

Going Solar - Solar Photovoltaic Greenhouse

"One of the cornerstones of my administration has been to reduce our states' carbon footprint. By making our schools more environmentally sound, we teach our students the value of preserving our natural resources."

Arnold Schwarzenegger. "GRID NEUTRAL: Electrical Independence for California Schools and Community Colleges" California Division of the State Architect, Department of General Services (2009)

Environmental Stewardship - A Cuyamaca College Core Value
Activity: Promote energy conservation, solar power, and other similar strategies. (Cuyamaca College Strategic Plan 2004-2010)

ABSTRACT:

Please provide an abstract below summarizing the description of your sabbatical leave proposal in a paragraph of about 100 words. This abstract will become part of the Board Docket. Please include the following information as part of the abstract:

- **Need for the Professional Growth** - describe the purpose of the sabbatical leave.
- **Sabbatical Leave Activities** - describe what you plan to do.
- **Anticipated Outcomes** - describe the primary outcome; instructor and classroom teaching outcomes; professional/faculty relationship outcome; student outcomes.
- **Means of Measurement** - describe what evidence you will submit to demonstrate achievement of your outcomes.
- **Expected benefit to the students, department, college, district, and/or community**

Need for the Professional Growth- describe the purpose of the sabbatical leave.

The Cuyamaca College Ornamental Horticulture Program has submitted a new degree/certificate program for Sustainable Urban Landscapes to the California Community College Chancellor's Office for approval and inclusion in the Cuyamaca College catalog for 2010-11. This new program will include elements from other disciplines within the Cuyamaca College Ornamental Horticulture Program including Nursery Technology. As a component of our sustainable program and to further my professional growth, the applicant proposes a systematic evaluation for the implementation of a solar powered greenhouse facility at Cuyamaca College and possible additional funding sources for later construction.

Since the late 1980s, the Cuyamaca College Ornamental Horticulture Program has been limited by the amount of greenhouse space available for student projects, nursery production, and varietal testing. This limitation has deprived students the ability to engage in student initiated plant production projects common at many other community college ornamental horticulture programs. While the Ornamental Horticulture Program has already raised over \$115,000 for the construction of a production greenhouse, access to the on-campus power grid has prohibited construction. Additionally, the Division of State Architects (DSA) has stated that it is a goal of the DSA that by December 2010, all plans coming through DSA will be reviewed for achieving grid neutrality. In order to educate our students on the emerging trend in solar

power in our industry, and to meet the expectations of the industry served, it is incumbent on the applicant to gain firsthand knowledge of grid neutral facilities in general and solar photovoltaic greenhouse construction and operation.

In July 2009 the San Diego Workforce Partnership approved \$400,000 for a Solar Photovoltaic program at Cuyamaca College, and the possibility of a solar powered greenhouse would provide students with access to a field demonstration and teaching facility with practical applications.

Sabbatical Leave Activities - describe what you plan to do.

The sabbatical will determine:

- 1) the feasibility of constructing a greenhouse that would be able to generate all electrical power needs through the use of solar photovoltaic panels or solar glass
- 2) identify funding opportunities to provide funding above the approximately \$115,000 currently available for an Ornamental Horticulture greenhouse.

Anticipated Outcomes - describe the primary outcome; instructor and classroom teaching outcomes; professional/faculty relationship outcome; student outcomes.

There are two primary outcomes for this sabbatical proposal:

1. establish the power requirements, site constraints, and functional characteristics of a grid neutral, solar powered greenhouse.
2. identify supplemental funding sources for greenhouse construction and solar power installation.

Instructor and classroom teaching outcomes, Professional/faculty relationship outcome, student outcomes:

1. the applicant will be able to incorporate solar photovoltaic principles into classes including Fundamentals of Ornamental Horticulture and Principle of Landscape Irrigation.
2. the applicant will assist other faculty in the department in preparing learning opportunities utilizing solar power alternatives
3. students will learn solar power alternatives for use in greenhouse plant production

Means of Measurement - describe what evidence you will submit to demonstrate achievement of your outcomes.

This sabbatical will be successful if the applicant can accurately determine construction feasibility and likely funding sources.

Expected benefit to the students, department, college, district, and/or community

A solar photovoltaic powered greenhouse: 1) supports environmental stewardship, one of the core values of the college and district, 2) provides the Ornamental Horticulture department and students in the emerging Solar Photovoltaic Program with a hands-on laboratory, and 3) enhances the college's and district's ability to obtain outside funding for solar power projects and other sustainable initiatives with the goal of reducing utility costs on campus and 4) contributes to the state's effort to use increasing amounts of renewable energy.

PROPOSAL: Going Solar - Solar Photovoltaic Greenhouse

As you prepare this proposal, it is also strongly recommended that you consult with the Department Chair/Coordinator and Dean prior to submittal to address any issues or to provide additional information or clarification regarding the proposal. Please answer each question completely (do not say "please see above").

