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Assembly of the Academic Senate, Academic Council  
*University of California*  
*1111 Franklin Street, 12th Floor*  
*Oakland, California 94607-5200*

April 5, 2004

**JOSEPH MULLINIX, SENIOR VICE PRESIDENT - BUSINESS AND FINANCE**

**Re Green Building Design and Clean Energy Standards Policy and Procedures**

Dear Joe:

As you know, the Academic Council held a preliminary discussion in January of the documents relating to the draft Policy on Green Building Design and Clean Energy Standards, and considered whether and how faculty should be involved in development and implementation of this policy. As I indicated in my follow-up letter of January 23, Council agreed that faculty input would be advisable in regard both to finalizing the guidelines and to implementation. It was also recommended that, as a regular practice, chancellors solicit from their divisional Senate names of faculty experts in green technology and building design to participate in policy implementation on the campus level.

In order to more fully understand the implications of the proposed policy and guidelines, Council asked faculty experts to review the documents. Comments were received from: Professor Edward Arens, Berkeley (Architecture); Professor John Bolander, Davis (Civil and Environmental Engineering); Professor Eton Cairns, Berkeley (Chemical Engineering); Professor Bryan Jenkins, Davis (Biological and Agricultural Engineering); Professor William Nazaroff, Berkeley (Civil and Environmental Engineering); and Professor Michael O'Hare, Berkeley (Public Policy). The full responses are enclosed, and here are the main points that were raised:

In general, the respondents applauded the administration's intention to integrate green building design, renewable energy, and sustainability concerns in UC's long term planning, as well as the stated goals of improving the University's effect on the environment and reducing dependence on non-renewable energy. One reviewer noted the importance of such a commitment in light of the "size of the University of California, its influence on trends, and its role in educating future leaders of our society" (Nazaroff).

Principles and Goals. Need was seen for a clearer articulation of the "principles of energy efficiency and sustainability" that underlie the policy and are referred to in the Regents Item (Attachment 1). Similarly, inclusion of a statement was recommended to

clarify whether UC is committed to becoming (as is stated in the Regents Item), “ a leader in the nation with these new building and energy standards” or is concerned mainly with “prudent usage of available technologies and recommended standards” (Bolander).

Several inconsistencies were pointed out between the goals and principles referred to in the Regents Item and in the introductory portion of the Draft Presidential Policy, and the terms of the policy itself. First, although the goal of educational leadership is stated, there are no educational activities described in connection with this policy. A further inconsistency was seen between the stated aims and the policy’s built-in limitations. For example, making implementation subject to budgetary constraints (see page 1, Draft Presidential Policy) was seen as unnecessary, since the principles of efficiency and sustainability can still be put into play within a tight budget (Jenkins). In a similar vein, it was also recommended that the language referring to targets for increases in renewable power or reductions in energy consumption (Item II.c., Attachment 2; and Item 1.a., Attachment 4), should assume that targets may be surpassed rather than be thought of as an endpoint (Jenkins).

Additionally, it was felt that the documents did not provide sufficient detail on which to base comments on “the many practical issues of implementation” (Cairn), and that the proposed policy was described in “quite general terms” (Bolander).

Policy Review and UC Resources. Regular review and updating of the policy was recommended in order to keep up with developments in green technology. It was also strongly recommended by one respondent to gather information from new building tenants after the first year and on a one or two year cycle thereafter (Arens). All reviews should include participation of faculty and students.

To achieve the policy’s aim of being a leader in implementing green technology, UC faculty experts and the University’s leading research groups in the field should be consulted, specifically: UC’s Center for the Built Environment, the Center for Environmental Design Research, and Professor Paul Linden’s natural ventilation group at San Diego.

Costs. Two views on program costs were expressed. One holds that the price of renewable energy, when separated from various subsidies, is higher at present than that of energy from fossil sources and may also carry unrecognized attendant costs. Also, some features in the LEED (Leadership in Energy and Environmental Design) standards may not be applicable to the varied climates of California and therefore not be cost-effective (O’Hare). On the other hand, another reviewer pointed out the long term cost savings gained from improved health and productivity of building tenants, and recommended adding specific provisions to the policy for careful monitoring of costs and benefits (Bolander).

