

CORNELL UNIVERSITY SOLAR DECATHLON 2007

Dear Potential Sponsor:

Thank you for your interest in the October 2007 Cornell University Solar Decathlon Project (CUSD). Sponsored by the Department of Energy (DOE) and the National Renewable Energy Laboratory (NREL), the Solar Decathlon is a competition between university and college students from all over the world, with all registered teams working to design and construct a completely solar-powered home. Each team must research, design, and construct a self-sufficient, solar-powered home which will then be transported and assembled in Washington D.C. The goal is to design, build, and operate the most attractive and effective solar-powered home that will increase public awareness on solar energy.



CUSD's award-winning house in the 2005 competition in Washington DC

Cornell University is proud to have placed 2nd in their first National Solar Decathlon competition. Now in 2007, our cross collaborative, multi-disciplinary team is working hard to claim the 1st place title.

Over 100,000 visitors on the National Mall, 507 media stories, and over 3 million hits to the competition website, Cornell University's prestigious placing within their first year participating in the competition has brought international recognition to the university and its partners as leaders in sustainable building design.

We are proud to be welcoming sponsors to Cornell University's Solar Decathlon (CUSD) project. Support of CUSD is an investment in our planet's future. The use of solar energy provides a unique and innovative energy alternative that is considerate of the environment. CUSD offers all sponsors an outstanding opportunity to provide support in our exploration of the practical applications of solar power for the future. Sponsorship indicates a commitment to the discovery of renewable energy and the preservation of our environment. Your contribution provides the team with the ability to carry out our vision and goals. We invite all interested parties to join us in this exciting endeavor that will propel our world into a prominent, energy efficient future.



The 2005 house being built

In this package you will find:

- A synopsis of the tax-deductible Donation Procedure and Sponsorship Tier Recognition.

- A grant proposal describing the project and budget in detail.
- Major press mentions of C.U.'s team and links to articles
- A summary of media success for the 2005 national event.

We hope that you will help us build our “house of the future” by becoming a sponsor of the 2007 CUSD Team. Each donation is tax-deductible and our contributing partners will be recognized by the CUSD Team according to level of sponsorship. Please see the Sponsorship Tier Recognition table following this letter.

Thank you again for your generosity and support.

Sincerely,

The CUSD Team

2007 Cornell University Solar Decathlon

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Write address: Solar Decathlon Team. 138 Upson Hall. Cornell University. Ithaca, NY 14853

The DOE Solar Decathlon Website: http://www.eere.energy.gov/solar_decathlon

2007 C.U. Solar Decathlon Team Website: <http://www.cusd.cornell.edu>

Sponsorship Tier Recognition

Personal Donations

Level I	\$50 - \$99
Level II	\$100 - \$249
Level III	\$250 - \$499
Level IV	\$500 - \$999
Level V	\$1000 - \$2500
Level VI	> \$2500 Names on website (above other levels), along with recognition in the house on a framed list of top personal donors.

*Separate webpage from corporate donations

*Names along with the amount will be listed in groups separated by donation level. Font size will increase in each level, with the higher levels on top.

Corporate Donations

- For cash donations, amount will be listed.
- For material donations, cash value as well as the type of item donated will be listed (for online listings only). The cash value will be determined one of two ways:
 - 1.) If we received the material free of charge, value is retail price
 - 2.) If we received the material at a discount, value is the amount of the discount (from retail price).

Donation Tiers:

Saturn	Recognition of company and donation value on CUSD website plus a medium sized company logo as well as links to both the company's main website and product page (if a product was donated).	\$800 - \$1,299
Jupiter	Same recognition as Saturn plus a large logo with a word blurb with a maximum of 75 words.	\$1,300 - \$2,499
Mars	Same recognition as Jupiter with a blurb of 150 words max.	\$2,500 - \$4,999

Earth	Recognition in local press releases, in project documentation, on the CUSD website, and placement on sponsor list.	\$5,000-\$9,999
Venus	Recognition in local press releases, in project documentation, on the CUSD website, and placement on sponsor list.	\$10,000 - \$14,999
Mercury	Benefits include recognition in regional and national press releases, and in all project marketing campaigns; and placement on sponsor list, recognition in local press releases, in project documentation, and on the CUSD website.	\$15,000 - \$24,999
Sun	Same recognition as Mercury plus a press release announcing the donation.	\$25,000 and over

Donation Procedure & Student Contacts

To speak about tax-deductible, monetary gifts and in-kind donations of products and services, please call or email Dan Zook at 607-592-6227 or dlz5@cornell.edu. To make a cash donation directly, please send a check payable to Cornell University to the following address: Solar Decathlon Team. 138 Upson Hall. Cornell University. Ithaca, NY 14853.

