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The S.KY Blue Team: UK's Shining Example

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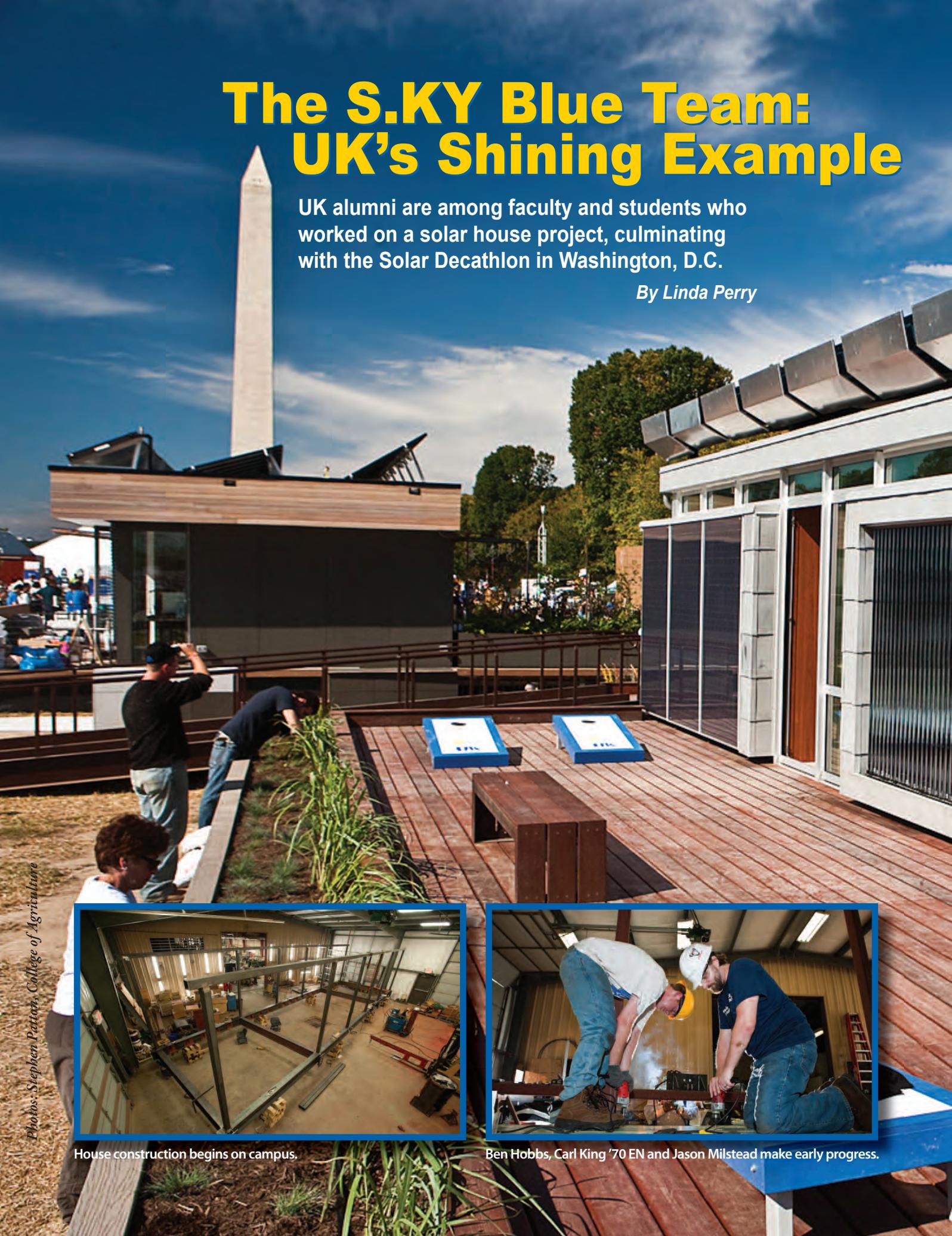


UK
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The S.KY Blue Team: UK's Shining Example

UK alumni are among faculty and students who worked on a solar house project, culminating with the Solar Decathlon in Washington, D.C.

By Linda Perry



Photos: Stephen Patton, College of Agriculture



House construction begins on campus.



Ben Hobbs, Carl King '70 EN and Jason Milstead make early progress.



