student sustainability committee
university of illinois at urbana-champaign

APPLICATION INFORMATION

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Detailed Project Description:

Background

The goal of the project will be to assess the feasibility for solar photovoltaic and solar thermal applications at 5 buildings on the University of Illinois campus at Urbana-Champaign. It will be conducted by Engineers and Scientists at the Business Innovation Services (BIS) unit that have considerable experience with helping organizations become more sustainable through more efficient utilization of resources. It is anticipated that implementing solar energy on campus buildings will help establish the U of I as leaders in solar technology diffusion.

Sustainability is a growing area of interest for many universities across the United States and how the issue of sustainability on campus is addressed depends on the university and the community. Many universities are evaluating how to implement renewable and sustainable energy practices on campus, or have already done so at the direction of the students, alumni, or president. The size of solar technology installations at other Universities range from demonstration units to large arrays that can offset significant energy usage. Oberlin College is one university known for its sustainable practices, not only in renewable energy technologies, but also in water conservation, and energy efficiency. The college has a 100kW solar parking pavilion that was installed in 2006. The University of Hawaii, University of Hartford, Emory

University, California State University, and Arizona State University all have solar technology applications on their campuses; some installed as part of a PV technology course.

Project staff will create an initial list of the portfolio of buildings on campus that would be eligible, refine the initial list of buildings to those buildings that have visibility to the student population, can provide significant impact to the existing building loads, and identify those buildings whose physical structure could support the proposed installations. This work would be conducted in concert with the site users, Facility and Services, and campus Architect to ensure coordination and buy-in from all affected groups.

This is the first step towards implementing renewable energy technologies and expanding the visibility of these efforts on campus. By installing solar energy technologies on campus, the University will be using renewable technology to off-set energy purchased from the grid. Solar technologies in particular are useful in that their effectiveness is highest during the summer periods when the electric grid is taxed the most with electric demand. Solar energy technologies are relatively low maintenance, with an expected life of 25 or more years.

Project Plan

Project staff will begin this project by organizing and evaluating a list of potential buildings. This will require considerable coordination with F & S. Information collected in this step will include building use, size (square feet, stories, etc.), construction, electrical and structural drawings, and age of the buildings and current mechanical systems, if available.

Project staff will then apply constraints to refine building list, including:

- Current building use, physical characteristics
- Visibility to students, community
- Surrounding environment
- Implementation issues (requires site visit and access to attic/mechanical spaces)

Based on this analysis, project staff will meet with appropriate F&S personnel and representatives from the Student Sustainability Committee, to discuss and select the 5 buildings that will receive a detailed on-site evaluation.

Identifying appropriate locations to install the solar technologies will be done according to the following criteria: potential application, visibility to members of the University community, building characteristics, and the surrounding environment. Each of these criteria will be investigated as part of this opportunity assessment.

- ***Application:*** Out of the portfolio of buildings, 5 buildings will be selected for solar feasibility analysis based on the usefulness of solar energy technologies to be applied to the building. This includes understanding the major energy using systems, the electrical system of the building, and the usage of the facility. For solar photovoltaic, the electrical system configuration will be key, whereas for solar thermal technologies, the use of hot water in the building and its location to the proposed installation site will be key.

- ***Visibility:*** Sustainability initiatives achieve greater support when the installed technologies are visible to the community: both the students and staff and the larger community at the University. Though this may be difficult for some of the buildings; however, there are likely buildings that have visibility either from the ground (preferable) or from adjacent buildings. Another mechanism for visibility that the UIUC BIS can address for future consideration, during the implementation planning stages, is the monitoring of the generation of the installed solar photovoltaics and providing that information to the public through a website, newsletter, or kiosk in a high traffic area.

- ***Surrounding Environment:*** Solar technologies rely on ready access to the sun in order to effectively and efficiently turn the sun into useable energy. The surrounding buildings, trees, and other obstructions will be considered during the opportunity assessment. The potential for efficiency reduction will be considered when revising the building list.

- ***Building Characteristics:*** The physical building characteristics will also be considered in the opportunity assessments. Issues such as roof structure and construction, visibility of the building, surrounding environment, electrical system condition, and building loads will be evaluated when determining the initial 5 buildings. How the solar technologies will be installed and accessibility to the proposed installation locations are key factors. This will include evaluating potential mounting mechanisms, orientation, mounting angle, and other installation issues. This will all impact the location and size of the solar technologies to be proposed.

