Adopted: October 26, 2004

ACADEMIC SENATE of CALIFORNIA POLYTECHNIC STATE UNIVERSITY San Luis Obispo, CA

AS-623-04

RESOLUTION ON ESTABLISHMENT OF A CENTER FOR SUSTAINABILITY IN ENGINEERING (CSinE)

$\frac{1}{2}$	WHEREAS,	Cal Poly, along with over 300 universities worldwide, is committed to environmental citizenship through President Baker's recent endorsement of the
3		Talloires Declaration; and
4		
5	WHEREAS,	The Talloires Declaration calls for urgent action, including the development and
6		implementation of environmentally sound industrial technologies; and
7		
8	WHEREAS,	It is incumbent on engineers, whose business is the innovation of and
9		management oftechnology to provide new and creative solutions in the global
10		community's quest for sustainable solutions; and
11	MUEDEAG	
12 12	WHEREAS,	There is a critical mass of individuals within the College of Engineering who are
13 14		and
15		
16	WHEREAS.	A Center for Sustainability in Engineering will leverage the efforts of individuals
17	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	within the College of Engineering; and
18		
19	WHEREAS,	Endorsements for the creation of the center have been obtained from the College
20		of Engineering, College of Engineering Dean's Advisory Council, the Deans
21		Council, and the Office of Research and Graduate Programs; therefore be it
22		
23	RESOLVED :	That the Academic Senate of Cal Poly endorse the proposal to establish the
24		Centerfor Sustainability in Engineering (CsinE).

Proposed by: Chaztiioanou, Richards, Vanasupa, CENG Date: September 27,2004

State of California Memorandum



Date:

To: David Hannings, Chair Academic Senate (

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From: Robert C. Detweiler Interim Provost and Vice President ""for Academic Affairs Copies: Peter Y. Lee SusanOpava Alypios Chatziioanou "Linda Vanasupa

September 27, 2004

Subject: Request for Academic Senate Review of the Proposal for the Establishment of a Center for Sustainability in Engineering (CsinE)"

Attached is a copy of a preliminary proposal to establish a Center for Sustainability in Engineering at Cal Poly. In accordance with campus Administrative Bulletin 87-3 (Guidelines for the Establishment of Centers and Institutes), this proposal received conceptual approval by the Academic Deans' Council at its meeting on May 10, 2004. I would now appreciate the Academic Senate review this proposal prior to the close of Fall Quarter 2004. Please feel free to contact Dr. Alypios Chatziioanou, Chair of the Civil and Environmental Engineering Department, or Dr. Linda Vanasupa, Chair of the Materials Engineering Department, authors of the proposal, should you have any questions or would like them to make a presentation to the Academic Senate. No State funding is guaranteed or foreseen for startup funds for this proposed center due to the current State budget situation.

Thank you, and if you have any questions, please do not hesitate to contact my office.

Enclosure

The full version of this proposal can be viewed at: www.calpoly.eduj-Ivanasup

Center for Sustainability in Engineering (CSinE) Proposal to the California Polytechnic State University

April 30, 2004

A. Chaztiioanou, D. Richards, L. Vanasupa College of Engineering

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Sustainability in Engineering

The Critical Need

The Urgency

The global scientific and engineering communities recognize the urgent need for society to minimize harm to the environment. Indeed, over 300 university presidents, including Cal Poly's, has underscored the urgency by signing the Talloires Declaration. In it, university leaders call attention to the precarious state of the environment and global society and call for immediate action,

"" .It has been predicted that the earth's oil reserves are nearing theirend ... 1 predictthatwe will reach the end of our reserves sooner than we think,"

-President Warren J. Baker, Announcing his endorsement of the Talloires Declaration, April 23, 2004 including developing and deploying . environmentally preferable technologIes, to ensure a more sustainable future for all humanIty.

It is incumbent on engineers, whose business is the innovation of and management of technology to provide new and creative solutions in the global community's quest for sustainable solutions.