LEED Standards. In general, reviewers agreed with use of the LEED standards and ratings. One reviewer saw the LEED standards as not necessarily the best choice, given the variations in California’s climate (see “costs” above). Whether standards are internal or external, it was recommended that the process for allowing exceptions to the standards be fully described.

Other recommendations. A number of comments were made relating to details of the policy and procedure and included recommendations on: ways of expanding use of

alternative energy sources and reducing consumption; revising specific targets to be consistent with the accelerated goals of the state's Energy Action Plan or other plans (Jenkins); and the advisability of using two specific classes of technology for incorporating renewable power in facilities (Nazaroff)

After receiving these comments and further discussion at our March 31 meeting, Council formulated two specific recommendations for structuring faculty participation. First, for the immediate purpose of refining and finalizing the draft policy and implementation procedures, we suggest assembling a group of faculty and administration experts for a one-day ad-hoc meeting. Those faculty members who have already reviewed the documents at our request might be good candidates for such a group, and I would be happy to solicit additional names if you wish to follow up on this suggestion. Second, in relation to ongoing monitoring, review and implementation of the procedures and policy, Council recommends establishing a standing advisory committee that, again, would include UC faculty prominent in the fields of green technology, design and renewable/clean energy. One notable prospect to serve on such a committee, and whose name was brought up in one of the enclosed reports and again in discussion, is Professor Paul Linden of the Department of Mechanical and Aerospace Engineering at UCSD. No faculty have been asked so far to serve in such a capacity.

The Academic Council appreciates the opportunity to advise on this matter. We know that the University's commitment to a strong "green building" policy has been of specific interest to this year's student Regent and to his predecessor, and we applaud the Regents' endorsement of the "overarching goals of improving the University's effect on the environment and reducing the University's dependence on non-renewable energy."<sup>1</sup> We believe these goals can best be realized through programmatic reliance on the expert knowledge of UC faculty, especially if the Regents and the President pursue the aim of making UC "a leader in the nation with these new building and energy standards."<sup>2</sup>

Cordially,



Lawrence Pitts, Chair  
Academic Council

Encl: 2-Responses from UCB and UCD  
cc: Executive Director Bertero-Barcelo

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<sup>1</sup> UC Regents Committee on Buildings and Grounds, Attachment 1, Regents Item: "Update on the Feasibility Study to Recommend a Systemwide Green Building Policy and Clean Energy Standard. (Approved by the UC Board of Regents, July 17, 2003.)

<sup>2</sup> Ibid.

**Individual reviews (6) of documents relating to Green Building Design and Clean Energy Standards Policy and Procedures, w/cover letters from Berkeley Divisional Chair Gronsky and Davis**  
**Divisional Chair Madewell**

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March 22, 2004

CHAIR LAWRENCE PITTS  
Academic Council

*Subject: Green Building Design and Clean Energy Standards Policy and Procedures*

Please accept these comments from the Berkeley Division on the draft *Presidential Policy on Green Building Design and Clean Energy Standards*. I've consulted colleagues on the Berkeley faculty with expertise in this subject and append the responses of Professor Edward Arens (Architecture), Professor Elton Cairns (Chemical Engineering), Professor William Nazaroff (Civil and Environmental Engineering) and Professor Michael O'Hare (Public Policy).

Our consensus is to fully support the University's decision to incorporate policies for increasing sustainability and energy efficiency into long term University planning, to serve as a role model and leader in this regard among members of the academic community, and to set precedent whenever possible with appropriate and tangible guidelines. We also strongly endorse continued faculty consultation. The concentration of expertise in UC's Center for the Built Environment, in the Center for Environmental Design Research, and in Professor Paul Linden's natural ventilation group at UC San Diego, among many others, would be difficult to find in the private sector, and could shape new building policies in the state and the nation for many years to come.

It is emphasized that frequent periodic review of clean energy standards and implementation policies is essential to sustain the relevance of "modern" standards regarding energy efficient design. Frugal practice should include a survey of new building tenants within the first year of occupancy and continuing on a biennial basis thereafter. In the conduct of any such reviews and surveys, and the evaluation of their significance, it is also strongly recommended that faculty and students participate fully, to afford and augment opportunities for educational leadership in this important field.

Further comments are offered on the standards and policies themselves, including the need for scholarly assessment of the real costs of renewable energy compared to fossil fuels, and the full spectrum of issues underlying choices in an energy-efficient design, which could reveal that LEED standards might not always be the optimum guide, especially with

California's variable climates. Critical review is needed to avoid decisions that might not be economical for the University and could distract from the University's true academic mission.