Upon receiving your donation, you will be registered as a sponsor and assigned a specific Solar Decathlon team member who will be your ongoing contact to our program. Your contact will call you to get details that will be used in your sponsorship recognition and send you a letter of thanks. You will also receive a receipt for your own tax purposes.

I. Sponsor Benefits

Depending on their level of sponsorship, donors may be recognized at the CUSD display that will be on exhibit at the national competition next year. Sponsor recognition will also be prominently displayed around Cornell's campus to appropriately honor all who contribute. Sponsors of the 2005 CUSD team received a great deal of publicity for their support through the team's second place finish and we expect the 2007 team to do the same. Many thousands of potential customers perused the recesses of our house to discover the sources of the revolutionary products and technologies that were on display. In addition to this exposure, we will place all of our sponsors on the team website for additional publicity.



students look at prospective designs for the 2007 CUSD house

Grant Proposal

The 2007 Cornell University Solar Decathlon Project

I. Abstract

The Solar Decathlon is a competition between university and college students from all over the world, with all registered teams working to design and construct a completely solar-powered home. Sponsored by the U.S. Department of Energy (DOE) and the National Renewable Energy Laboratory (NREL), the next Solar Decathlon competition is scheduled for October of 2007. As in years past, each of the competing teams must research, design, and construct a solar-powered home, which will then be transported and assembled on the National Mall in Washington D.C. The goal is to design, build and operate the most attractive, effective, 500-square foot mobile house exclusively powered by solar energy.

II. Mission Statement

We are an interdisciplinary team committed to educating our peers and the public through the design and construction of an economically and environmentally scalable solar home.

The 2007 house applies a flexible framework to adapt to the needs of a changing society.

III. Project Description

Why Solar Energy?

With fossil fuels providing 85% of the world's energy and record levels of CO₂ in the atmosphere, society is facing an impending energy and environmental crisis. Not only must we contend with the inevitable exhaustion of fossil fuels, but also the adverse effects of the pollution caused by their consumption. Rethinking American residential energy use is critical in tackling this issue; a paradigm shift could ameliorate our situation as well as spur sustainable energy innovations in other sectors.

Why CUSD?

Cornell University Solar Decathlon (CUSD) team will change public perception of renewable energy in the residential market by effectively showing its commercial viability, scientific effi-

cacy, and present necessity. The 2007 team will build upon the objectives and experiences of our 2005 predecessor. In particular, the 2007 team acknowledges the importance of one of the main objectives of the 2005 team, which was to make an affordable and reproducible home. While we consider the 2005 house's second place finish a resounding success, we see an opportunity to expand our focus. Now that the Cornell team has successfully completed one full competition and has experienced the whole process, we feel we are in a prime position to expand our objectives beyond the scope of just cost-effective housing. We will take this opportunity to rethink our design decisions and component selection. In addition to commercial viability, we will emphasize architectural value and consumer appeal. We also hope to build upon the knowledge base developed by the 2005 CUSD team by conducting building science research and exploring new technologies.

What does CUSD have to offer?

The CUSD home will embody more than a showcase for technical excellence. Our design process will involve collaborative interaction, increasing the awareness of the Cornell community to sustainable energy. This student-run project will involve tightly-knit collaboration between students in engineering, architecture, business, landscape architecture, and many other disciplines. The CUSD house will communicate our investigations and discoveries in ways that will inspire and encourage observers to participate in a transition toward renewable energy and sustainability. Along the path to building our house, CUSD will create many educational opportunities at Cornell and within the Ithaca community. Our multi-faceted approach to this design challenge demonstrates commitment to excellence in research, innovation, and performance.



Architecture students looking over proposed plans for the 2007 competition

Student Involvement

CUSD's 2007 Solar Decathlon Team is comprised of approximately 90 graduate and undergraduate students working under the direction of 3 faculty advisors and 12 student team leaders. Professor Zellman Warhaft of Cornell's Mechanical and Aerospace Engineering Department was the lead faculty advisor of the 2005 CUSD team and will continue to direct the current team.

As an intercollegiate student competition, the Solar Decathlon demands student involvement. Comprised of over 90 students with representation in six of the seven undergraduate colleges at Cornell, CUSD draws together a unique group of students for a common goal. This rare opportunity to apply extensive planning and teamwork to real world applications not only allows CUSD members to contribute to a noble cause, but also prepares them for opportunities outside of CUSD and Cornell.