Historically, as in other academic fields, environmental initiatives within engineering have mainly been isolated within the discipline of environmental engineering. However, both the approaches to meeting economic and social

demands amid tighter environmental constraints have been evolving over the last 30 years. Indeed as the international community has been examining the scope of the problem--depleting natural resources, diminishing biodiversity, social inequity-- it is clear that sustainable solutions will require knowledge from all disciplines. There are no magic bullets. There are no simple

"This is the century when human beings must learn how to live on this planet in an environmentally sustainableway."

-John Hennesy, ElectricalEngineer and President, Stanford University, on establishing "Stanford's Institute for the Environment," March 2004

solutions. What is required is new thinking, new ideas, new ways of balancing economics, the environment, and social imperatives (the triple bottom line). Because we have already damaged key components of the biosphere such as forests, waterways, fisheries and the ozone layer, we cannot delay making this paradigm shift.

The Rationale Fortunately, a number of efforts are already underway at Cal Poly to promote sustainable solutions. In addition to projects, courses and course content within the College of Engineering (CENG), faculty outside CENG have established programs to address some of the critical needs; the *Renewable Energy Institute* and *Environmental Biotechnology Institute* are two examples. Our intent is to bolster these efforts and to strengthen the overall efforts at Cal Poly. The proposed Center for Sustainability in Engineering (CSinE) will primarily, initially, leverage the work of individual

investigators within CENG to end CENG programs* and influence nationwide. However, given the science and solutions to sustain contribute to the larger CalPoly	ffect the paradigm shift needed throughout engineering programs statewide and complex multi-disciplinary nature of the ability, CSinE efforts will benefit from and community as well.	
 In the first two years, CSinE effactivities: Facilitating the integratic concepts throughout englishing a conference Establishing outside fur 	Forts will be concentrated on three primary ion of environmental and sustainability gineering curricula e for Fall 2005; nding for the Center's on-going activities;	Strategic Plan
Vision: To provide engineers with the interdisciplinary perspective needed to inspire,. develop, implement, innovate, practicable methods for sustainability	Our vision and mission	
host workshops locally and at st conferences such as <i>Frontiers in</i> <i>Education</i> , or the annual <i>Americ</i> <i>Society for Engineering Educati</i> Potential funding sources for cu activities include government ag private foundations and industry droft plan for the curricular	trategic n can ion.Mission: CSinEis committed to leading the development of engineers who are systems thinkers, technological innovators and catalysts of change for sustainable futures.	
integration is included in Appendix B of this document. It includes goals, actions and objectives for each year of study with the intent of shifting the paradigm toward multi-disciplinary environmentally preferable, socially sensitive, systems- based thinking and design.	 Objectives: Shift the engineering educational paradigm so that it involves systems thinking, and incorporates environmental and social considerations in engineering design and management; Ensure that engineering design incorporates continuous improvements in integrating environmental and social considerations; Serve as a resource for faculty to integrate sustainabi/ity practices into the curriculum; Coordinate and fund multidisciplinary 	Objectives
• The CENG Department Chairs and Directors have endorsed the proposal to integrate sustainability and create a Center. Please see item 4 in Appendix A.	 Projects with sustainable components; Become self-supporting by Year 3; Increase communityawareness of the need for sustainable solutions. 	

The second goal of CSinE in the first two years is to host a major international conference on the challenges to integrating sustainability into the undergraduate engineering curricula engaging industry, academia, and government. It is tentatively planned for the Fall of 2005 and potential speakers have been identified. The National Academy of Engineering has been approached to playa

Strategies

strategies:

- Host biannualinternational conferences
- Secure fonding for the Center
- Create an Advisory Board
- Provide release time to faculty to develop curricular materials
- Hold workshops for engineering faculty
- Disseminate curricula materials for engineering programs
- Networkwith other institutions and governmenf agencies
- Identify and leverage research oppoitunities

partnership role. In addition, professional engineering associations will be asked to join the effort as well. Funding will be sought from the Environmental Protection Agency, National Science Foundation, the Engineering Foundation, the Sloan Foundation, corporate entities, as well as private foundations. Funds will be used to cover commissioned papers, costs oftravel of speakers, publication costs, as well as salary and other conference costs. Some costs will also be covered by registration fees. It is anticipated that the conference will be the first of several to be hosted biannually on the same or related topics.

