



Building for the Future

The Case for
Green Buildings
and Energy Security
for the
University of California

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THE CLEAN-TECH MARKET AUTHORITY

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KEY FINDINGS

- **There is a significant and growing demand for renewable energy, energy efficiency, and green building practices** from a wide range of fronts, including the administrations of President George W. Bush and Governor Gray Davis, the State Legislature, the student bodies of all UC campuses, and the citizens of California. This is reflected in a variety of public statements, policy initiatives, legislation, reports, resolutions, and surveys.
- **Renewable energy and energy-efficiency technologies are cost-effective today.** Under existing contracts, the University already can buy green power at only 2% to 3% more than conventional electricity, and this price difference can be easily made up through green building design. In addition, studies by solar providers as well as current solar installations on campuses show that onsite solar power can also be cost-effective or even save money over the life of the system.
- **Universities, colleges, and community colleges in California and the United States are making major commitments** to renewable energy and green-building practices. Many of these campuses have shown that these measures and technologies can be implemented cost-effectively.
- **There are a variety of institutional barriers**—some within the University itself, others within State government—that need to be eased or removed to make it easier and more affordable for campuses to implement these technologies and practices.
- **There are a variety of economic and social benefits** to be gained by the University of California—as well as by the State of California and its citizens—from implementing a University-wide commitment to purchasing green energy, installing solar energy equipment on new and renovated buildings, and designing all construction projects to meet the LEED standards, the de facto national standard for green-building practices.
- **The University could facilitate increased use of these technologies and practices through central coordination.** While some UC building projects have utilized state-of-the-art renewable energy, energy efficiency, and green-building technologies, there is little system-wide coordination of information or resources, or buying aggregation among the campuses. This lack of coordination raises the costs and barriers of implementing these technologies and practices.
- **A wide variety of financing opportunities and financial incentives are available to help defray costs.** Several state agencies have created programs to subsidize the cost of renewable-energy and energy-efficiency projects, with dozens of additional programs available at the local level.

OVERVIEW

As one of the largest real estate developers in the state, the University of California faces an extraordinary opportunity to align its building and facility needs with California's and America's goals to increase energy security and independence, reduce environmental threats, protect public health, enhance educational environments, and provide jobs and economic well-being.

This paper presents a vision of how the University, steered by its Regents, can claim a leadership role by embracing the goals of renewable energy, energy efficiency, and green-building practices in all of its building projects. It shows how doing so can be cost-competitive with conventional building practices when considering a building's life-cycle costs; the benefits to the University at various levels; and the benefits to the communities surrounding University campuses and facilities and to the State of California and its citizens.

Specifically, this paper describes how the Regents of the University of California could justify adoption of a University-wide policy requiring that all new and remodeled buildings be designed to operate on a minimum of 25% "green" energy sources, with at least 10% of its energy needs derived from on-site, renewable resources such as solar photovoltaic energy systems; and that all new building projects be designed and constructed to meet the Silver-level guidelines of the U.S. Green Building Council's LEED Green Building Rating System.

It is an ambitious plan, but it is not unprecedented. A growing number of universities, community colleges, and other academic institutions around the United States are making commitments to sustainable building practices. They are joined by forward-thinking cities, counties, states, and businesses making similar commitments. Moreover, the policies and practices proposed in this paper directly address the energy goals of both President George W. Bush and Governor Gray Davis, as well as the desires of the University's student body and California's citizens, as expressed through resolutions, opinion polls, and other means.

ENERGY SECURITY AND GREENER BUILDINGS: A GROWING CALL

The past few years has seen a growing call from a wide range of fronts for increased use of renewable energy, energy efficiency, and green-building practices. At the national level, the National Energy Policy released by the Bush administration in May 2001 called for large-scale deployment of renewable energy technologies derived from nature's services, including sunlight, wind, and heat from deep inside the earth. It also promoted the role of energy efficiency as a cornerstone of a sound energy-security policy.

Closer to home, Governor Davis in 2000 signed an Executive Order (D-16-00) that established a state sustainable building goal and called on his administration to "site, design, deconstruct, construct, renovate, operate, and maintain state buildings that are models of energy, water, and materials efficiency; while providing healthy, productive and comfortable indoor environments and long-term benefits to Californians." In his 2001 State of the State address, Governor Davis specifically challenged the University of California, along with the California State University and Community Colleges, to "move toward energy independence."