Thank you for the opportunity to comment. Please refer to the enclosures for the full text of the many thoughtful comments provided by our Berkeley colleagues.

Sincerely,

Ronald Gronsky,  
Chair, Berkeley Division

cc: Edward Arens  
Elton Cairns  
William Nazaroff  
Michael O'Hare

Enclosures: Comments of Professor Arens (3/16/04)  
Comments of Professor Cairns (3/15/04)  
Comments of Professor Nazaroff (3/13/04)  
Comments of Professor O'Hare (3/19/04)

VIA E-MAIL

March 16, 2004

To: Chair Ronald Gronsky  
Berkeley Division

From: Professor Edward Arens  
Architecture  
University of California, Berkeley  
E-mail: <earens@berkeley.edu>

Subject: *Draft Green Building Design and Clean Energy Standards Policy and Procedures*

I have reviewed the draft Presidential Policy on Green Building Design and Clean Energy Standards (Attachment 2 of the Oct 31, 2003 letter from Joseph Mullinix that you sent me), and the UC Clean Energy Guide: Procedures for Implementation of Clean Energy Standard (Attachment 4). I offer the following comments/suggestions:

In general, these new policies are a positive departure from the University's past procurement processes for buildings and energy. There is a dedicated and knowledgeable group of staff preparing the new policies, and support from high levels. My first three comments address details that enable rapid and effective progress towards the goals of the policies. My fourth comment concerns involving UC's academic building science expertise.

- 1) The policy should specify that a LEED silver rating should be internally obtained for the first applicable non-laboratory building project, and that the experience be evaluated to guide future requirements. This is so that no one postpones getting started with green building design while they are debating the new proposed evaluation methods. Several other UC campuses have done it this way.
- 2) This is an important point: There should be a new section requiring a systematic approach to obtaining building performance information from the buildings' occupants and tenant organizations. This should occur within a year of occupancy, and periodically (perhaps once every two years) thereafter. The lack of consistent occupant feedback is the biggest problem with the building industry, and it is actually not that difficult or onerous to implement (UC's Center for the Built Environment now leads the world in this activity).
- 3) 'Continuous commissioning' is also a good thing, and is also not mentioned in the policy. I am not familiar with the expense of proposed commissioning programs, so I'm not sure what type of wording would be appropriate here.

4) In Green Building Design *Section (n.)*:

I suggest that the document specify, along with the other organizations engaged in improving evaluation methods for green building, the University of California Berkeley's *Center for Environmental Design Research*. This Organized Research Unit has as much or more longevity than any of the other organizations listed, and is a recognized world leader in building science and sustainable design and operation practices. Its large research program combines faculty, researchers, and students from architecture and engineering disciplines. It seems to me that the green building policy should recognize this asset within the UC system, and express the desire to work with them.

I am not aware of any other UC ORU dedicated to building science. There are however departments on the various campuses with individual faculty or small research groups who might be able to contribute to UC building program. (Prof. Paul Linden's natural ventilation group at UCSD is the absolute world-leader in this important component of sustainable building design). I think Section (n.) should express the intent or desire to engage faculty and students. The whole policy is currently written as if everything is to be done and decided by University staff.

The Clean Energy Standard looks OK to me. I am not expert in evaluating the target levels of clean energy.

VIA E-MAIL

March 15, 2004

To: Chair Ronald Gronsky  
Berkeley Division

From: Professor Elton Cairns  
Chemical Engineering  
UC Berkeley  
E-mail: <ejcairns@lbl.gov>

Subject: *Draft Green Building Design and Clean Energy Standards Policy and Procedures*

I have reviewed the Green Building Policy and the proposed implementation documents.

The policy seems quite reasonable, and the implementation plans look feasible. There is not sufficient detail to judge the practical issues of the implementation.

Perhaps one important contribution of the Berkeley faculty could be a continuing role as advisor and consultant as the procedures are worked out in detail and implemented.

The goals seem modest enough to be achievable with acceptable investment. Experts in the use of energy in buildings are Ed Arens of the Architecture Department and Steve Selkowitz of LBNL. I suggest that they be consulted as this moves forward.

If I can be of further assistance, please contact me.