Need for Sabbatical

1. How does your proposed activity meet the need for professional and personal growth?

The Cuyamaca College Ornamental Horticulture Program has submitted a new degree/certificate program for Sustainable Urban Landscapes to the California Community College Chancellor's Office for approval and inclusion in the Cuyamaca College catalog for 2010-11. This new program will include elements from other disciplines within the Cuyamaca College Ornamental Horticulture Program including Nursery Technology. As a component of our sustainable program and to further the applicant's professional growth, the sabbatical proposal will provide a systematic evaluation for the implementation of a solar photovoltaic greenhouse facility at Cuyamaca College and possible additional funding sources for later construction.

The Cuyamaca College Ornamental Horticulture Program has been limited by the amount of greenhouse space available for student projects, nursery production, and varietal testing. While the Ornamental Horticulture Program has already raised over \$115,000 for the construction of a production greenhouse, access to the on-campus power grid has prohibited construction. Additionally, the Division of State Architects (DSA) has stated that it is a goal of the DSA that by December 2010, all plans coming through DSA will be reviewed for achieving grid neutrality. This sabbatical will allow the applicant to 1) research options for solar photovoltaic power options for greenhouse operation, 2) provide the applicant and the Ornamental Horticulture Program and opportunity to establish a leadership role in sustainable nursery production and 3) identify potential funding sources for construction of a solar photovoltaic production greenhouse on campus.

2. How does your proposed activity benefit (please address at least three of the following):
a. the students?

Educational Benefits for Students

The potential for incorporating energy-generating technology into education and curriculum is enormous. The following are just a few suggestions:

- Hands-on experiments and curriculum provide discovery moments by allowing students to see, hear, and experience energy-generating technologies.
 - Kiosks and reporting tools, complete with renewable energy systems, provide students opportunities to calculate energy production and greenhouse gas emissions, and compare data with other schools.
 - Outdoor and weekend activities reinforce math and science components of renewable energy systems. "GRID NEUTRAL: Electrical Independence for California Schools and Community Colleges" California Division of the State Architect, Department of General Services (2009)
- Students in the Ornamental Horticulture Program, as well as other academic and career technical education programs, will also benefit through the classroom and field experience of managing a solar powered greenhouse.

A solar powered greenhouse would be more than an abstract principle of "going green." By being a concrete example of energy conservation students, as well as the industry and community, can learn from the experience of Cuyamaca College faculty and students.

2 b. the institution?

California Solar Initiative - A Decade of Support for Solar

The California Solar Initiative builds on 10 years of state solar rebates offered to customers in California's investor-owned utility territories: Pacific Gas & Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E). These rebates are derived from a portion of the funds collected from the utilities. Starting in 2006, this \$3.3 billion ten-year program provides incentives for schools and community colleges to put solar on roofs throughout the state.

One of Cuyamaca College's core values is environmental stewardship. This sabbatical will support this value in two ways:

- 1) investigation of this and other funding sources may open up opportunities to reduce electricity use and utility bills for the college and the district.
- 2) Cuyamaca College is in the early stages of developing through grant funding a solar photovoltaic program. Research into the feasibility and possible eventual construction of a functioning solar powered greenhouse will not only benefit students in the Ornamental Horticulture Program but also the developing solar photovoltaic program as well.

c. the community?

California Global Warming Solutions Act of 2006

"Planning and implementing grid neutral schools now will prepare schools and community colleges for compliance with the California Global Warming Solutions Act....The law will require that by the year 2010 the state must begin efforts to offset their carbon emissions from all sources, which includes educational buildings....Now is the time to start planning how to go grid neutral and maintain grid neutrality for the long term."

GRID NEUTRAL: Electrical Independence for California Schools and Community Colleges" California Division of the State Architect, Department of General Services (2009)

The community will benefit though the ability to see a functioning demonstration and teaching facility that is grid neutral and sustainable. This example can inspire other businesses or individuals in the community to invest in solar photovoltaic for their home or business.

2 d. the discipline/contribution to scholarship

Previous solar greenhouses used stored heat from solar radiation to help achieve reduced electrical consumption, but the proposed greenhouse at Cuyamaca College, would be the first to be grid neutral and would serve as a demonstration project for both the nursery industry and other community colleges across the nation. The Ornamental Horticulture discipline will benefit from this project through the staff development presentations to the Ornamental Horticulture faculty. Through the joint efforts of faculty and staff in the program, further experiments, activities, and learning opportunities will be developed.

3. Describe the relevancy of your activity to your current/new assignment and the improvement of student learning.

The applicant is currently assigned as the Program Coordinator of the Ornamental Horticulture Program where the greenhouse would be sited. The applicant's assignment includes instruction, curriculum development, adjunct faculty recruitment and mentoring, field site facilities development and management. All of the areas of responsibility would benefit from the research into solar photovoltaic technology.