Governor Davis has clearly expressed his desire to bring renewable energy to the state's schools. In October 2002, he announced a new Solar Schools initiative that will pay up to 90% of the purchase and installation cost of putting solar panels on schools. In announcing the program, the Governor stated: "Using solar energy allows school districts to spend more of their funds on education, not energy. In addition, it will give students a working knowledge of the benefits of Renewable Energy technology."

The Governor's commitment to renewable energy was echoed by the State Legislature, which in September 2002 enacted an ambitious "renewable portfolio standard" requiring electricity retailers serving the State to nearly double California's existing clean energy resources by 2017. In doing so, California followed the lead of Texas where, in 1999, then-Gov. Bush signed legislation that helped to establish Texas as the wind capital of America.

The University of California, with more than 90 million square feet of building space currently and millions more planned over the coming decade, also has articulated its vision of a more environmentally sustainable future. In its draft white paper, the UC Ad Hoc Committee on Sustainability (made up of representatives from the UC Office of the President and facility managers from various campuses) stated that "It is now time for the University of California, as a multi-campus system of leading research universities, to demonstrate significant leadership with regard to sustainable development and operation of its campuses."

According to the Interagency Green Accounting Working Group, co-chaired by the Governor's Office, the State Consumer Affairs Agency, and the Treasurer's Office:

The State government through its public buildings, such as universities, represents the “front line” of innovation and change to bring about sustainability. The public sector leads by example and programs for implementing new conservation, energy efficiency, savings and green power technologies.¹

The University of California has made important strides in these directions. For example, the plans for its new Merced campus calls for setting standards for “sustainable use of energy and other scarce resources, and to be a model of development in the great San Joaquin Valley,” according to the campus Web site.

This interest in sustainability has been underscored by the University’s student body, which has called upon the Regents to make even stronger commitments to renewable energy and green buildings. All of the University’s student governments and some of its graduate student councils have passed a resolution calling on the Regents to adopt a policy of 50% renewable energy and LEED Silver certification for all new construction.

The students’ strong interest in more sustainable energy practices mirrors that of the larger California population, which has expressed overwhelming support for renewable energy production in the state. According to a 2001 study by the Public Policy Institute of California: “85% of state residents favor a state policy that requires doubling the use of renewable energy over the next decade.”²

Across the U.S., students have made school administrators aware of their strong interest in reducing energy use and emissions related to climate change through increased energy efficiency and through commitments to purchase renewable energy, or to generate it on-site, and to adopt greener building standards. Select examples:

- In March 2002, students pressed the **Los Angeles Community College District** Board of Trustees to commit to a 25% renewable energy standard, including 10% onsite generation, and to adopt a building policy that would require up to 80 new buildings to be constructed in compliance with green-building design principles. The additional costs for the green-building components totaled only \$35 million out of an overall budget of \$1.2 billion—a less-than-3% set-aside, the cost of which will be offset by energy savings and other benefits.
- Responding to student demands, the **California State University** system has undertaken a broad initiative to reduce energy use at all campuses by 15% by 2004, and to consider the life-cycle costs of building improvements. Also, where feasible, CSU plans to use renewable energy technology for generating electricity on campuses.
- **California’s community colleges**—the world’s largest post-secondary educational system, with 4,700 buildings and 53 million square feet of space—is preparing a system-wide energy management plan that will feature alternative technologies, renewable energy, and sustainable construction techniques.
- **Humboldt State University** students recently voted to raise their own fees to fund renewable energy, energy-efficiency programs, and green-building efforts for the campus.

¹ Interagency Green Accounting Working Group, “A Five-Year Renewable Investment Plan for Public Buildings,” July 2002.

² Public Policy Institute of California “Special Survey on Californians and the Environment, June 2001.

