OFF THE GRID. SUSTAINABLE. EFFICIENT. GREEN. LEED CERTIFIED. These terms have become familiar buzzwords in a world facing a growing need to conserve energy and resources. They also describe an emerging movement in architecture as designers and builders seek to create comfortable, livable spaces that benefit both homeowners and the planet.

Through the Solar Decathlon, teams of college students take part in this movement by constructing solar-powered houses that are energy-efficient, cost-effective, and beautiful. Assembled side by side in a temporary neighborhood where they are toured by the public and judged by experts, these houses represent two years’ worth of work by students majoring in everything from landscape architecture to mechanical engineering. They show us what homes might look like in a sustainable future, as well as what we can do now to move in that direction.

by Heather Holmstrom

Every two years, the U.S. Department of Energy (DOE) hosts the Solar Decathlon, an international competition that challenges college students to design, build, and operate solar-powered houses. Teams of students design and build a house at their school, disassemble it, transport it across the country and sometimes oceans to the competition site, reassemble the house, and ready it for competition. The competition comprises 10 different contests, in which the houses and the teams that built them are scored on criteria ranging from architecture and engineering to market appeal and communications.

As an architecture student at the University of Nevada, Las Vegas (UNLV), I saw the Solar Decathlon as an opportunity to actually build a project, to see it go from drawings on a page to a house with a front door I could walk through. I got involved in the fall of my senior year, two years before the competition took place and even before UNLV’s proposal to join the competition had been submitted. I enrolled in the architecture studio class that researched the competition and previous winning projects as we thought about what a house designed and built by UNLV would look like. While my classmates and I worked on design concepts, another group of students, faculty, and university administrators assembled our proposal, which included UNLV’s technical and design innovations, team and fundraising structure, project planning, initial design concepts, and letters of support from the university administration and community partners. The proposal was submitted to the DOE in November 2011.

In January 2012, the DOE announced the 20 schools selected to compete in the 2013 Solar Decathlon in Irvine, California. We were ecstatic to be selected, but we didn’t have much time to celebrate. Even though we had been working hard before the announcement, the real work now lay ahead. With the formal acceptance, we had to develop partnerships within the university and community to ensure our success. Not only did we need help from professionals in a variety of fields, but we also needed to raise funds to construct the house, transport it to Irvine, and house up to 30 students during the competition.

Designing the Soul of the Desert

The remainder of 2012 was spent designing the house and working on public relations, and I remained on the team as I enrolled in UNLV’s Master of Architecture program that fall. As a team, we voted to name our home DesertSol, which refers to our climate’s most abundant resource, the sun (sol in Spanish), and also sounds like “desert soul,” reflecting our hope that it would embody the spirit of the Mojave Desert. We spent months of late nights and weekends discussing what we wanted DesertSol to be, designing spaces and landscapes, drawing construction documents, and calculating efficient mechanical, plumbing, and electrical systems.

Over 60 students majoring in disciplines including architecture, mechanical engineering, civil engineering, construction management, and journalism worked together to design DesertSol. This team of dedicated students was divided into three main groups: architecture, engineering, and communications. Each group worked on their assigned tasks, with the group leads meeting with the student project managers and faculty to discuss critical decisions. In my role as team lead for logistics and regulations, I worked with all the groups to make sure we met the Solar Decathlon requirements, helped manage the complex schedule of deadlines set by the
Steel screens laser-cut with a desert mesquite tree pattern provide shade without obscuring the view. During the winter, these shades retract to allow the sun to heat the home.

Homes built for the Solar Decathlon must be functional, efficient, and appealing. For one contest, teams must host a dinner party to demonstrate how well the home works as a living space.
DOE, and assembled the project manual, a document that lists the specifications for every material and piece of equipment used in the house.

**Getting Road-Ready**

When the calendar turned to 2013, we began the sprint toward the competition in September, preparing to start construction, finishing the construction documents, and seeking donations of tools and materials. To make it easier to transport the house to Irvine, we designed DesertSol to be built on two mobile steel chassis, similar to what mobile homes are built on. This allowed us to split the house into two parts, hook them up to semi trucks, and drive them down the highway. When the chassis were delivered in April, construction finally began. As a team, we decided to act as our own contractors as much as possible, allowing the students to gain hands-on experience by actually building the house.

While building DesertSol was the primary focus of the summer, we also had to meet a number of other submission deadlines for as-built drawings (which showed any changes made from the original construction documents), the project manual, a video presentation of DesertSol, and the public exhibit materials. The latter materials are critical: a major component of the Solar Decathlon is communicating the architectural concepts, engineering systems, and overall strategies to the general public. In addition to my role as team lead, I headed up the production of the exhibit materials, which included display boards for the house as well as handouts for everyone who visited DesertSol. I also planned the tour we would give to visitors.