## VIA E-MAIL

13 March 2004

To: Chair Ronald Gronsky  
Berkeley Division

From: Professor William W Nazaroff  
Department of Civil and Environmental Engineering  
University of California, Berkeley  
E-mail: <nazaroff@ce.berkeley.edu>

### *Introduction*

These comments have been prepared in response to a request from UC Berkeley's Senate Division Chair Ronald Gronsky. In the course of preparing these comments, I read and considered the following documents, which were all of the documents sent to me with the review request by Marilyn Kwock, Assistant to the Chair.

- Letter from Lawrence Pitts to Joseph Mullinix, dated 23 January 2004, concerning "Green Building Design and Energy Standards Policy and Procedures"
- Memorandum from Joseph Mullinix to Vice Chancellors, Administration, Vice Chancellors, Budget and Planning, Vice Chancellor Denton, Capital Projects, dated 31 October 2003, on "Request for Review of Green Building Design and Clean Energy Standards Policy and Procedures"
- Attachment 1: Regents Item "Update on Feasibility Study to Recommend a Systemwide Green Building Policy...(Presented to the UC Board of Regents on July 17, 2003..."
- Attachment 2: "Draft: Presidential Policy for Green Building Design and Clean Energy Standards" (Original date June 11, 2003; latest date C&R Comments: Jan 12, 2004)
- Attachment 4: "Draft University of California Clean Energy Guide: Procedures for Implementation of Clean Energy Standard (undated).

### *Comments*

- (1) I applaud the intention of the UC administration to incorporate green building, energy efficiency, and sustainability concerns into the capital projects and the facilities operations of the University of California. Among the reasons this is important are the size of the University of California, its influence on trends in the broader academic community, and its role in educating future leaders of our society. In the United States, one-third of end-use energy and two-thirds of electricity are consumed in 80+ million buildings. Huge direct and indirect environmental consequences are associated with the ways we design, build, operate, maintain and ultimately dispose of buildings. Progress toward a sustainable future cannot ignore the importance of the built environment.
- (2) The first paragraph of Attachment 2 articulates four benefits of renewable energy and energy-conservation projects: stabilization of campus budgets, increased environmental awareness, reduced environmental impact of University activities, and provision of educational leadership. Nowhere else in the documents I reviewed are measures described that would foster educational activities in connection with this policy. I believe this to be a significant limitation of the policy and would encourage a strong effort to redress it.
- (3) Attachment 2 contains many specific goals both under "Green Building Design" and under "Clean Energy Standard." Setting goals is important. However, matters of sustainability in building design and in energy are in their infancy. One can anticipate substantial developments during the next decade. It would seem wise to me to provide for a regular review and evaluation of these guidelines, for

example at 3-5 y intervals, to ensure that efforts toward achieving the broad objectives are aligned with the latest understanding.

- (4) The broad goal under the “Clean Energy Standard” is laudable — reducing dependence on nonrenewable energy sources. Three approaches are identified: (a) energy efficiency projects; (b) incorporation of renewable power measures in facilities; and (c) green power purchases from the local grid. Specific goals are established for each approach. Approaches (a) and (c) seem strongly appropriate. However, I question the wisdom of aggressively pursuing approach (b), especially with a fixed numerical target (10 MW of local renewable power by 2014). The university should be very cautious about undertaking activities that distract from its core mission. Two specific technology classes are mentioned: solar photovoltaics (e.g. on building roofs), and landfill-gas fueled electricity generation or thermal energy production. In my opinion, neither of these are clear winners for the university. For example, solar PV is not economical for grid-connected loads, nor will it be in the near future. Furthermore, although it is zero emissions during the use phase, the energy payback times are large (few years or more) and there are other environmental consequences of manufacturing PV units. As to landfill-gas fueled electricity generation, does the university own a landfill? If so, why? And, if not, then what is the source of the fuel to be considered? It is my sense that the opportunity costs for the University to become involved as an energy generator are too large. The University should focus on its core mission. Energy production should be left to energy companies.
- (5) In Attachment 2, paragraph I.e, the antecedent to “this standard” is unclear. It seems that this paragraph should be merged with I.d.