- **Stanford University** students have committed to a Kyoto Now! Campaign and pressured the administration to “meet or beat” the Kyoto Protocol target of 7%, reducing campus-generated greenhouse gas emissions below 1990 levels by 2007. One key means of achieving this is through energy efficiency and increased purchases of energy from renewable sources.
- **Connecticut College** last year became the first university in the world to commit to purchasing 100% renewable power for its electricity needs.
- **Oberlin College** students plan to make their campus “climate neutral”—that is, to produce no net greenhouse gas emissions—by 2020. The school’s planned 14,000-square-foot Environmental Studies Center will have the latest in energy efficiency technology and is expected to produce more energy than it uses.
- **Brown University** has undertaken an environmentally responsible design initiative that includes a new \$30 million laboratory and classroom building that uses advanced design and energy-efficiency technologies.
- **Emory University’s** Board of Trustees recently endorsed LEED for use as a guiding principle in the development of all the university’s construction and renovation projects. It determined that the initial cost of LEED certification would be recovered through lower operating costs throughout the building’s life-cycle, particularly in the area of energy savings.

Together, these and other efforts clearly demonstrate that students, community stakeholders, and others, working with forward-thinking administrators, can design and implement policies that make significant commitments to greener, more energy-sustainable buildings.

WHY ENERGY AND GREENER BUILDINGS MATTER

The design, construction, and maintenance of buildings has a tremendous impact on our environment and our natural resources. According to the U.S. Department of Energy, buildings use one-third of all the energy and two-thirds of all electricity consumed in the United States. Buildings account for half of all sulfur dioxide emissions, 25% of nitrous oxide emissions, and 10% of particulate emissions, all of which damage urban air quality. Buildings produce more than a third of the country's carbon dioxide emissions – the chief pollutant associated with climate change.

Green-building practices offer an opportunity to create environmentally sound and resource-efficient buildings by using an integrated approach to design. Green buildings promote resource conservation, including energy efficiency, renewable energy, and water conservation features; consider environmental impacts and waste minimization; create a healthy and comfortable environment; reduce operation and maintenance costs; and address issues such as historical preservation, access to public transportation, and other community infrastructure systems.

The University already has recognized the benefits of sustainable building design. Its Ad Hoc Committee on Sustainability has concluded that:

Investment in sustainable design of high-performance buildings and campus environments based on life-cycle cost evaluation would lead to lower long-term operating costs and tangible environmental benefits.

It cites such benefits as lower costs from reduced resource consumption during operations, especially lower energy and water usage; extended life-cycles of critical building systems and components, reducing the need for expensive and disruptive facility renovation and renewal; and lower costs of disposal for a smaller overall waste stream, both from construction and from ongoing operations. It also cites other benefits of sustainable design, including improved indoor environmental quality and reduced exposure to environmental pollutants; healthier, more productive environments for teaching, learning, and research; and reduced contingent liabilities due to improvements in indoor air quality and reductions in waste and emissions.”³

The Benefits of Greener Buildings

Energy-efficient and sustainably designed buildings can cost more up front, but save money through lower operating costs over the life of the building. The integrated systems approach of green-building practices ensures that buildings are designed as a single, integrated system rather than a collection of stand-alone systems.

³ University of California Sustainability Initiative (Draft)

The benefits of greener buildings have been well documented. A good case study can be found in the city of San Diego's Ridgehaven Building project. At a glance, the Ridgehaven Building appears identical to its neighbor. However, the 73,000 square-foot building was completely renovated with many cost-effective green-building methodologies and technologies. As a result, the Ridgehaven Building uses 65% less total energy than its nearly identical neighbor, yielding a saving of more than \$70,000 in annual utility costs. Even more important, the building occupants love its light and "healthy" atmosphere, boosting their productivity. Ridgehaven was renovated in 1996. Green-building technologies and techniques have advanced considerably since then.

In the academic environment, studies have demonstrated the ability of greener buildings to improve learning and worker performance. For example:

- A 1999 Pacific Gas & Electric sponsored study on daylighting in elementary schools showed that, all other variables being equal, students in daylit classrooms progressed 15% to 23% faster in reading and math skills than students in non-daylit classrooms.
- Another study, of three school systems in Washington, Colorado, and California, found that students in classrooms with the most diffuse and glare-free daylight improved their performance on standardized tests by up to 26% over classrooms without daylight, and 10% over average classrooms.
- Other studies have found that improvements in the indoor air environment may substantially increase employee moral and productivity, and that there is a clear correlation between sustainable building design and operational practices and worker productivity and satisfaction.

