

Request for Educational Funding of Solar Decathlon 2011

Background

The Solar Decathlon is a prestigious bi-annual competition sponsored by the U.S. Department of Energy (DOE) and their National Renewable Energy Laboratory (NREL). Each student team designs, builds and operates an energy efficient, solar-powered home for this competition. Teams are required to meet specific criteria, demonstrating their ability to design and build an innovative, entirely solar-powered, 800-square-foot home from scratch. Each house must produce enough electricity and hot water to perform all the functions of a home. The Solar Decathlon event is a highly publicized national event.

Students from the University of Illinois have competed in the 2007 and 2009 Solar Decathlon (SD) competitions. The 2009 team was very successful and obtained second place in the competition last October. As Chancellor Herman wrote in his letter of congratulations to the team: *“Finishing in the top two among the very best in the nation and Europe is an achievement that has made the entire Illinois family proud. ... The creativity and hard work you each contributed to this effort shows how the interdisciplinary approach at Illinois can lead to amazing accomplishment.”*

The SD provides a highly visible demonstration of Illinois students’ knowledge and creativity in design and research advancement for solar energy, home systems efficiency, as well as green building design and construction. During the 2009 competition hundreds of thousands of people, including many congressmen, observed the powerful combination of solar energy, energy efficiency and home design. In addition to the great learning experiences for hundreds of students involved in this unique multi-disciplinary project, it is also a great opportunity to promote University of Illinois and highlight the achievements at Illinois in the national media.

Even as the 2009 SD house was being evaluated on the National Mall, a team of students and faculty began to plan for the 2011 competition. The process for being selected began with submission of our proposals November 18, 2009. In January 2010 we learned that we were one of more than 40 teams that would be allowed to develop a schematic design and submit design drawings and a model on March 18 for a second round entry review.¹ We found April 8th that we were one of the twenty teams of college and university students selected from around the world to participate in the design development, construction, and October 2011 competition on the Washington, D.C. National Mall.

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Actually the original information provided by DOE was for a December 18, 2009 announcement of teams selected for the competition. The request for a schematic design, including a model, that was received on January 18, 2010 was not expected and disrupted our original planning and design process.

Overview of Building the Entry

The design development that led to the March 15 schematic design was primarily the effort of twelve undergraduate and graduate students, with five faculty members support. Students were able to take ARCH 495 to obtain credit for this work. In the last competition, a weakness of the Illinois entry was the lack of a specific use/market. Decisions made during the development of the schematic design included focusing on the construction of a unit that could supply disaster housing. This added several issues including portability and helped to focus many other decisions. Currently the class has a May 5 deadline for submission of preliminary BIM documentation of the schematic design.

On May 21 and 22, four to eight members of the team will be needed in Washington, D.C. to discuss the schematic design as represented by the model submitted in March and the BIM documents finalized in May. Representatives of DOE will discuss the submission in terms of each of the ten competition elements:

- Architecture contest (juried)
- Market Appeal contest (juried)
- Engineering contest (juried)
- Communications contest (juried)
- Affordability contest (juried)
- Comfort Zone contest (measured)
- Hot Water contest (measured)
- Appliances contest (measured)
- Home Entertainment contest (measured and juried)
- Energy Balance contest (measured).

During summer 2010, there will be a need to develop a website for the Illinois 2011 SD entry. While there continues to be an SD 2009 website, this new site will provide access to all faculty and students on campus, as well as the general public, to the 2011 SD project. This will contribute to the general goals of educating students and the public about the opportunities in solar photovoltaic technology, and also to high performance buildings in general. DOE expects a website to be finished by August 17th 2010.

During the Fall 2010 semester there will be classes in Agricultural and Biological Engineering, Architecture, Electrical and Computer Engineering, Mechanical Engineering, Civil Engineering, and Art & Design, which will be taught by SD team faculty. Each class will focus on the development of one aspect of the decathlon project. For example, Mark Taylor in Architecture will teach a class studying the building envelope and novel ways to incorporate the ubiquitous CONEX (CONTainer EXpress) container into a design. These steel shells represent a reliable container for shipping disaster housing around the world. The high thermal conductivity of steel means that their use as housing units will require attention to the suppression of solar heat gain and the transmission of heat through the entire building envelope. Xinlei Wang in ABE will teach a class developing an HVAC system that will work within the framework of the existing schematic design. It will be important during this time to have a graduate student

responsible for coordinating the work of these individual classes, insuring an overall solution of cutting edge elements that fit together and facilitate learning across the separate classes.