VIA E-MAIL

March 19, 2004

TO: Chair Ronald Gronsky  
Berkeley Division

FROM: Professor Michael O'Hare , Public Policy, Berkeley Division  
E-mail: <ohare@berkeley.edu>

Subject: *Draft Green Building Design and Clean Energy Standards Policy and Procedures*

I have reviewed the campus green building policy documentation you sent me and I have the following comments, which may not be useful given how far the project has advanced so far.

This program fundamentally treats energy from renewable sources and efficiency concepts as codified in LEED as priceless, that is, as though they should be advanced and adopted no matter what their cost in other terms. This may be a politically clever way to generate demonstration projects and experiments which are not intended to pay their way, but I think it is wrong-headed as a way to deal with energy and environmental policy generally.

Two critical comparisons are not properly recognized. The first is between renewable sources and fossil fuels. The underlying justification for this program is that the social *cost* of renewable energy is less than that of energy from fossil sources. At the moment, and for many years to come, the *price* of renewables is much higher than the price of fossil except in special circumstances, necessitating various subsidies to make them attractive. Some of this price advantage may result from unrecognized external costs, or existing hidden subsidies, and these should be identified and accounted for in UC decisionmaking. But some if it represents real costs, including even real energy costs--ethanol, for example, from corn incorporates big energy inputs of fossil fuel. Solar energy is collected with physical infrastructure that uses up real resources including energy. A program such as described here is quite liable to increase both economic costs generally and energy costs, possibly even fossil fuel consumption.

The second comparison is between using less energy to operate a building through design and using more. It's not difficult to increase net energy consumption by imposing design rules. A classic example is the substitution of electronic ignition for the standing pilot in gas ranges; because the pilot is a 100% efficient (though small) space heater buffered by the 70% efficient building heating system through the thermostat, it *reduces* building heating consumption in approximately the northern half of the US...leave aside the cost of the electronic ignition itself. Energy conserving design is not free, but includes features that sacrifice non-energy benefits (window size and count, etc.) and energy itself (fabrication of insulating materials, etc.). Sometimes a particular feature is worth it and sometimes it isn't. Especially in the varied California climates, a standard design portfolio of standards is unlikely to be efficient.

It would be much more useful for the university to develop a social cost charge to be assessed against fossil fuel use in budgeting for buildings, coupled with a standard that decisions optimize lifetime cost including this charge. The charge should be developed by real cost-benefit research and updated semi-annually. Such a mechanism would be easier to use, much more efficient, and incorporate exactly the right kind of flexibility.

TO: Lawrence Pitts  
FROM: Bruce Madewell

March 18, 2004

Dear Larry,

Please see below comments from Bryan Jenkins and John Bolander from UC Davis, Re: *Green Building Design and Clean Energy Standards Policy*. The response from Professor Bolander is also included as an attachment. I believe you will find both Professors Jenkins and Bolander expert on these subjects should you need additional advice.

Sincerely,  
Bruce

**Re: Green Building Design and Clean Energy Standards Policy**

Dear Professors Bolander and Jenkins,

The Committee on Committees of the UCD Academic Senate provided your names in response to a request from the universitywide Academic Senate. Academic Council Chair Larry Pitts has asked each division within UC to identify one or more faculty members with expertise to review the proposed University of California Office of the President implementation procedures for the *Green Building Design and Clean Energy Standards Policy*. Your critical or supportive comments and those from the other campuses will serve as guide for Academic Council's response to the Office of the President.

If you agree to review the attached material, I will need your comments before the middle of March for the March 31 Academic Council meeting. Please let me know if you are willing to review these materials, and if you need additional information.

Bruce R. Madewell, Chair  
Academic Senate, Davis Division

VIA E-MAIL

TO: Bruce Madewell

FROM: Bryan M. Jenkins, Professor, Bio and Ag Engr., bmjenkins@ucdavis.edu>

Subject: Re: Fwd: Green Building Policy

March 15, 2004

Bruce,

Thanks for allowing me to review the Green Building Design and Clean Energy Standards documents. They address much needed policy relating to enhancing the University's sustainable development. Following are comments on the attachments:

Comments on Attachment 1, Regents Item:

Item (1) calls for the University to adopt as policy the principles of energy efficiency and sustainability in the planning, financing, design, construction, and other facets of facilities development and management, but these principles are not articulated in the document and no reference is provided to documents where they are developed in the context of green buildings. While these concepts may be generally understood, having a clear articulation of the principles should prove useful in implementing the policies relying on them. There are a number of other places where sustainability principles are mentioned but not articulated. Adoption of sustainability principles in the design and operation of University facilities is in general consistent with the state's goals set forth in the Environmental Goals and Policies Report (EGPR) submitted to the legislature last fall by the Governor's Office of Planning and Research, see (<http://www.opr.ca.gov/EnvGoals/EnvGoals.shtml>). The EGPR adopts a policy of sustainable development, and if approved, could be referenced in University policy.