IV. Project Costs and Expenditures

There are many costs that the team must assess over the competition's two-year course, most of which may be inferred based on the costs for the 2005 house. Our 2005 experience in the competition will help the team budget more effectively and will provide contacts that are already familiar with our needs, thereby streamlining our work with them. Our largest expenditures will come in the form of building materials. We hope to procure a significant portion of these expensive materials through donations, as was done in the past. While the team will acquire building materials from many different vendors, the expenses incurred by the 2005 team can be used to estimate the project costs for the 2007 team.

Primary house costs for 2005, including construction materials, the HVAC system, major appliances, plumbing, and lighting, cost the team approximately \$100,000. These systems and materials were valued at approximately \$255,000, so the team received a significant discount. The total value of material donations for the 2005 project came to about \$190,000. This comprises more than half of the total donations to the 2005 team. Our team's recent success should allow us to negotiate greater discounts from previous vendors and significant discounts from new vendors. We hope to acquire more materials as full donations.

Secondary house costs including landscaping, furniture, and other decorations and small appliances cost the 2005 team approximately \$19,000. These costs will probably vary significantly from those of the 2005 team. For example, landscaping costs depend on the garden's purpose; a garden designed solely for aesthetic value will have a different cost than a garden designed to grow edible plants. Nevertheless, it is clear from this number that the secondary house costs will not be major expenditures.

Other, additional 2005 project costs including non-student labor, house transportation, tools, and fundraising came to approximately \$110,000. This total will be lower for the 2007 team because of our experience with 2005 project. We have better knowledge of the items comprising this cost and are better equipped to shop around for superior and cheaper products and vendors. These additional project costs can easily run over budget if not carefully monitored. To prevent this, we will create a comprehensive budget and accounting system to ensure that the expense of these additional items do not exceed their worth. The team's paper advertising provides an excellent example of this. Printing costs can be minimized by finding the right vendor or even buying our own equipment. Media guides and other promotional brochures are costly but provide valuable

services. Sent out to various media contacts and potential donors, the media guide will contain a team summary, contact information, pictures, and other pertinent information that will promote our team and engender support. Beyond the media guide, we will use quarter cards, posters, and presentation handouts to raise awareness and recruit more members. These posters, booklets, postcards, and pamphlets are extremely important to the continued growth of our team but also expensive. Consequently, we will carefully factor such costs into our budget to maximize effectiveness and minimize cost. These paper products will be designed and written entirely by students, as was done on the previous team. To take advantage of the breadth of majors available in our recruiting pool, we will apply the skills of graphic design and communications students to produce excellent paper products without necessitating the use of an outside company.

Another costly aspect we must consider is labor. Although we have a great number of willing and dedicated students, certain aspects of construction remain outside our range of knowledge and expertise. It will therefore be necessary to find outside help and instruction to complete certain aspects of the house’s construction. This aid will probably come at a cost and therefore we must account for such outside assistance in our budget. Other miscellaneous costs include promotional memorabilia given to alumni during presentations and office materials for organizational purposes. The budget will be created by estimating expenditures and determining the total amount of desired funding.

Estimated 2007 CUSD Solar Decathlon Project Budget

Primary Materials	\$\$
Floor structure, insulation, and finishes	15,000
Hard-wired lighting / House electrical	20,000
HVAC System	20,000
Major Appliances	10,000
Misc components and finishes	25,000
Plumbing (including fixtures)	5,000
Roof/ceiling structure, insulation, and finishes	15,000
Solar electric system	100,000
Wall structure, insulation, and finishes	25,000
Water heating	5,000
Windows and doors	10,000
TOTAL Primary Materials	250,000
Direct Labor	\$\$
Plumbing	5,250
Electrical	5,250
TOTAL Direct Labor	10,500

Secondary Materials	\$\$
Landscaping	10,000
Furniture	5,000
Decorations and kitchenware, window & door coverings, shades	1,000
Small appliances and plug-in electronics	7,500
TOTAL Secondary Materials	23,500
Other Materials	\$\$
Communications / Outreach / Fundraising	15,000
IT / Server	10,000
TOTAL Other Materials	25,000
Other Labor	\$\$
Summer internship salaries	80,000
Faculty and staff	10,500
Lecturers	10,000
TOTAL Non-student Labor	100,500
Other Direct Costs	\$\$
House transportation	40,000
Route survey	1,500
Travel to Washington DC	3,000
TOTAL Other Direct Costs	41,500

GRAND TOTAL 451,000

V. Long Term Research

An important new addition to this year's CUSD team is the creation of a long term research sub-team. In order to reach Solar Decathlon's ambitious goal of building a demonstrable, solar-powered home that reduces the "whole-house levelized energy costs to \$0.10/kWh" by 2015, the team must find and develop innovative building system designs and energy collection technologies. Unfortunately, the compressed two-year competition cycle limits the participants' ability to pursue technological developments. In response, CUSD will incorporate this long-term research sub-team dedicated to providing innovative building systems for Solar Decathlon competitions beyond 2007. Cornell University, a leading research institution, is especially well suited for developing emerging building design and construction ideas into reliable and mature systems.