During the Spring 2011 semester, the work of the individual classes will continue as pieces are fabricated. It will be important during this time to have coordination of individual classes. For example, decisions implemented in ECE in constructing a PV array will need to be consistent with the building envelope and structure being developed in Architecture. This will again be a place where it will be important to have a graduate student responsible for coordinating the work of these individual classes, insuring an overall solution of cutting edge elements that fit together and facilitating learning across the separate classes.

Construction of the actual SD entry will begin during the Spring 2011 semester, and will continue through the summer. During the Fall 2011 semester, the 2011 SD house will have to be disassembled, packed, shipped to Washington, D.C., reassembled, participate in the National Mall SD events, disassembled, packed and shipped to Champaign, and finally reassembled for continuing educational and research purposes.

While most student work in the Fall 2010 will occur in the individual classes taught by SD team faculty, opportunities for student participation will increase during all of the months of 2011. Experience has indicated that some students will want to volunteer for short time spans, and others will want to become committed members of the team. It seems important to maximize the educational potential of the SD project for all students. This will require coordination and instruction beyond what will occur in the individual classes, and beyond that provided by the individual faculty.

Proposal

This proposal is to support activities of the SD 2011 that will maximize its educational impact on team participants, student volunteers, the campus and the public. To maximize educational impact we seek to 1) increase the educational content of SD activities, 2) increase the opportunities to receive that content, and 3) ensure student participation in the SD activities in Washington D.C. and on the campus. There are three elements that will maximize the educational outcomes of the SD 2011 effort.

1) Increase Educational Content: While individual departments, schools and colleges will be hosting classes as a part of the SD process, the information in those classes will be limited to the experience of a single faculty member. While excellent faculty are participating and leading these courses, there are individuals from outside of the university that can provide important information at various stages of the process. The educational content can be increased by bringing in guest lecturers and consultants. We request that SSC sponsor six lecturers/consultants over the next two years with the provision of \$6,000 for honoraria and expenses.

Educational content of the individual courses can also be increased by close coordination among the several classes that will be taught in the Fall 2010 semester. While the

academic units can be thought of as being responsible for the support of a single class, there is no unit that can be expected to provide overall coordination and support. We request that SSC fund a 25% Graduate Assistantship during the Fall 2010 semester to promote and coordinate the educational activities of the individual classes. We also request that the SSC grant a provision of \$2,000 to pay a student hourly during the summer to do research and help coordinate and organize all the classes that will be taking place over the next 3 semesters. This will ensure that this is good communication and direction in all of the classes.

2) Increase Student Opportunities Receive Content. Students that participate in the SD classes will obviously have an educational experience, but what about others? We know that many learned about the progress of the SD 2009 house by following its progress on our website. We want to maximize that opportunity as we proceed with the 2011 house. It will be important to have a well designed website which is kept up-to-date. To do this we request that SSC fund a 17% Graduate Assistantship to support a graduate assistantship for a web designer for this summer and the following three semesters.

Classes in all areas of campus will need to be created or modified. These classes will also require funding in order to support the education research that needs to be done. One of the exciting components of this project is the collaboration between the different disciplines. Materials will need to be bought in order to facilitate tests/trials done by engineers, architects, etc... We are requesting \$5,000 in support for materials, such as a Conex Shipping Container to be shared and used by many of the classes for tests. We are also requesting 2,000 to buy the necessary software to perform energy modeling and help enhance students educational understanding. Lastly, we are requesting \$15,000 for the new classes and the modification of classes that will happen over the next 3 semesters.

While the web designer will ensure that there are broad opportunities for all students on campus, and for the public in general, to learn about the progress of the SD house, we believe that there are important additional opportunities for learning. One opportunity would be to provide information to high schools in Illinois that interested classes could use in conjunction with the SD website to study alternative energy and sustainable housing. A student could prepare information to distribute during the Fall 2010 semester so that high schools could begin to study the SD house in the spring of 2011. This might be done by increasing the appointment of the web designer for two semesters, or working with a graduate student from the College of Education.

The educational opportunities on campus would be maximized by having a graduate assistant coordinate student volunteers during the fall 2010, spring, summer and first half of fall of 2011. While the students that are members of the classes in the Fall 2010 semester will form a core, there will be many other students that will want to participate in the construction of the house. To be useful they must be carefully coordinated and asked to do tasks appropriate to their skill level and at an appropriate time in the construction process. In addition a graduate student in this position could provide some overall content about alternative energy and sustainable design, as well as training on a

few basic construction skills. Without such a coordinator, volunteers can actually slow the pace of the project and introduce errors into the design and construction of the home. We request funding for a 50% graduate assistantship for the two full semesters and summer in calendar year 2011, as well as a 25% appointment for the overall coordination in Fall 2011.