Over the longer term, it is anticipated that CSinE will fully engage in efforts to promote research and development related to finding sustainable solutions. While there are many aspects of sustainable development that can be characterized as needing basic research, much of it is applied. As such Cal Poly is uniquely positioned to provide leadership in this area. Additionally, such applied research also provides valuable real-world learn-by-doing" experience from which Cal Poly students can abundantly benefit. As such, CSinE would be poised to take advantage of a situation in which Cal Poly's competitive advantage can be, and should be, harnessed to address a pressing global need. Furthermore, given the nature of the issues of sustainability, it is very likely that many of the engineering design issues that arise will require the input of other fields such as ecology (obvious as engineers learn to design within environmental constrains) as well as anthropology and sociology (as engineers learn to design within social constraints). As such, if CSinE is to live up to its vision of providing engineers with the *interdisciplinary* perspective needed we anticipate both drawing on, and contributing to the larger Cal Poly community.

Funding for this effort will take two forms. The first to support faculty and students on specific projects with funding from state and federal government agencies, private foundations and corporate sponsors. The second is to seek sustaining funds for CSinE from private individuals, corporations and private foundations. An example of an specific project involving industry and government sponsors is on recycling automobile tires currently being negotiated by one of the proposers of CSinE (LV).. Applied, multi-disciplinary projects such as this would fall under the mission of CSinE and sought by the Director and Associate Directors. The Director and Associate Directors will work together to form the investigator teams and cultivate funding opportunities for these types of projects.

Finally, there is already a clear synergy with the other CENG initiatives, such as the Project-Based Learning Initiative and the Bonderson Building, which is scheduled to be ready by CSinE's third year. Many of CSinE's space needs can be satisfied by the new building. Additional funds that become available through indirect returns and grants will be used towards meeting staffing needs as well as creating a paid director position. During the first year, the Director will work *pro bono*.



The Director of CSinE would be appointed by the Dean of the College of Engineering in consultation with CENG Chairs and Directors. The appointment would last for one year unless otherwise recommended by the CENG Council. Her primary role would be to implement or facilitate the implementation of the strategies: fundraising handling budget and staffing issues; interacting directly with CENG students and faculty; working with the

Organization and Governance

	Dean to detennine space needs and allocations for the projects; fonning partnerships with other institutions and agencies. The Director will also consult with an advisory board that is appointed by the CENG Dean after recommendations by the CSinE Director and the CENG Council.
	The Associate Directors are appointed by the Dean of CENG in consultation with CENG Chairs and Directors when the director is not a Cal Poly faculty member. They serve as advisors to the Director and internal advocates for the University.
About the Director, Deanna Richards, Ph.D.	DEANNA 1. RICHARDS is an independent consultant. She provides technological and management strategies, tools and solutions that enable corporate, public and non-governmental entities address environmental and sustainable development concerns. Dr. Richards launched and directed the Technology and Environment/Sustainable Development program of the National Academy of Engineering from 1989 to 2000, before striking out on her own. At the Academy she initiated and oversaw efforts to address policy and management issues related to technology, the environment and economic growth, directed several studies on related issues and produced several seminal publications. Today she continues her pioneering efforts in the field of industrial ecology, engineering within ecological constraints, environmentally conscious manufacturing, as well as innovations to meet sustainable development objectives with a range of clients. She is currently serving within Cal Poly's College of Engineering as the Director of the Sustainability in Engineering Initiatives. (Please see Appendix C for more infonnation on Dr. Richards).
About the Center Faculty	The faculty establishing the Center has been involved in research and development that support the Center's objectives for several years. Their collective experience includes securing external funding from government agencies, private foundations, and corporations. They have lead both education and research initiatives (see Appendix D for a summary of sponsored research). As the core CSinE team, they are well positioned to work with the Director to enable the success of the Center.
	In addition to some of the funded research listed in Appendix D, the College of Engineering faculty continues to engage activities related to the proposed Centers mission, including hosting workshops and short courses for industry, courses and activities within the engineering curricula, and presentations at international conferences.
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We are requesting start-up funds totaling \$50K for the first two years. Note that CENG is committing a 25% match for funds in the first year and a 17% match in the second. The Director will not draw a salary until the second year.