The U.S. Green Building Council's Leadership in Energy & Environmental Design (LEED) rating system program has emerged as the leading standard for evaluating and certifying green building attributes and performance. LEED evaluates environmental performance from a "whole building" perspective over a building's life cycle. LEED certification—which is given at four levels—Certified, Silver, Gold, and Platinum—has become the de facto building standard in the U.S., and is becoming the model for similar programs in other countries. A number of cities and counties have committed to LEED standards for all new building and renovation programs; at the Pentagon, officials are seeking to meet LEED standards for its entire renovation project.

ENERGY, GREENER BUILDINGS, AND UC: THE CURRENT PICTURE

University of California campuses already incorporate techniques and technologies that meet high standards for energy use and green building, but this is done on an ad-hoc basis with little central coordination. The University employs a decentralized system for building design, construction, and operation, leaving decisions and standards to each individual campus. The University's Office of the President offers resources to help campuses implement renewable-energy, energy-efficiency, and green-building practices, but does not require campuses to implement them.

More than 45% of electricity used by UC campuses is provided through a contract with Arizona Public Service (APS); the balance comes from other utilities and from some on-site co-generation. In addition to its conventional power offerings, APS offers electricity derived from renewable sources—principally solar and wind power—and its contract with UC allows the University to buy this “green power.” However, there is no directive for campuses to specify green power. In addition, while some University buildings incorporate green-building techniques, there has been no effort to mandate green-building standards, or to certify that buildings meet the LEED Silver standard, the second of four levels of green-building achievement.

This lack of system-wide initiatives represents a lost opportunity. Creating University-wide goals and standards for energy use and green building design and operation can provide efficiencies of scale that can significantly lower the cost of designing, constructing, and operating buildings that reflect the state of the art of energy use and efficiency and environmental building techniques.

In addition, making green-energy purchases, promoting energy efficiency, and implementing onsite generation of renewable energy can serve as a hedge against uncertain future energy prices. Over the past 30 years, California electricity prices have risen an average of 6.7% a year, according to the California Public Utility Commission. At that continued rate, a kilowatt-hour that costs 10¢ today will cost about 19¢ in a decade. This does not factor in price spikes due to disruptions of any type. Reducing energy needs through efficiency, and increasing self-sufficiency through on-site generation, will buffer the University against these costs and risks.

The experiences of some UC campuses indicate that there are significant economic benefits for implementing these strategies. For example, UC Santa Barbara's strategic energy plan has determined that for planned new building on the campus over the next 10 years, an incremental investment of \$6.6 million in sustainable design would yield \$1.1 million in annual operational savings. In addition, if all energy saving strategies identified in the UCSB strategic energy plan were implemented, the campus could accommodate new building growth with *no net increase* in peak electrical demand for the campus. This represents a tremendous infrastructure cost savings (such as eliminating the need to build

substations and additional distribution lines) that is not included in the roughly 6-year simple payback calculated for UCSB’s energy savings.⁴

Bren Hall: A New UC Building Standard

UCSB recently completed the Donald Bren Hall, a state-of-the-art green building that opened in fall 2002, which demonstrates that the costs of greener buildings aren’t prohibitive up front, and provide a wealth of benefits over their life-cycles.

Bren Hall—an 85,000-square-foot building containing labs, classrooms, a large conference facility, and offices—is home of the Center for Environmental Science and Management and incorporates the latest in energy efficiency, including a 42-kilowatt solar photovoltaic system; in all, 31% of its energy comes from renewable sources.

Among the building’s features: daylighting, motion detectors for lights, natural ventilation, operable windows tied to the heating system, toilets using reclaimed water, low-emissions paints and finishes, drought-tolerant landscaping, and a fire lane made from recycled permeable turf-block with grass sod overlay.

Adding these and other green components added about \$835,000 to a budget of \$20,158,000—about 4% of overall building costs. However, most of the green building aspects were made after the original designs had been finalized, requiring many modifications to the original designs — inflating the final cost of the building by \$672,394 through change orders. Still, the designers expect the building will repay these costs easily through reduced energy costs; the building exceeds the State’s Title 24 standards by 31%. In addition, the facility is being used as a learning lab by UCSB students, who are collecting and analyzing building data for course-related work.

