



Clean Energy Grant Application

EVERGREEN

THE EVERGREEN STATE COLLEGE

Please read the grant application guidelines prior to submitting your proposal. We will not consider incomplete applications. Completed applications should be e-mailed to the coordinator at cleanenergy@evergreen.edu before the deadline. For questions regarding the application process, contact the coordinator.

Project Title	Solar Thermal Monitoring System	
Project Lead	Name:	Steven Abercrombie
	E-mail:	
	Phone number:	
Student, Staff, Faculty, or Student Group: <i>(staff and faculty please name department)</i>	Evening and Weekend Studies	
<i>Students only</i>	Class standing:	
	Faculty or Staff sponsor:	
Campus Location	Sustainability Demo Mod	
Date	Sunday May 6, 2012	

Abstract	<p>The recent installation of solar hot water systems on the Sustainability Demo Mod is intended to help advance TESC towards carbon neutrality by 2020. Solar thermal technology can reduce greenhouse gas emissions and conserve natural resources through switching from fossil fuels to solar energy for water heating. The CEC supported this project with an understanding that this installation would also provide data that could be used in curriculum by future students. Two separate solar thermal systems were installed to provide comparative data. The project is ready to be among the first of its kind in directly comparing the efficiencies of evacuated tubes and flat plate solar thermal systems in our region.</p> <p>The current monitoring system installed on the systems only records a limited set of parameters (total energy output from each solar system) and requires a manual download via a memory card to analyze data. Additional funding from the CEC would allow for automated data collection that can be accessed via the web for academic use by faculty and students.</p>
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CEC Vote: (for office use only)

Proposed Motion	
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Moved:		Second:		
Yes:	No:	Abstain:	Absent:	Recusal:

Please respond to the following sections below. We ask that you present your proposal to the Clean Energy Committee to answer further questions about your project. If your project is funded we require you to publicize your work, and provide the committee with documentation, and a final report.

- If you require more space, please submit any additional documentation with your application.

Areas affected by proposed project: The committee reserves the right to have grant proposal reviewed by an authorized representative from affected areas prior to full review. Please refer to the grant guidelines to see if your project requires authorizations. Contact cleanenergy@evergreen.edu if you have any questions. Be sure to give yourself enough time to communicate with staff and faculty before the deadline. When you receive authorization, type the name of the representative below. Authorization will be verified.

Affected Area		Approval Required	Approval Received
Faculty / Staff Sponsor	Steve Abercrombie	Always	Yes
Director of Facilities			
Environmental Health & Safety Officer			
Campus Land Use Committee			
Academic Budget Dean			
Student Activities Advisor			
Science Operations Manager / Organic Farm Manager			
Residential and Dining Services			

Timeline

- Provide an estimated timeline listing the length of time from start to finish and detailing the length of time that each component will take.

1. Design	May - June 2012	4. Research / Construction	July 2012
2. Approval	June 2012	5. Present / Report	August 2012

3. Procurement	June 2012	6. Follow-up	Fall / Winter/ Spring 2013
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Detailed Project Description

Please include:

- Project goals
- Definition of sustainability and the relationship of the project to this definition
- Longevity and/or permanence of the project results on campus
- Location, including any concerns that may arise from the chosen site
- Previous experience directing projects of this nature
- If applicable, comparisons to similar projects at other campuses

Description	<p style="text-align: center;">Project Goals:</p> <p>This project will install an energy monitoring system to each of the two solar thermal systems on the Sustainability Demo Mod. Incorporating these monitoring systems will allow the college to conduct a side-by-side feasibility study between the evacuated tube and flat plate solar hot water heating systems. The data gathered will provide staff, students, and local professionals with direct comparative data. These energy monitors are the final link in the solar thermal project to expand research opportunities for current and future students and faculty in the field of sustainability.</p> <p style="text-align: center;">Definition of Sustainability and the relationship of the project to this definition:</p> <p>The Natural Step definition and framework for sustainability will be used to evaluate this project. The Natural Step Framework's definition of sustainability includes four system conditions (scientific principles) that lead to a sustainable society. These conditions, that must be met in order to have a sustainable society, are as follows:</p> <p style="padding-left: 40px;">In a sustainable society, nature is not subject to systematically increasing:</p> <ol style="list-style-type: none"> 1. concentrations of substances extracted from the Earth's crust; 2. concentrations of substances produced by society; 3. degradation by physical means and, in that society, 4. people are not subject to conditions that systematically undermine their capacity to meet their needs. <p>This definition draws clear, measurable and scientific definition of what is and what is not sustainable. The goal of this project is to reduce the production of energy that currently violate systems conditions 1, 2 and 3. These violations currently result from powering student housing. Through the installation of solar panels, in combination with other efficiency projects, student housing will be able negate violating any of the systems conditions for the production of its energy. There is still a long way to go for student housing to be considered sustainable, the installation of solar evacuated tubes and flat plates will be a strategic step towards the manifestation of a sustainable campus as defined by the natural step framework.</p> <p style="text-align: center;">Longevity and/or Permanence of Project Results on Campus:</p>
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Since the solar thermal system is already installed, this monitoring system will be designed to last the life of the system. Since information technology changes rapidly, the data collection and integration to a web-accessible database will be designed and funded by this request for a minimum of 5 years.

Location, including any concerns that may arise from the chosen site:
 The data monitoring equipment will be housed with the system tanks and pumps. There is electrical service, adequate space to house the equipment and a wireless or campus network connection accessible at this location. The only concern is to ensure that the ambient environmental conditions in the utility room (which is insulated and weather-proofed).

