professionals will respond to it in a more embracing way."

But it's not just modernists and urbanites interested in the house's design. Giles recently was approached by investors interested in constructing several thousand versions of the house for a housing development in Peru. Giles' focus in modularity, multifamily building, and customization opens the MiSo House concept to multilevel living as well. "The project has springboarded into another grant we've received for prefabricated modular housing for multifamily low-income development," Giles 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 the event each year, BP Solar recognizes that technologies introduced at the Solar Decathlon represent the next generation of green building concepts—and green builders.

“The heart of this event is that in these projects, 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.”

While some teams cooperate with product manufacturers and developers, others create their solar houses and their components from scratch. One such project is Iowa State University’s (ISU) Interlock House for 2009. 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 ISU 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 taking a look at the innovative student-presented 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 homebuilders, appliance manufacturers, and other companies that are on this low-carbon, energy-optimization journey.”

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