How Green Building Measures Save Money—Three Examples

<i>Energy Efficiency Measure</i>	<i>Description</i>	<i>Installed Cost</i>	<i>Energy Savings</i>	<i>Payback</i>
Cool Roof	Traditional roofs are dark, resulting in summer rooftop temperatures of 150-160° C. Coating roofs with light, reflective material can reduce temperatures by up to 60°, reducing building temperatures and increasing building comfort	~30% less than traditional roofs	~\$4.00/square foot over 20 years	immediate
Occupancy Sensors	Lighting accounts for 40% of a building’s electricity consumption. Sensors detect motion so that lights are only on when rooms are occupied.	\$30-\$150 per sensor	25%-75%	< 3 years
Variable Frequency Drive (VFD) motors	Conventional motors are either “on” or “off,” regardless of their required power. VFDs optimize the energy used to control building comfort in HVAC systems by running only at the speed needed for occupant comfort.	~10% more than conventional motors	~30%	< 4 years

⁴ University of California Sustainability Initiative (Draft)

A BOLD VISION FOR A SUSTAINABLE FUTURE

UCSB's leadership in sustainable buildings, along with select projects at other UC campuses, is replicable system-wide. Doing so would establish the University as the leading academic institution in renewable energy and green building; it also would provide direct benefits to the University and its students and contribute to the economic, environmental, public health, and security needs of California and its citizens.

But it will take a strong mandate at the highest levels of the University system—including the Regents, the Governor, and the State Legislature—to implement such an ambitious program and to ensure its success. It also will require easing or removing institutional barriers that inhibit or, at times, prevent implementation of sustainable building practices.

The following recommendations represent a bold but achievable vision for a University-wide energy and green-building program:

- 1. Create a University-wide mandate that all new and renovated buildings use a minimum of 25% “green energy.”**

Consideration also should be given to the more ambitious student proposal of 50% green energy. Committing to purchasing such quantities of green energy from electric utilities can be done easily and effectively through existing and future contracts. Buying green power could raise energy costs slightly: according to data from the US Department of Energy⁵, most California utilities charge a premium of only 1¢ to 2¢ per kilowatt-hour for green energy; the premium from APS, from which UC contracts much of its energy, is 2% to 3%. However, making this commitment on a system-wide basis could allow the University to negotiate favorable green-energy contracts with APS (whose current contract expires in 2003) and other utilities that could minimize added costs. Remaining costs could be offset by ongoing energy-efficiency efforts on each campus. Moreover, committing to 25% or 50% green energy now could provide some flexibility in implementing the onsite generation portion, below.

- 2. Create a University-wide mandate that 10% of energy needed for all new and renovated buildings come from onsite generation such as solar photovoltaics (PV).**

The costs and efficiency of solar PV systems have improved steadily in recent years, and will continue to do so. However, even through PV costs more than grid-based electricity, integrating solar into UC buildings can make economic sense when coupled with aggressive energy-efficiency measures. Solar PV is most cost-effective for buildings that currently pay utility rates and are not part of the APS contract. One example is at UC Berkeley, where the Associated Students of the University of California, or ASUC, has determined that installing solar PV on the roof of the Martin Luther King, Jr. Student Union

⁵ See <http://www.eren.doe.gov/greenpower/summary.shtml>

will provide cheaper electricity rates, by about 2 cents per kilowatt-hour, than it is currently charged by PG&E, the local utility. The money saved over 10 to 12 years will cover the solar system's total anticipated cost, after which savings will accrue to the ASUC.

Another analysis was conducted by PowerLight, a leading provider of solar PV systems, including major installations for the military and state and local governments. It calculates that a 250-kilowatt solar PV system designed for a University of California building could pay for itself within 18 years, factoring in government incentives, energy savings, and other considerations. (The actual savings would depend on the prevailing rates and rate structures, utility demand charges, and other factors.) This does not include additional savings that could come from energy-efficiency measures that would reduce a building's overall energy needs, which reduce the PV system's size and, hence, its payback period. The PV modules would be warranted for 25 years and could, with proper maintenance, last considerably longer. Once the system was paid for through energy savings, it would be expected to produce free electricity for at least 10 more years.

Financing Solar

The table below summarizes the costs and revenues from installing a 250-kilowatt solar rooftop PV installation, as provided by one leading solar vendor. It assumes installing 24,719 square feet of modules, which produce about 304,000 kilowatt-hours the first year, with a .5% performance loss each year thereafter over the system's 25-year life (though the system could easily last much longer). The numbers assume the entire net purchase price of the system was financed by a 27-year loan at 5% interest. The data also assumes the cost of grid electricity to be 12¢/kWh—the average rate for utility-purchased electricity. Should the real cost of electricity rise to 15¢/kWh, the total net savings over 27 years would rise to more than \$620,000. Other assumptions include 3% annual inflation and annual real electricity price increases of 1.5%.

