Solar’s bright future is now

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A tidy village dedicated to the future of green, solar-powered living has taken over the heart of the National Mall, where 20 teams of college students are vying to see who can build the most appealing energy-efficient home.

The teams, from universities in North America and Europe, are competing in the Department of Energy’s biennial Solar Decathlon, which runs through October 18. The challenge: design and build a prototype house that can provide the comforts of home while generating all the energy residents need from the sun’s rays. Teams get bonus points if they can produce surplus electricity and sell it back to the power company.

The transformation began on September 30, when the first flatbed trucks carrying building modules rolled onto the Mall across from the Smithsonian Castle. Student-led teams, backed by professional builders, suppliers and advisers, turned the Mall into a feverish construction site from early morning until late each evening. They built sleek pyramids, rusty silos, reclaimed-water gardens, glassy boxes and shaded porches. And each house sports an electric meter that can run in reverse, giving the team credit for each kilowatt it can sell into the local electric grid.

A decathlon, of course, consists of 10 events. These houses are being judged for their architecture, market viability, engineering, comfortable temperature and humidity, hot water production, appliances, entertainment, communication with the public, lighting design, and ability to produce at least as much energy as they consume.

The competition is designed to push solar technology forward — and to train the next generation of architects, engineers and other design pros to create homes that operate with nearly no carbon footprint, according to Richard King, who runs the project for the Energy Department.

“We don’t know how to do it in the United States; otherwise we’d have solar houses all over the place,” he said. In the past three decathlons, students have learned from their competitors and incorporated winning ideas into subsequent designs. “They learn from each other; they learn what really works,” he said. “It’s a wonderful iterative process of advancement.”

He noted that several teams that competed in past decathlons have gone on to form their own energy technology companies. And some technologies used in previous entries, such as structural beams made of fast-growing bamboo, are already starting to be commercialized.

This year’s contestants, chosen a year ago from 40 entries, were each awarded $100,000 from the Department of Energy to build the prototypes. That funding was supplemented by team fundraising and corporate sponsorships. From this point on, the teams are competing simply for bragging rights.
The teams have taken wildly different approaches to their designs. Some reflect how environmental conditions differ from Ontario to Arizona. Others reflect the

teams' distinct priorities. Several focus on cutting-edge technology, while others have tried to take off-the-shelf technology and produce a home that could be taken to the mass market quickly and affordably.

One example of the cutting-edge approach would be Team Spain's entry, built by Universidad Politecnica de Madrid. Unabashedly modern, the house sits under a large inverted pyramid that contains solar-electric panels and solar-heating water collectors. The pyramid is attached to the roof with a ball-and-socket mechanism that pivots the pyramid to track the sun. The sides of the pyramid also reflect sunlight into the house through skylights.

Virginia Tech's house incorporates sliding-glass walls on the north and south faces. The walls can be opened and closed automatically by an in-house computer linked to indoor climate sensors and an outdoor weather station. The walls can also be operated by iPhone.

The house designed by Technische Universitat Darmstadt in Germany — the school that took top honors in the last decathlon, in 2007 — is outfitted with an 11.1-kilowatt photovoltaic system designed to produce twice as much energy as the house consumes. The shiny, black, two-story structure is covered with single-crystal silicon solar panels on the roof and abut 250 thin-film solar panels on all four sides.

By contrast, the University of Illinois and University of Louisiana at Lafayette teams have focused on designing homes that could be put into production quickly by modular-home builders and that hearken back to traditional architectural styles native to their areas.

The Illinois entry looks almost like a Shaker design in its simplicity. The exterior siding was reused from an old barn in northern Illinois, but indoors it features engineered bamboo laminate board that replaces traditional wooden studs to support the walls. The fast-growing bamboo, a type of grass, is a greener alternative to pine and other woods typically used in construction. The house is powered by a 9-kilowatt photovoltaic system.

The prototype built by the University of Louisiana at Lafayette is designed to be a practical modular home that can withstand a major hurricane. It reflects traditional Cajun housing style by way of a "dogtrot" that cuts through the heart of the house. A dogtrot is a covered breezeway, long used in Southern architecture, that keeps the hot kitchen separate from the cooler living and sleeping areas. This dogtrot is updated with transparent sliding doors that can enclose the area when residents want it for an indoor space or open it up to the breeze when they want to use it as a porch.

Cornell University's house stands apart from the other entries with its agrarian-looking design. The house consists mainly of three rusted, corrugated steel cylinders intended to reference the grain silos on upstate New York farms. The house is powered by an 8-kilowatt photovoltaic system and features a custom-made computer driving the entertainment center.

One of the judges is Sarah Susanka, architect and author of "The Not So Big House" and other books that advocate multi-use spaces and high-quality

materials. Based on an early review of house plans, she said she was “blown away” by the creativity of this year’s entries.

“I don’t think many people have had the opportunity to tour well-designed smaller structures,” Susanka said. “That’s a real revelation to a lot of people.”

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