Timeline:

May – June 2012 – Research and purchase monitoring system equipment. Jeff Michael, an undergraduate student and co-author of this grant application, will assist with researching potential monitoring systems.

June – August 2012 – Install, commission, and test monitoring system. I will work with RAD employees to perform the monitoring system install, and commission the system. I will request student participation through supporting Learning Contracts on renewable energy and data monitoring.

Campus Connections (Please select all that apply):

	Research	Implementation	Education
Renewable Energy			
Resource Conservation			
Sustainability Strategies			

Impact on Campus Sustainability Goals:

Energy, Environmental, Social and Economic Impact

- How does your project align with the Climate Action Plan or the goal of zero waste and carbon neutrality by 2020?
- How is your project consistent with the mission of the Clean Energy Committee?

<p>Impact on Campus Sustainability</p>	<p>In the course and Program that I teach Living Buildings - Science and Analysis and Ecology and the Built Environment - I would use the installations and data in different means. In the more advanced Science and Analysis course students complete analyses focused on determining how design and construction can have energy net-zero outcomes. The combination of on-campus data sources permit me to present students with an ecological and physical context with which they are familiar (the TESC campus) and challenge them to analyze how a proposed campus or residential building can generate 100% of the energy it consumes on a net-annual basis. Given the climate at TESC both load reduction and on-site renewable energy are required to accomplish such a goal.</p> <p>Currently, only PV solar generation and wind speed data are available for the TESC microclimate. Having real energy generation data that students can analyze to compute actual performance of an installed system, rather than relying on theoretical system performance data is an important learning output. In addition, being able to use theoretical system data to predict a design outcome and then correlating that data with actual system data is another benefit of an on-campus installation.</p> <p>In the introductory level program, I would use both the physical installation as well as data showing generation losses and inefficiencies to introduce concepts of on-site renewable installations to students. Ecology and the Built Environment presents students with assignments that ask them to compute their personal energy consumption. On-site solar thermal systems would present that data where students could be assigned to evaluate how panels (on both a net and peak basis) would be required to support their hot water consumption (space heating use can also be evaluated). This combined with the physical installation, concepts such as tilt, solar incidence, shading, and an understanding of structural and biological influences on the panel installation lead to a rich learning experience for the students.</p> <p>How is your project consistent with the mission of the Clean Energy Committee?</p> <p>Having monitoring systems that integrate into a central data repository is a key success factor for any renewable energy installation on the TESC campus. It will educate students about clean energy by letting them perform data analysis on multiple systems in academic programs.</p>
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Outreach and Education:

The Clean Energy Committee strives to fund projects that will be highly visible and have a positive impact in the lives of the Evergreen students responsible for the clean energy initiative. Approved proposals will be required to publicize their project in press releases and/or presentations, including mention of sponsorship by the Clean Energy Committee. It is also expected that you will present your work at the Synergy Conference, the Science Carnival, or another public presentation approved by the committee. With that focus, please address the following:

- visibility of the project to students and the greater evergreen community
- role that students will play in the project
- opportunities for involvement in classroom curriculum
- media outreach opportunities

- any additional information on methods the project will use to educate and engage students and the public about clean energy technologies and resource conservation.

<p style="text-align: center;">Outreach and Education</p>	<p style="text-align: center;">Installing the solar thermal systems with a robust set of data points that I will use with the academic courses I teach and programs to engage students in a number of ways:</p> <p>The primary means that students would interact with the proposed system is through data generated by the installation. This data would include variables including total energy generated, pumping energy, tank temperature, and system status. Students would analyze this data in a variety of ways ranging from developing a basic understanding of the relationship between weather, climate, and renewable energy generation; to more advanced multivariate analyses when including additional data sources such as solar radiation or information from other campus renewable energy installations or the campus meteorological station.</p> <p>Students would also perform analyses between the flat plate and evacuated tube systems to compare which one is more efficient over various time scales as well as analyses regarding the return on investment of the systems.</p>
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Budget and Fundraising

Please include:

- A detailed budget for the full project costs, including initial costs and life-cycle operation and maintenance costs.
- Detail both the specific budget items and the total funding amount being requested, and include support documentation.
- If the Clean Energy Committee does not fund the full requested amount, will the project be able to move forward?
- List any grants or other sources of funding that have been obtained or applied for. If these funds are limited to a certain component of the project, please specify
- NOTE: Preference will be given to those projects that seek additional funding from other sources. This priority is given to encourage cost sharing and to allow the funds available to support a greater number of sustainability projects on campus.

Budget	<p style="text-align: center;">\$4000 total budget</p> <p>\$1500 data monitoring & installation per system. Currently we have identified a system that will cost approximately \$700 per system for material and \$225 for a five year web monitoring agreement. \$575 is for labor and additional installation materials, including a wireless transmitter, data cords, additional valves or leads for the installation, etc.</p> <p style="text-align: center;">That system is Apollo 1 system from Sun reports. We will also investigate more traditional data logger systems from Onset Corporation and Western Scientific to determine if those can be integrated with existing campus monitoring infrastructure. http://www.sunreports.com/products.html</p> <p style="text-align: center;">The remaining \$1000 is a services contingency for supporting the campus data integration. This fee is reserved to pay an on-campus programmer to integrate the data collected into the existing campus Ruby On Rails data system that currently serves campus meteorological data.</p> <p style="text-align: center;">If the CEC funds the project at less than \$2500 we will not be able to move forward. At the \$2500 funding level RAD may have to provide additional labor or materials to perform the system installation, the ability to do this has not been confirmed with RAD.</p>
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Cost Summary Including Tax

Goods and Services	\$350
Equipment	\$1850
Labor and Maintenance	\$1800
TOTAL PROJECT COST ESTIMATE	\$4000