BIS staff will obtain necessary permissions (site user, F&S, Architecture review) to conduct the assessments prior to accessing the buildings. Based on the on-site analysis of the criteria described above, a report will be developed and provided to SSC that includes analysis and recommendations related to these criteria. Additionally, the report will specify equipment and budget needs, as appropriate to prepare the projects for bid and implementation. However, BIS will not produce specific designs or drawings for the solar installations at individual buildings

Project Budget

Personnel	
Mike Chimack	$9,100
Tim Lindsey	Cost Share
Travel	$400
Lodging	$400
TOTAL	**$9,900**

Project Timeline

A projected timeline is provided below. BIS estimates that the project will take approximately 4 weeks to complete from the time the contract is approved. This schedule is contingent on F & S providing necessary access and permissions.

Activity	Week 1	Week 2	Week 3	Week 4
Evaluate and Select Potential Buildings				
Conduct On-Site Assessments				
Develop System Specifications				
Prepare Report and Present Results				

Energy, Environmental and Socioeconomic Impact

This project will ultimately lead to the generation of renewable energy from the installation of solar photovoltaics and solar thermal energy technologies in 5 campus buildings. The goal of this initial phase is to conduct an opportunity assessment to determine the location and benefit of installing these technologies on campus. In general, the Champaign/Urbana area has solar monthly average daily total solar resource value of 4.74 kWh/m^2/year. This value represents the solar resource available to a photovoltaic panel oriented due south at an angle from horizontal equal to the latitude of the collector location. This is therefore the maximum generation for a fixed flat plate collector that can be expected. Multiple such panels could likely be installed on the 5 buildings selected but a precise number will not be known until this feasibility study is completed.

Using this value, a 5kW fixed flat plate collector, installed at a 40 degree tilt, would generate approximately 6,225 kWh per year. This would offset approximately $500 per year in avoided electricity costs, or 10,408 lbs of CO2 for the same 5kW system. The size of the system selected for the 5 buildings is dependent on the building characteristics described above and the available budget and grants available.

Greenhouse Gas Impact

Using this value, a 5kW fixed flat plate collector, installed at a 40 degree tilt, would generate approximately 6,225 kWh per year. This would offset approximately $500 per year in avoided electricity costs, or 10,408 lbs of CO2 for the same 5kW system. The size of the systems selected for the 5 buildings will be dependent on the building characteristics described above and the budget, grants and other incentives available.

Other Environmental Impact and Metrics

Because solar photovoltaics achieve their maximum efficiency in generating energy during the peak hours of the summer months, installating solar photovoltaics can also help in reducing electric demand, which contributes to a more stable electric grid.

One of the ancillary goals of the project should be to employ Illinois-based companies for the technology and installation as appropriate or available.

Outreach and Education

One of the key aspects of this feasibility study is to identify buildings and areas that have high visibility to educate and promote renewable energy technologies on campus and to the greater community. Other outreach and education instances include press releases in local and university publications, presentation to student and university groups, and papers in appropriate conferences as applicable. The UIUC BIS understands that promoting the work in sustainability and renewable energy helps to educate and disseminate information to a broader audience. The majority of outreach and education will be as part of the implementation stage of this project. However, for the purposes of this opportunity assessment, the UIUC BIS will develop presentations to facilitate education of the university, its students and staff, and other interested parties in the sustainability efforts that are starting with this initial project. BIS staff will also work with up to 3 motivated U of I students who are interested in this project by including their participation in the on-site assessments. This will offer an excellent opportunity for these students to obtain first-hand knowledge and experience under the direction of highly experienced professionals.

Future Considerations

Ongoing Monitoring

For future consideration, during the implementation phase, UIUC BIS can further investigate incorporating energy metering and additional outreach in the form of a website or dashboard that monitors the energy generation by the installed technologies.

Solar Transpired Walls

Though not specifically a renewable energy, in some applications installing a solar thermal wall to preheat incoming outside air into large spaces may be appropriate. This passive method of using solar energy to preheat air using a dark colored wall can off-set space heating requirements. This technology has been used by the US Department of Energy at some of its facilities and national laboratory locations.