Budget Estimations

	Year 1	Year 2	Year 3	Year 4**	Year 5
Estimafed Income					
Center Start-up Funds	\$20,000	\$30,000			
CENG Funds	\$5,000	\$5,000			
Indirect Returns			\$5,000	\$10,000	\$20,000
Conference Fees		\$120,000			
Grants		\$20,000	\$30,000	\$40,000	\$60,000
Total	\$25,000	\$175,000	\$35,000	\$50,000	\$80,000
Estimated Expenses*					
Staff and Student Assistants	\$7,000	\$40,000	\$25,000	\$38,000	\$66,000
Direct Conference Expenses	\$10,000	\$120,000			
Supplies and Services	\$8,000	\$15,000	\$10,000	\$12,000	\$14,000
Total	\$25,000	\$175,000	\$35,000	\$50,000	\$80,000

*Expenses include foundation administrative fees or other overhead as required. **If Conference is biannual the 4th year budget needs to be adjusted accordingly.

Short Answers about CSinE

QI. Where does the initial \$50,000 "Start-up Funds" come from in the proposed budget? These are the start-up funds for centers. Part of the sponsored projects indirect cost is retained for this purpose. The faculty in CSinE have brought (as PI's or CoPI's) to this campus projects totaling several millions of dollars.

Q2. Who are the faculty involved?

Faculty directly involved include: D. Richards (director), L. Vanasupa, A. Chatziioanou, D. Braun, A. MacCarley, J. Harris, Y. Nelson and N. Pal. Other faculty have expressed interest and are expected to join shortly.

Q3. How will the proposed Center interact with existing groups that are concerned with issues of sustainability?

We have already initiated discussions with all existing Centers and groups. Possible cooperation paths include developing proposals for grants, and developing campus strategies towards sustainability.

Q4. Sustainability is an interdisciplinary issue. What is the needfor center for sustainability focused on engineering?

This will create a clearing-house and help-center for engineering faculty and students. It will also provide an administrative vehicle for engineering projects and staffing needs.

Q5. Will this Center redirect resources away from other initiatives on campus?

No. One of the main CSinE objectives is to attract outside funding and indirectly increase the available campus funding for this area. One proposal (~\$350,000) has already been submitted this summer (2004.) No funding is requested beyond the start-up center funds.

Longer Answers About CsinE

Q6. How will CSinE make a difference from what is being done now?

Sustainable development offers CalPoly many opportunities and challenges. The strength of CalPoly's College of Engineering (CENG) lies with the people it engages in its activities: students, faculty and staff, alumni, advisory board members, grantors and other sponsors and other segments of university and general community. CENG faculty already offer courses related to sustainability and/or integrating concepts into the curricula. For example, in environmental engineering there is a course on sustainable development and another that covers topics such as design of environment and green chemistry that could broadly be of interest to students of industrial, mechanical, materials and electrical engineering. The materials engineering department has developed an integrated plan to introduce sustainability into its 4year engineering curricula that could serve as a model for CENG and the nation. The electrical engineering faculty have adopted a resolution regarding sustainability, engaged their industry advisory board in their sustainability efforts and developed seminars related to sustainability engineering. CENG students have long been exposed to aspects of sustainability through projects such as building and racing solar cars and demonstrating how automobiles can be made more fuel-efficient. Many of these efforts were self-initiated and a product of the spirit and enthusiasm of the faculty and students.

Sustainable development, however, is not about the past. Nor is it about the present. It is about the future. The establishment of the Center for Sustainability in Engineering (CSinE) reflects CENG's efforts to help forge that future in three ways

(A) Education

In education the emphasis will be on integrating sustainability into the existing engineering curricula so as to make environmental and sustainability thinking second nature to the next generation of engineers. First, a model to integrate sustainability into the 4-year engineering curricula developed by Linda Vanasupa, Associate Director of CSinE, has already been developed and is being implemented. Second, efforts are being made to develop projects that will allow students to apply what they learn as part of the College's project-based learning initiative. A goal is to build on the "learning by doing" CalPoly ethic. Third, a distinguished guest lecture series is planned to host at least one lecture per quarter. Fourth, a major conference on sustainability in engineering education is planned to be held every two years. Fifth, efforts will be made to develop rewards for faculty and students for projects-based learning proposals and modules related to sustainability.