CUSD will have the opportunity to tap into well-established research programs throughout the University. One intriguing line of potential research is the use of genetic algorithms, simulation programs based on ideas from Evolutionary Theory, to develop original and efficient structural systems for mounting photovoltaic panels or incorporating them into innovative wall systems. Professor Hod Lipson has been developing bio-inspired robots using genetic algorithms at the Computation Synthesis Lab here at Cornell and has expressed interest in aiding our research in this area.

Fuel Cells also provide a promising research topic. With hydrogen fuel cell technology forming a new frontier of energy conversion and storage, CUSD is fortunate to have the Cornell Fuel Cell Institute as an academic resource that will allow quick identification and procurement of the best existing fuel cell technologies. One of the main advantages of using a fuel cell is that it is “clean,” producing only water and heat. This, coupled with progress in energy conversion efficiency, may enable fuel cells to become a viable energy storage method. Because fuel cell technology is not completely developed, fully implemented household applications are costly. However, given the current pace of development, the team will continue to monitor and research the practicality of hydrogen fuel cells.

The final responsibility of the long term research sub-team is to maintain and monitor the 2005 CUSD house. A weather datalogging system will be coupled with the datalogging system in place in the finished house, providing future CUSD teams with interior and exterior conditions data. Having data on interior and exterior conditions of a house will aid CUSD engineers in understanding and optimizing energy simulators. Also, building systems can be carefully monitored to determine how they perform over several seasons. Firsthand knowledge of how buildings age and where they eventually fail will aid the design process of every new building.

The Long Term Research sub-team will call for proposal submissions in the spring semester of 2006. Proposals will be evaluated by the group members on their feasibility, potential tangible benefits for future projects, and budget. A few projects will be chosen to be funded for future work and this will be a continued, cyclic process.

VI. Community Outreach

Ithaca and upstate New York are very environmentally conscious areas. There are many programs in the area surrounding Cornell that exhibit examples of renewable energy. The Ithaca/Tompkins County Library, for example, has a 143 kW photovoltaic system on its roof. Another good example of local renewable energy systems is the sustainably designed community, EcoVillage of Ithaca; EcoVillage is a community consisting of over thirty households that utilize passive and active solar design. As we have in the past, we plan on approaching the New York State Energy Research and Development Authority (NYSERDA), and partnering with them to benefit New York State with renewable energy research. When building our solar home, CUSD will be able to consult these and many other local resources in order to understand the real world issues and design considerations of renewable energy systems.

CUSD greatly values community awareness of solar design and support of our project. Accordingly, the team will continue our educational outreach efforts in the Ithaca area as well as in Washington, DC during the 2007 competition. Carrying over from our outreach work from the 2005 competition, we will continue to collaborate with Boyton Middle School, Dewitt Middle School, and the Alternative School. We also hope to broaden our influence by developing contacts at other local schools and institutions. We are exploring opportunities to work with local community groups such as the Science Center, the Ithaca Library, and the Museum of the Earth.

For our school outreach, CUSD team members will work with participating teachers to supplement the schools' energy curricula with sustainable energy and green design concepts. The team will also continue to guest-teach and run class activities. Furthermore, the CUSD team will openly invite teachers to bring their classes on field trips to see the completed 2005 house and our work on the 2007 house.

The team will offer similar outreach opportunities to schools in the Washington, DC area during the 2007 competition. Team members will continue contact with Sidwell Friends School and Thomas Jefferson High School for Science and Technology and will try to develop contact with more schools in the DC area. Schools will have an opportunity for a CUSD guest speaker visit and then private tours of the house during the 2007 competition.

Finally, the 2007 team aspires to reach out to as many Cornell University students, faculty, and staff as possible. In addition to open houses for the 2005 house, the team is planning other campus outreach events. For instance, the 2005 team ran a "Solar Decathlon Decathlon" event to increase awareness of green design, sustainability, and the Solar Decathlon project on campus. This event involved a field day where teams from different freshman residence halls competed in ten events while CUSD team members informed spectators and players about the Solar Decathlon competition and recruited new team members.

VII. More Information

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