System Purchase:	
Purchase Price	1,650,000
(less government rebate)	(825,000)
Net Purchase Price:	825,000
Maintenance:	
Maintenance Reserve	(114,000)
Total Maintenance:	(114,000)
Financing:	
Total Financing Payments:	(1,408,520)
Savings:	
Avoided Electricity Purchases	1,524,240
Reduced Heating and Air Conditioning	45,062
Reduced Roof Maintenance	135,185
Avoided Transformer Losses	45,727
Total Savings:	1,750,214
Total Net Savings:	227,694
<i>Source: PowerLight Corporation</i>	

One means of reducing solar PV's cost would be to aggregate purchases among the UC campuses to negotiate more favorable purchase and installation prices. Conversations with PV suppliers indicate that costs for system-wide aggregated purchases could significantly decrease installation costs. The LACCD has been doing just this. In discussions with suppliers, they anticipate being able to purchase PV modules for about \$2.50 per watt or less over the next five years and expect that this price will decline to approximately \$1.50 per watt for the subsequent five years.

Achieving the 10% mandate would require removing some obstacles in the University's planning and budgeting processes, and some additional help from the Office of the President to provide assistance and economies of scale.

For example, one barrier to increased implementation of solar are State budget requirements, which do not allow shifting monies for energy generation between operating and capital budgets. As a result, monies that would normally have been budgeted for electric utility bills cannot easily be shifted to purchase solar PV systems, the result of which would reduce or eliminate electricity purchases. State budget rules do allow such budget shifts for efficiency measures, however; these need to be extended to fund onsite generation projects.

Another barrier has to do with the way bonds are structured by the State Department of Finance, which requires that the University would have to repay a bond financing a PV system from the University's utility budget. That budget is currently in deficit, due to large, unexpected outlays resulting from the state's "energy crisis" of 2000-2001, making it difficult to repay the bonds. The Department of Finance would need to revise these rules to facilitate solar PV purchases.

3. Create a University-wide mandate requiring LEED Silver certification for all new and renovated buildings.

Given the high standard being used at many campuses to integrate energy efficiency and other green-building practices into new and remodeled buildings, it is possible that many recent buildings would qualify for LEED Silver. However, campuses have been reluctant to seek LEED certification, citing the costs of doing so. To demonstrate the University's commitment to green building, it is important that all campuses and University projects be held to the same high standard of design and construction by requiring LEED Silver certification as a minimum standard.

The U.S. Green Building Council estimates that an experienced design and construction team can complete documentation at a cost of \$8,000 to \$14,000 in additional design and application fees. (The most recent version of the LEED standard was designed to streamline the documentation requirements for certification and is expected to simplify and reduce the costs of the documentation process.) It is likely that these costs could be significantly lowered by coordinating the LEED certification process for all University projects through the Office of the President (or, perhaps, through an outside consultant) in order to create efficiencies and economies of scale in the application process. At present, individual campuses must apply for certification.

Clean Energy Financing Incentives

According to the California Energy Commission web site, there are more than 300 government and utility programs in California to help finance energy-efficiency and renewable-energy initiatives in homes, businesses, and schools.

The table below shows select examples of programs that can provide direct benefit to energy-efficiency and renewable-energy projects on UC campuses.

<i>Sponsor</i>	<i>Program Name</i>	<i>Description</i>
California Energy Commission	Efficiency Financing	Provides, financing for Energy Efficiency Projects, up to \$2 million per application.
California Public Utilities Commission	Photovoltaics—Self-Generation Program	Pays up to 50% of the cost of PV systems up to 1 MW.
Los Angeles Department of Water and Power	Cool Roof Savings Program	Offers rebates of 20¢ per square foot installing “cool roof” material.
Los Angeles Department of Water and Power	Green LA Program	Pays up to \$6/Watt for installing PV systems that are manufactures in the LA area.
Los Angeles Department of Water and Power	Chiller Efficiency Program	Offers cash incentives of up to \$70/ton for owners and operators of buildings and manufacturing plants that use either water- or air-cooled chillers.
Riverside Public Utilities	Energy Efficiency Lighting Incentive	Offers incentives of up to \$10,000 for replacing older inefficient lighting with the most energy-efficient fixtures available.
San Diego Regional Energy Office	Solar Energy Program	Receive a rebate of up to \$4.50 per watt for installing solar panels.
Southern California Edison	Statewide Nonresidential New Construction Programs/Savings by Design	Provides incentives to building architects, design teams, building owners and/or developers to include in the design levels of energy efficiency that exceeds Title 24 standards by a minimum of 10%.