We worked on construction right up to September 20, the day we transported the house to Irvine. The day before it left, we separated the house into its two parts and carefully wrapped it with boat wrap to protect it for the five-hour drive. Even so, it was nerve-racking to watch two years of hard work heading off seemingly precariously down the road.

**Inspected, Tour ed, and Scored**

In Irvine, the 19 teams (one team had dropped out, unable to complete and transport their house) were lined up along an old marine runway just as if it were a neighborhood street. Everyone had a little over a week to reassemble their house, make any necessary repairs or adjustments, furnish and decorate, and pass all the inspections by the Solar Decathlon organizers.

I had worked on DesertSol for two years, imagining the competition, and now it was finally here. I arrived in Irvine five days into the reconstruction, and walking down the street and finding DesertSol nearly complete was amazing. DesertSol looked right at home among the other houses, and I was excited that we had made it this far.

After the houses were constructed and inspections passed, the testing started. Each of the 10 contests was either measured or juried. Measured contests meant that some portion of that activity could actually be measured—how hot the water from the shower is, how much electricity the solar panels generate, what the indoor temperature is. For juried contests, experts in different areas came to score the house’s architecture, engineering systems, market appeal, or communication materials. These juried contests required that students present the house to the jurors to score. With a few other students, I gave the market appeal and communications presentations.

For four days during each of the two weeks when the houses were being measured and scored, they were open to the public to tour and learn about sustainable design. Every day of the public exhibit, we had hundreds of people walk through our home asking questions about DesertSol’s design and engineering and offering compliments. We were excited to share DesertSol with visitors, and it was especially gratifying to talk to people who had driven all the way from Las Vegas to support us.

**The Thrill (and Agony) of Competition**

At the start of the second weekend, the Solar Decathlon officials began announcing winners of the juried contests. Our scores in the ongoing measured contests had placed us second overall, but since every contest is worth 100 points, winning a juried contest could greatly improve a team’s overall ranking. On Thursday, they announced the winners of market appeal and affordability. We came in 13th place for affordability, a low ranking that we had expected, having chosen early on in the design to have a slightly more expensive house that would help us score higher in other contests such as appliances, engineering, and architecture. Our hopes revived when we came in first for market appeal! It was rewarding to know that out of all the houses, the jurors felt that our home best met the needs of our target market. We had maintained our second place overall ranking in the competition.

The next day, communications and architecture scores were announced. We won second place in communications and fifth in architecture. Having led much of the communications strategy with the public exhibit materials, I got to accept the trophy on behalf of the team. Once again, after another round of awards, DesertSol was in second place overall.

On the final day, the engineering scores would be announced—along with the overall winners of Solar Decathlon 2013. The rankings were extremely close; only a few points separated the top teams, so high scores in engineering would determine who would win. With two other teams, we tied for third place in engineering; but since only rankings were announced and not the number of points awarded, no one knew the final overall scores. As we waited to hear the top three teams, the anticipation was almost unbearable.

We were beyond excited to come in second place overall and first among the U.S. teams. The Vienna University of Technology from Austria won first place overall, beating us by less than five points in the closest Solar Decathlon competition ever held. Our two years of work and dedication had paid off, and we were proud to represent our university and city. As we walked back to DesertSol to start that day’s public exhibit, the organizers hung a second place plaque next to the sign for our house. Visitors congratulated us during the rest of the day’s tours, and we showed off all our awards on DesertSol’s kitchen table, the second place trophy front and center.
At Home in the Desert

After a week of disassembly, DesertSol was back on the highway, headed to what is now its permanent home: the Springs Preserve, a Las Vegas attraction that features museums, botanical gardens, trails, and exhibits to teach people about life in the Mojave Desert. Now located in exactly the environment it was designed for, DesertSol reopened to the public this past February and will continue to educate people about steps we can all take to use less water and energy and live more sustainably.

The Solar Decathlon was an amazing experience. Not many students get to tackle such a project while still in college. I gained invaluable skills about how architecture projects actually work by coordinating with engineers and contractors and working with the public and community. As I continue working on my graduate degree at UNLV, I am translating the knowledge I gained into new projects that provide a resource for the community, benefiting people and the environment just as DesertSol was designed to do.

Heather Holmstrom completed her Master of Architecture degree with a concentration in education this May. She is currently working for an architecture firm in Las Vegas while working toward her architect’s license. In her free time, Heather enjoys traveling and doing anything with an adrenaline rush, including skydiving, racing cars, and swimming with sharks.