It's the 21st century equivalent of an old-fashioned barn-raising: individuals coming together to lend their expertise and man (or woman!) hours to construct a building. Only this time the individuals coming together are not farmers but UK college students and their professors. And the building is not a drafty barn but an energy-efficient, solar-powered home.

To be fair, the building wasn't erected during a long weekend, like a traditional barn-raising. This one took a lot of forethought, research, consultation, and sheer determination before the first photovoltaic cell was in place. That's because a lot was at stake: UK was one of 20 universities from around the world competing in the 2009 Solar Decathlon sponsored by the U.S. Department of Energy.

This meant that the house had to be painstakingly built in Lexington by UK students, under the guidance of UK faculty, and then transported by a Lowboy trailer to the competition site. There, on the National Mall in Washington, D.C., it received its "finishing touches" in October over a period of several days. In that regard, it was like a barn-raising from years gone by.

"The saving grace of this project is that we designed the house to make the trip to Washington almost completely together as one unit," says Ben Hobbs '09 EN. Hobbs, now a UK grad student in biosystems and agriculture engineering, has been involved with the project for over a year. He says the 800-square-foot house (14 ½ by 52 feet) arrived at the National Mall and then had some components added, like the hot water unit, air-conditioning/heat pump and outdoor decking. The photovoltaic panels that fit on the roof also were added upon arrival.



Anne Fugazzi finishes cabinetry.



Don Colliver: project objectives run parallel to UK Strategic Plan.

Kentucky Makes Top 10

S.KY Blue had a very respectable finish, placing 9th overall in the 2009 Solar Decathlon competition. Germany was the overall winner, followed by Illinois, California, Ontario, Minnesota, Alberta, Cornell and Rice. To see the results, go to www.ukalumni.net/solar

“An interesting aspect of this project is that so many students working on the house are now actually UK alumni,” says Gregory Luhan, associate dean of research at the UK College of Design, and one of the two principal investigators. Many of the students began working on the project when they were UK undergraduates and the house was on the drawing board. Some graduated and returned as grad students to finish what was started — and their educations.

Don Colliver, a professor in biosystems and agricultural engineering in the UK College of Agriculture, was also a principal investigator on the project. He says this was an extremely exciting effort to be a part of, for sure, even though it sometimes meant working 80 hours a week. “For engineering and architecture students, if this were an athletic team, it would be the equivalent of the NCAA Sweet Sixteen basketball tournament,” says Colliver, who is also a UK alumnus, having earned a bachelor’s and master’s degree in engineering in 1974 and 1977.

The monumental effort by the students has a real payoff, says Colliver, “Students have learned tremendously about what it takes in the real world to design a building.”

“The most important lesson I learned is that we had to work together — the architects, the engineers — we had to agree on something and then the project could go forward.”

John Stewart
’09 Electrical Engineering
Louisville

The Solar Decathlon started in 1999, occurs every two years, and is actually 10 contests in one. This year a record-breaking crowd accounted for more than 300,000 house visits to the 20 competing solar homes, which included entries from the continental United States, Puerto Rico, Canada, Spain, and Germany. UK’s entry — the solar house it built inside the UK Agricultural Machinery Research Laboratory — fought for the top prize in the areas of architecture, engineering, lighting design, net metering, communications, comfort zone, home entertainment, hot water, appliances and market viability.

To that end, for the last two years, the UK team has been an interdisciplinary group comprised of students, faculty and staff from six colleges and 16 centers and departments on campus. As the project got closer to completion, students and professors from the colleges of Agriculture, Design, and Engineering finalized their own innovative solutions for a living/working environment that reduces dependency on fossil fuels and other nonrenewable natu-

ral resources. The College of Communications and Information Studies was also involved, getting the word out about the effort with press releases, a Web site and Facebook page. Calling the team “S.KY Blue” (representing solar innovations at UK and in Kentucky, as well as a direct relationship to the university’s mantra to “see blue in everything we do”) the UK solar house was created by more than 175 students.

“The students have worked as a collaborative team and learned in the very early phases of the project that they couldn’t exist in their own silos. They had to work together,” says Luhan. “This was made most clear once they started the fabrication and construction of the house. On a daily basis they had to improvise and solve problems that they couldn’t possibly have foreseen, even in their virtual models.”