Finally we would like to expose as many students as possible to the SD 2011 house and issues of energy and sustainability by developing a 2-3 hour course for the Spring Semester 2011. This course would be designed in part to be delivered online. This would allow a substantial enrollment substantial flexibility in scheduling. We request funding for 17% graduate assistantship for a graduate student familiar with online instructional design for the fall 2010 semester, and a 17% graduate assistantship funding for a graduate student in spring 2011 and fall 2011 to lead online discussion sections and otherwise be involved in keeping the content current with the progress on the house.

3) Ensure Student Participation throughout the competition: There are at least three times that students will have the opportunity to participate in events in Washington D.C. May 21-23 will provide student leaders of the SD team with the opportunity to discuss their house with disciplinary experts from DOE and it NREL staff and contractors. To assist in obtaining the maximum participation by student leaders at this event we request that SSC provide \$500 for each of six members of the team that attend this event. These funds will be used to offset the costs of transportation, meals, and lodging.

The second time that students will have an opportunity to participate in educational activities in Orlando, Florida in January 2011. At this conference, students will spend 5 days in at the National Building Conference. The 6 student that will attend this event will have the opportunity to present the team's model and design to builders around the world. It will also provide an opportunity for the students to interact with green builders and learn about new technologies that can be brought back and shared with the rest of the team. We are requesting approximately \$1,000 per students to cover the cost of transportation, lodging, and food.

Finally, students will have an opportunity to participate in educational activities in Washington, D.C., will be during the three weeks of Solar Decathlon activities on the National Mall during October 2011. This is an amazing opportunity to participate in the evaluation of the house, to interact with the other 19 teams and learn from their designs, to interact with the public, and to interact with members of congress and others in the federal government. Lodging in Washington, D.C. is expensive. Government rates in hotels are over \$225 per night. Students may need to be in Washington D.C. for over three weeks. We would like up to 30 students to have the opportunity to be in Washington for some part of the Decathlon. We are requesting support of \$40,000 to be used for transportation, meals, and lodging of team participants.

Outcomes

The metrics for judging the success of the educational impact of the SD are more difficult to quantify than the metrics for judging reductions in greenhouse gases or energy use.

Still we all know that real learning is increased by the opportunity to obtain information and increase the amount of information available. Records will be kept of student involvement, volunteers, website access, and other available counts. We will set targets for student involvement and compare the actual participation to those targets, and when possible, to participation in prior years.

Budget

We estimate that at least \$700,000 will eventually be required to support this project. DOE will provide \$100,000 to each team. We will be seeking funds from industry, foundations, and units of the University. At this time we are requesting funds from the Student Sustainability Committee to support activities that will increase the educational aspect of designing and constructing the SD house.

There is an immediate need for \$3,000 to support travel for students to the initial meeting with DOE in May, \$3,000 to develop an appropriate web site before August, and \$2,000 to support a student hourly position this summer. The following budget outlines these and other costs contained in this proposal.

Educational Needs	Amount Requested
Website Creation (student hourly)	3,000.00
Summer Student Hourly	2,000.00
Six Lecturers/Consultants	6,000.00
Classes	
Course Modification	5,000.00
Course Creation	10,000.00
Course Materials	5,000.00
Software Licenses	2,000.00
Graduate Assitantships	
25% Coordinate Educational Activities Fall 2010	4,500.00
25% Coordinate Educational Activities Spring 2011	4,500.00
17% Website Designer Fall 2010	2,250.00
17% Website Designer Spring 2011	2,250.00
17% Website Designer Fall 2011	2,250.00
Increasing Web Designers Assitanship (2 semsters)	4,500.00
50% Overall Coordination Fall 2010	9,000.00
50% Overall Coordination Spring 2011	9,000.00
50% Overall Coordination Summer 2011	4,500.00
25% Overall Coordination Fall 2011	4,500.00
17% Online Web Course Development Fall 2010	2,250.00
17% Lead online discussion sections Spring 2011	2,250.00
17% Lead online discussion sections Fall 2011	2,250.00
Travel	
May 21-23 Meeting in Washington DC	3,000.00
January Meeting in Orlando	6,000.00
October Competition on the Mall	40,000.00
Total	136,000

We are requesting to be considered for a **\$100,000** grant amount. While this amount would not cover all educational costs for the entirety of the project, it would help facilitate the success of a large majority of it. Thank you again for your support in the 2009 competition. We look forward to having the opportunity to work with you again. Please let me know if you have any questions.

Sincerely,

Megan Smith

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