The last part of item (1) stating that the University should adopt these principles "to the fullest extent possible, consistent with budgetary constraints and regulatory and programmatic requirements" seems to largely defeat the purpose of the policy. Although the University must, of course, comply with regulatory mandates, efficiency and sustainability principles can still guide the development of University infrastructure, even under budgetary limitations. This part of the text seems unnecessary and artificially constraining. Although I am unsure of the current status of this document, I suggest deleting that portion of the text in any future policy statements.

Item (2) addresses reducing non-renewable energy but the text beginning with "...local renewable power, and green power purchases from the electrical grid..." leaves out non-electrical renewable energy sources (e.g., renewable gas or liquid fuels). I suggest rewording as "...local renewable energy, green electricity purchases from the grid, and other renewable energy sources..."

Comments on Attachment 2, Draft Presidential Policy

Item I.b. of Green Building Design allows for exceptions from the LEED 2.1 standard, but there is no mention of how requests for exception will be evaluated or approved. The guidelines should indicate typical circumstances for which exceptions would be considered. These guidelines could be flexible enough to allow for unforeseen circumstances, but in general should be strong enough to avoid the

exception becoming the norm. This also goes for item I.e.

Item I.q. is somewhat abbreviated and could be expanded to include discussion of with whom sharing is intended and what form the sharing should take. I assume this refers to information flowing both to and from the University, but the statement is unclear in this regard.

Item II.b. under Clean Energy Standard mentions only the state's RPS and appears not to have been updated to address the accelerated goals under the state's Energy Action Plan or the new administration's objectives. The University should consider whether it wishes to adopt accelerated goals consistent with other state goals.

Item II.c. adopts a goal of up to 10 MWe of local renewable power by 2014. This specific performance objective is inconsistent with the rest of the policy that uses percentage targets. Nor is it clear why the capacity should be limited to 10 MWe when the University might pursue development beyond 10 MWe. Perhaps this could be rephrased as "With a goal of providing 10 MW or more of local renewable power..." or put in the context of a portfolio standard similar to II.b. Item II.c. should further specify that development of local power generation should consider combined heat and power systems to reduce other energy consumption and take advantage of what otherwise would be waste heat. In this item the policy should also address the maintenance and replacement of systems in order to allow for sustained long term operation and improvement.

Item II.e. should also mention the use of renewable fuels in addition to energy-savings for fossil fuel reduction and environmental improvement. For example, a renewable fuels standard could be adopted for the University's transportation fleets, similar to the electricity standard under II.b.

Comments on Attachment 4:

Item 1.a. should be made consistent with any changes to II.c. of Attachment 2 mentioned above. Item 1.b. should be revised to read "...to reduce energy consumption by 10% or more by 2014..." Item 1.c. should be revised to read "...increasing to 20% or more in 2017." This latter item should be made consistent with any changes addressing accelerated goals under the Energy Action Plan or other plans as discussed above. The University's policy should be clear in its intent of moving towards a sustainable energy system.

Let me know if you wish to discuss this further.

--Bryan

March 16, 2004

From:

John Bolander, Associate Professor  
Department of Civil & Environmental Engineering  
University of California, Davis

Re: review of draft Presidential Policy for Green Building Design and Clean Energy Standards

*Review scope*

The comments provided here stem from a review of attachments 1, 2, and 4 to the October 31, 2003 memo from Senior Vice President Joseph P. Mullinix to the Vice Chancellors of Administration, Budget and Planning, and Capital Projects. Attachments 3, 3A, and 3B (Draft Procedures for Implementation of Green Building Policy) were not included in the material provided for review. The comments are also centered more toward the green building aspects of the draft policy, rather than the clean energy aspects, due to the background of this reviewer.