Source: California Energy Commission www.consumerenergycenter.org/rebate/resultnew.php

There are other steps the University can take to lower the costs and barriers to sustainable building projects. The role of energy efficiency cannot be overstressed. Numerous studies have demonstrated the potential for efficiency measures to greatly reduce energy use and costs. In the Los Angeles Community College District, for example, efficiency projects are resulting in buildings that exceed the State’s Title 24 energy code by 20%. Such savings can help finance the costs of renewable energy projects.

Another opportunity to cut project costs is to create a database or other resource to facilitate the sharing of green-building and energy resource best practices among the campuses could help reduce the learning curve and costs associated with propagating these practices, and could facilitate aggregate purchases of energy, building materials, and other products and services. As a draft of the University of California Sustainability Initiative states, “... there has been limited internal communication about

these (sustainability) efforts and little system-wide leadership to identify sustainable strategies which might prove useful to all campuses or which might leverage the strengths of the University system.”

Still another effective strategy for helping to fund renewable energy and green building projects is to directly appeal to alumni and other sponsors and contributors for funds for these purposes. This was an effective strategy used for UCSB's Bren Center, where donations were targeted specifically to fund green building aspects of the project.

NEXT STEPS AND STRATEGIES

Here are seven critical steps that must take place for the University to embrace a clean-energy future:

- Adopt a University-wide green building and clean-energy policy calling for a minimum of 25% (or 50%) green energy, including at least 10% on-site generation, and a LEED Silver certification for all new and renovated buildings.
- Exercise the clause contained in the University's existing APS energy contract to purchase green energy—at least 15% of purchases from APS.
- Work with the Governor's office, the State Legislature, and other appropriate governmental bodies to make it easier to finance renewable-energy projects using savings from operating budgets.
- Set up a competitive University-wide aggregation strategy that combines purchases of photovoltaics systems across all campuses to negotiate lower prices.
- Create an office within the Office of the President that can coordinate and streamline the LEED-certification process for all campus projects, thereby reducing the cost of LEED certification.
- Develop and implement a coordinated University-wide strategy to utilize and maximize all available rebate and financing incentives on all campus building projects.
- Create a University-wide clearinghouse for green-building and clean-energy information, resources, and best practices across all campuses and facilities.

Such steps are not without precedent. As stated earlier, the Los Angeles Community College District already has committed to the 25%/10% goals, setting the standard for California colleges. The technologies are already in place that would enable the University to follow suit.

The benefits of energy efficiency, renewable energy, and green buildings to the University are many. They include greater energy security, including less vulnerability to energy shortages, market manipulations, or disruptions. They provide a hedge against higher energy costs in the future. They also include better, more healthful buildings that promote learning and productivity. There are also benefits to the larger community, including reduced air emissions resulting from generating electricity from fossil fuels, and the resulting reduction in asthma and other respiratory illnesses and diseases associated with those emissions.

Beyond that, the initiatives described in this paper signal the University of California's continued role as a good citizen, and as a standard-setting leader for academic institutions around the world.

Implementing these initiatives will require well-orchestrated leadership on the part of the University, with support from the Regents, the Governor, and the State Legislature. It will require rethinking building strategies, and the way they are coordinated at the system level. And it may require changes in accounting and procurement procedures, among others.

The University's Ad Hoc Committee On Sustainability succinctly states: "The University has an historic opportunity to re-evaluate our customary methods of facilities capital investment, and over time reduce the operating cost structure embodied (implicitly or explicitly) in the design choices, which shape our facilities."

As the University's aggressive building program moves forward, it is important that such steps be taken as soon as possible—particularly before the new Merced campus is built—to ensure that the University takes full advantage of the currently available technologies, and all of the benefits they bring.