

Taming the sun's energy for affordable housing: Vanderbilt, MTSU, Habitat for Humanity partner to expand solar's reach

By Hollie Deese

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What some local college students are building today could be the high-efficiency housing solution of the future for the area's low- and middle-income families.

An interdisciplinary group from Middle Tennessee State University, Vanderbilt University and Habitat for Humanity of Greater Nashville – calling themselves Team Music City – are competing in the U.S. Department of Energy's 2015 Solar Decathlon in Orange County Great Park, Calif.

The event challenges students to design and build a functioning, energy-efficient, solar-powered house over the course of two years.

The winning team will best combine cost-effectiveness, consumer appeal and design with optimal energy production and maximum efficiency.

But that's not the only goal for Team Music City. It also is creating a model home that could provide low-cost energy solutions for future area Habitat builds.



Adviser and Vanderbilt professor Sanjiv Gokhale, left, discusses plans with Solar Decathlon team members Danny McClanahan and Tiffany Silverstein of Vanderbilt University, Morgan Corlew of Middle Tennessee State University, an unidentified student and Danielle Jellison of

MTSU

-- Mtsu Photo By Mtsu News And Media Relations

While much of the technology – by requirement of the competition – has to be readily available in the marketplace, there are going to be new applications introduced with the goal of bringing down costs in installation and maintenance.

“Nashville is putting a lot of effort into drawing professionals to the area, and as you draw professionals into the area you also need infrastructure to support all those professionals,” says Dr. Ralph Bruce, professor of electrical engineering at Vanderbilt and a faculty leader of the project.

“Therefore, you have those people who build the infrastructure and people who live in the infrastructure, typically in the moderate- to low-income area.”



Flanked by students, MTSU engineering technology associate professor Tom Gormley gestures while making a point during the first Solar Decathlon meeting at Vanderbilt University.

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Drawing from a variety of classes at the two schools, students in construction management, interior design, electrical, mechanical and civil engineering are involved in the planning, designing and building processes of the home that will be greater than 600 square feet but less than 1,000 square feet in size. The design has yet to be finalized.

Making solar affordable

In conjunction with Habitat, the students are working to take things that are going into current high-end residential solar installations and morphing them into technology that makes sense financially for use in moderate- and low-income areas.



Exterior image of the house built by students from Kentucky/Indiana: University of Louisville, Ball State University and University of Kentucky to compete in Solar Decathlon 2013.

-- Jason Flakes (Nomoi)/U.S. Department Of Energy Solar Decathlon

“The Nashville Area Habitat for Humanity is one of the few that builds communities of habitat homes rather than just single one-offs, so we are really interested in not just making this a single home for the solar decathlon, but producing a really useful prototype that can be integrated over a large community,” says Danny McClanahan, 18, a rising sophomore at Vanderbilt from Bethesda, M.D., who majors in mechanical engineering and computer science.

“That is one of the things we have in mind constantly as we build the [Habitat] home.”

Projects like these are important to Chip Wilson, Habitat’s senior vice president of construction, who runs energy models on two or three projects a year to look at the cost effectiveness of different technologies.

“If you want to stay current on building sciences you have to try stuff, and you have to get outside your comfort level,” Wilson says. “We try to be as innovative as we can while being affordable.



The winning home in 2013, designed by Team Austria Vienna University of Technology.

-- Jason Flakes (Nomoi)/U.S. Department Of Energy Solar Decathlon

“We don’t have the luxury of just hanging a ton of solar panels, so we have taken the passive approach first and try to keep the waste down to a minimum.”

After the competition, the home will be rebuilt on one of Habitat’s sites in East Nashville or Inglewood for further research on energy efficiency.

“Habitat has agreed to provide a lot, and the foundation and utilities, so when we bring it back to Nashville, we are going to rent it for the first year so we can continue to measure the results of what it is like for a family living in it, if

the energy usage really make sense, so we can learn from a living lab for our students,” says Thomas Gormley, professor of engineering technology at MTSU.

Wilson would even consider implementing designs from the team’s house in future builds, depending on how the research shakes out.

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“We have to see what is most cost effective,” he explains “We are in the affordable housing business, so we have to be careful about throwing a bunch of technology on a house and making it unaffordable, both for the agency to build and for the homeowners to maintain.

“The equipment has a service life, so we really want to get to the bottom of some of that. We think the solar decathlon is really going to help us.”

Vanderbilt’s Bruce also hopes third-party operators will be interested and come in and alleviate the costs on homeowners’ initial installation.

“The emphasis that drives us is the concept of building affordability in an active solar home in the Middle Tennessee area, an affordable home not only for the high-end folks who are willing to pay, but a model for people of moderate-to low-income.”

Real world uses

Students working on the project are getting a crash course in real-world application, not only in terms of sustainability but also in terms of what it takes to work with different crews on one construction project.

“It has been challenging, but exciting, because that is one part of the design process you don’t really get to do in school, actually working with engineers and people in construction,” says Elizabeth Kurtz, 27, the student head of design on the project and a rising interior design senior at MTSU. “It is a good learning experience.”

It has been beneficial for the more technical students to have to think about design in the real-world use of their engineering ideas as well.

“I approached the house from an engineering perspective,” McClanahan says. “I wanted to think about how we could optimize every possible system in the home.”

But once he started working with the design students his thinking changed.

“MTSU provided a really brilliant design standpoint to look at the home from, as opposed to just the engineering standpoint I was looking at it from,” he adds. “So the way the home is designed is taking two entirely different viewpoints and trying to merge them together.”

The home will be built on the Vanderbilt campus, then taken apart, moved to MTSU and rebuilt in order to work out any kinks that might happen before the home is transported across the country for the competition.

This process particularly appeals to Danielle Jellison, 20, graduating MTSU in December in commercial construction management. She also works for Hardaway Construction in Nashville, a firm well experienced in LEED builds.

“I am learning how the structure is going to work and what we can do to make it detachable, but still structurally sound,” she says. “Just learning the process of how stuff works is going to help me in the future.”

McClanahan thinks solar is the future of energy production and is enthused to be working on a project that could have real-life application on the future of housing.

“One of the things that is so special about this is that we are aiming for something that extends far beyond the solar decathlon,” McClanahan adds.

“We’re using the solar decathlon to enhance our overall project, which is to produce this home as a solution to housing for middle- and low-income in the Middle Tennessee region. The solar decathlon talks a lot about creating a sustainable solar future, and we really like that.”