Student learning would benefit through hands-on laboratory activities that focus on operation and management of a solar photovoltaic greenhouse, a concrete example of sustainable nursery production, and instructors that have researched or been trained in alternative energy sources for greenhouse production.

Description of Overall Activity

4. Please provide a brief description and purpose of the proposed sabbatical leave activity.

The sabbatical will determine:

1. the feasibility of constructing a greenhouse that would be able to generate all electrical power needs through the use solar photovoltaic panels or solar photovoltaic glass and
2. identify funding opportunities to provide funding above the approximately \$115,000 currently available¹ for an Ornamental Horticulture greenhouse.

¹ In 1987, the Cuyamaca College Ornamental Horticulture was awarded a \$10,000 grant from the Stanley Smith Horticultural Trust for the construction of a new greenhouse for the Ornamental Horticulture Program. Additional fundraising brought in approximately \$5000 MORE. The Cuyamaca College President at the time, Dr. Samuel Ciccatti, set aside approximately \$60,000 from district funds for the construction of the greenhouse. However, because of the need to bring electricity to the site, the construction bids exceeded the funds available and the project was stalled. Shortly thereafter, Dr. Ciccatti retired and the incoming President, Dr. Amador, pulled the \$60,000 college/district funds for other uses. In 2001, George and Pat Anderson donated a parcel of land to the Ornamental Horticulture Program and the proceeds from the sale of the land added approximately \$100,000 to the greenhouse fund. Current estimates place construction costs in excess of the \$115,000 available.

5. Please provide a clearly defined set of objectives and the course of action to achieve those objectives that are consistent with the purpose and nature of the proposed leave.

Objective #1: establish the power requirements, site constraints, and greenhouse functional characteristics.

Course of action:

- A) review previously developed construction plans (1987) for Ornamental Horticulture greenhouse
- B) contact greenhouse manufacturers to assess greenhouse equipment and technology developed since original construction plans were completed
- C) contact solar photovoltaic experts to determine methods and materials compatible with the project
- D) determine project feasibility within the site, structure, and power constraints.

Objective #2. identify supplemental funding sources for greenhouse construction and solar installation.

- A) review state and federal initiatives for solar photovoltaic installations
- B) research private grant funding sources for solar photovoltaic installations
- C) contact industry groups related to the greenhouse industry, power generation industry, or solar photovoltaic industry for funding sources.
- D) determine the likelihood of securing additional outside funding.

6. Please address the feasibility of the activity by discussing:

a. a proposed timeline that is appropriate to the activity,

January - February 2011

- A) review previously developed construction plans (1987) for Ornamental Horticulture greenhouse
- B) contact greenhouse manufacturers to assess greenhouse equipment and technology developed since original construction plans were completed

February - March 2011

- A) contact solar photovoltaic experts to determine methods and materials compatible with the project
- B) visit solar photovoltaic demonstration sites
- C) determine project feasibility within the site, structure, and power constraints.

March - April 2011

- A) review state and federal initiatives for solar photovoltaic installations
- B) research private grant funding sources for solar photovoltaic installations

April - May 2011

- A) contact industry groups related to the greenhouse industry, power generation industry, or solar photovoltaic industry for funding sources.
- B) determine the likelihood of securing additional outside funding.

6 b. the availability of appropriate resources

Faculty:

There are two full-time instructors in the Ornamental Horticulture Program and eleven adjunct faculty teaching in courses that would be affected by this sabbatical project.

Staff:

Cuyamaca College currently has two individuals, Jonathan Kropp, Project Specialist and Jennifer Lewis, Environmental Training Center Manager, that are involved with the college's solar photovoltaic grant.

Support Resources:

Cuyamaca College is in the process of leasing grant research software.

Outcomes

7. Clearly describe the expected outcomes of your activity.

The applicant will

- 1) establish the power requirements, site constraints, and greenhouse functional characteristics for a solar powered greenhouse at Cuyamaca College.
- 2) identify at least five supplemental funding sources for greenhouse construction and solar installation.
- 3) incorporate solar photovoltaic principles into classes including Fundamentals of Ornamental Horticulture and Principle of Landscape Irrigation.
- 4) provide staff development activities to other faculty members regarding the use of solar photovoltaic technology in the landscape and horticulture industries.

8. What evidence will you submit to demonstrate achievement of your outcomes?

Success of the grant will be demonstrated thorough

1) the successful completion of a construction feasibility and funding source report. These reports will be presented to the department, division dean, executive dean for development, Center for Innovation, vice president of instruction, president, chancellor, and governing board.

2) completion of staff development activities scheduled for fall 2011 to present information on solar photovoltaic greenhouse design, construction, and operation to faculty in Ornamental Horticulture and other disciplines.

3) incorporation into the Ornamental Horticulture curriculum the concepts, principles, and practices of sustainable nursery production through solar photovoltaic greenhouse construction.