Luhan says that one of the strategies of transporting a house like this is how much it weighs. The adjustable jacks underneath the house raise and lower it so the building could be put on a truck bed. “When we got to the Mall, we used the jacks to lift it up, the truck drove away and we set the house down at the ideal height.”

The house sits about 29 inches off the ground. A ramp also makes the house ADA accessible and compliant. Luhan says a lot of the ideas the team integrated into the home are not just about solar technology but also about passive technology, taking advantage of everything that is free, like air and light.

“What a great example of ‘real world’ situations being introduced into the academic environment.”

Ernest O. Robbins II
’69 Civil Engineering
Dunn Loring, Va.

“One of our core ideals was to ‘live light’ and have access to light no matter what room people were in,” he says. The rooms inside were designed as artistic volumes arranged to allow for the homeowner’s daily rituals of sleeping, bathing, eating, and entertaining



House travels 450 miles to Washington, D.C.



S.KY Blue team re-assembles house in D.C.

'Old' Kentucky Home Gets A New Look

The S.KY Blue team used Kentucky products whenever possible. Some quick facts about the house:

- Perforated cement fiberboard is on exterior.
- 36 photovoltaic panels on roof; 6 panels on front. The single-axis roof mechanism tilts to follow the sun during the year.
- 60 evacuated tubes collect energy for hot water.
- Rain collection system for irrigation.
- High insulation values in walls, floor, windows and ceiling.
- House monitors energy on 42 circuits; weather forecast system evaluates 3-6 hour periods and automatically controls the optimal amount of energy to use.
- Highly-efficient toilet, appliances and electrical fixtures.

as they relate to the sun. To this end, the eastern morning sun enters the bedroom, wakes you up, has you proceed to the core of the home, which is a travertine bathroom with sunlight washing and warming the walls, moves into the kitchen area and then arrives at the public living space. The living space is adaptable

"We've come to show these people we're not just some hicks from the hills," I overheard one student say after pulling a 28-hour shift with a smile on his face."

Isaac W. Fedyniak
'05 Electrical Engineering
Lexington

through the use of pocket panels. "We have a pocket table that slides out of the wall to table height. It then uses hydraulics to lift it up to become a harvest table to extend the kitchen work surface by an additional 24 square feet of table surface area," Luhan says.

The team also developed a series of built-ins that were based on Shaker philosophy. The chairs were designed in Germany, fabricated in Italy and hang on the walls on a Shaker-like peg. When you take a chair off the wall it opens into a full chair. "It makes it very light," he says, "and you don't have a lot of surface area taken up by furniture when you aren't using it."

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UK's house had about 6,000 visitors daily.

Outside, students artfully translated photographic images by Lee Ann Paynter '09 FA into an LED backlit, perforated cement rainscreen facade that illuminates the surrounding deck and rain-water collection system. Regional flora and fauna watered by an innovative pulse-irrigation system designed at UK completes the landscaping.

The Start Of Something 'Big'

Two years ago the UK team met with individuals from around Kentucky to solicit ideas about what types of innovations would be marketable and included in the house design. There was a sentiment that the house should bring together the beauty of traditional Kentucky elements with modern high-performance and energy-efficient systems that would result in a net-zero energy home — meaning it has to create any energy it needs without tapping into auxiliary power.

"We had three major objectives," says Colliver. "Building technical capacity, achieving a net-zero house in Kentucky proving that solar energy does work, and designing and constructing a building that would be attractive, marketable, and appeal to homeowners."

Colliver says that building technical capacity means increasing the knowledge of people who are working in the solar field, not just students and faculty. "We also engage others with our research programs as we work with vendors and partners who have helped us develop concepts for our house," he says.

"There are no shortcuts to success. Cutting just one corner will always produce two more."

When the original proposal for the project was finalized, Colliver says he and Luhan put it up

against UK's Strategic Plan and were gratified that many objectives in the proposal were parallel to UK's key objectives. "Education, research and outreach into the community is truly exemplified in the project we have here," he says.

The S.KY Blue team began actual construction of the house in 2009, building the structure inside an industrial-looking building behind Commonwealth Stadium.

"Because the house is so small, we had to create the illusion that it was big," Hobbs says. "So we faked it by using an open floor plan, high ceilings and glass walls."

Hobbs says one of the most rewarding aspects of the project is

Ricky Williams
'09 Mechanical Engineering
San Antonio, Texas



Greg Luhan gives tour to Dr. and Mrs. Todd.