*Review*

The modern trend toward the design of green buildings, and the emergence of green building as a rapid growth industry, began just over a decade ago. Within this relatively short time span, there has been an extensive amount of research and practical work done in this area. A recent report developed for a group of over 40 California state government agencies [1] provides a comprehensive summary of the costs and financial benefits of green buildings. Based on costs obtained for 33 green buildings located in various regions of the U.S., the report concludes that the green aspects of a building cost only about 2% of the total cost of design and construction. This 2% investment returns, on the average, a 20% savings in total cost over the life cycle of the structure. A significant portion of these financial benefits is from savings related to energy, waste handling, water usage, and reduced operations/maintenance. However, the larger portion of the financial benefits comes from improvements in occupant productivity and health.

In light of these conclusions, and the results of numerous other studies, the UC system-wide proposal for green building policies and clean energy standards is appropriate and timely. The material presented in attachment 2 (Draft Presidential Implementation Policy – Green Building Design and Clean Energy Standards) touches on most of the important issues, although the proposed policy is described in quite general terms.

Attachment 1 concludes with the statement that UC will become a leader in the nation with these new green building and energy standards. However, the degree of commitment to obtaining that goal is not apparent in the listing of items in attachment 2. Most parties would benefit from a clearer statement on whether these efforts aim toward advancing the state-of-the-art in green building design and clean energy standards (or whether these efforts mainly involve the prudent usage of available technologies and recommended standards).

The following comments are related to the implementation of the general policy.

1. The value of proposed activities, both to UC and to other interested parties, would be greatly enhanced through the careful monitoring of the costs and benefits. Monitoring is implied through the President's annual reporting of the University's sustainability efforts and operating costs. However, it would be helpful to have more explicit statements on the types of monitoring and the itemizations used for cost/benefit reporting. At least there should be a statement that appropriate monitoring of costs/benefits

is integral to the proposed efforts and necessary for making informed decisions on amending the proposed policy.

2. Continuing from the previous item, it is interesting that the draft policy does not mention the occupant productivity and health benefits associated with green buildings. The implication is that such benefits will not be included in the cost/benefit analyses that are included in the annual reports. The quantification of productivity and health benefits is highly uncertain (relative to the quantification of energy savings, for example), but such benefits should not be ignored in the reports and policy decisions. Even by conservative estimates, productivity and health benefits dominate the overall financial benefits of green building [1]. One possible contribution to the state-of-the-art might be in developing innovative means for monitoring and quantifying productivity/health benefits for inclusion within the life cycle costing of green buildings.
3. The tone of the proposed policy for green buildings is rather conservative, which does not contribute to the notion that UC will become a national leader in this area. However, the requirement for an equivalent to a *LEED 2.1 Certified* rating is a positive step and is sensible as a minimum standard.
4. Item (c) under section (I) states that a standard equivalent to a *LEED Silver* rating or higher is a goal, subject to the constraints of program needs and standard budget parameters. It is odd that these new design strategies, which consider various non-traditional performance measures over the building life cycle, are subject to standard budget constraints. The benefits of improving the rating level would be more fully apparent after a comprehensive life-cycle cost analysis, which is referenced within item (I). Also, by conditioning the acceptance of a *LEED Silver* (or higher) rated design on standard budgetary parameters, the policy statement suggests that higher rated designs are more expensive. This is not necessarily true, as higher ratings can lead to lower overall life cycle costs [1].
5. Job site supervision and commissioning are helpful in ensuring the buildings are constructed and operate as planned. As the performance requirements are increased, so are the needs for attention to details in construction and operation. When evaluating green building projects and policies, it is important to distinguish between performance problems inherent to the technology and those due to failure to properly implement the technologies. A surprisingly large number of performance problems can be attributed to the latter of these two causes.
6. Stated goals of the draft policy include reducing the University's detrimental effects on the environment, increasing environmental awareness, and providing educational leadership for the future. Ultimately, the scope of the implied cost/benefits analyses should be extended to include upstream and downstream effects of the University's actions. Many of these actions, such as energy usage and procurement/disposal of building materials, can have adverse consequences that extend far from the draft policy's center of attention. The upstream and downstream effects can be brought into a life cycle assessment framework, but the relative weighting of such effects (alongside the more precisely known, traditional cost items) is subjective. Nonetheless, leadership in this area is needed and UC is capable and worthy of assuming a leadership role.

#### References

1. Kats, G., et al., 'The Costs and Financial Benefits of Green Buildings', A Report to California's Sustainable Building Task Force, October, 2003.