In the long term, CSinE hopes to offer CalPoly Engineering students the opportunity to reflect as broadly as possible on the world their technical work will transform Efforts will be made to secure funding to develop academic minors and double major programs and courses which merge engineering and liberal arts and which will address broad sustainability concerns. These will be developed in conjunction with other colleges on campus and these minors and majors would be available to all undergraduates regardless of major field of study. For example, a Minor Program in Technology and Values could be organized around such themes as Environmental Science and Ethics, Biotechnology and Society, Technology and Public Policy, Technology and the Environment and History of Technology and the Environment and so on. These academic offerings could be combined with opportunities for engineering students and students in liberal arts to work on public policy issues at the cutting edge of technology and sustainability at either the local, state, or national level. This could be an effective means to engage engineering students in the broader systems aspects of sustainability engineering and engage non-engineering students in aspects of engineering in general.

(B) Research and Application

In research the field is wide open to faculty and students and limited only by imagination. CalPoly's unique "learning by doing" approach provides for experimentation in applying what is known and experimenting with solutions for sustainable futures.

Most efforts in research tend to focus on traditional areas related to the environment, such as environmental engineering, water resources, agricultural engineering or energy. However, few engineering efforts do not have some bearing on sustainability, considering that sustainability is about economic development, the environment and society. Indeed, from just the environmental aspect, research opportunities have broadened to include other engineering areas:

In 2003, the U.S. Environmental Protection Agency stated that "sustainability in both the developed and developing world requires scientific and technical innovation to create designs that enable the earth and its inhabitants to prosper" in announcing a competition to "demonstrate to the nation and the world the possibilities of innovative, inherently benign, integrated, interdisciplinary designs to simultaneously benefit people, prosperity, and the planet." They include as part of that competition these areas:

- agriculture (e.g., irrigation practices; storage and handling of food products)
- built environment (e.g., green buildings; transportation and mobility; smart growth)
- ecosystem (e.g., protection of ecosystem health; protection of biodiversity)
- materials and chemicals (e.g., materials conservation; renewable, bio-based feedstocks; inherently benign materials and chemicals through green engineering, green chemistry, biotechnology; recovery and reuse of materials through product, process, or system design)
- energy (e.g., energy production; energy distribution; energy conservation; inherently benign energy through green chemistry, green engineering, biotechnology)
- resources (e.g., delivery of and access to educational, medical, information)
- water (e.g., water quality, quantity, conservation, availability, and access)

They could have added health care, education, defense (defense is not abhorrent to nature), more broadly than simply the delivery or distribution systems of knowledge, goods, and supplies.

Through CSinE, CENG intends to actively pursue a wide range of opportunities for applied project-based research related to sustainability that will build on CalPoly's competitive advantage as a center for applied research while also providing students with a rich "learning-by-doing" experience.

Some of this research will be done with others Colleges on campus as well as in partnership with other engineering colleges or institutions and organizations.

(C) Outreach

In addition to the usual avenues of conferences, publications and a CSinE web page, opportunities will be sought for faculty to provide their expertise and sustainability-related solutions and innovations beyond the campus. Projects will be sought locally and around the world where students and faculty can lend their knowledge, time and effort to make a difference in communities in the overall quest for sustainable futures. This could be done through joint studies and exchanges with other institutions. It would not be inconceivable for CSinE to engage in projects ranging from turning waste into useful material or working on making San Luis Obispo County energy sustainable or reducing poverty in Africa.

Q7. How will CSinE Work with Other On-Campus Institutes/Centers?

CSinE will is intended to strengthen on-going campus efforts just as it is intended to strengthen on-going CENG efforts. CSinE has already initiated the building links with others engaged in sustainable development on campus. We intend to build strong working relationships through:

- Consultation: For example, on energy related matters it is envisioned that CSinEwill engage the Electric Power Institute and the Renewable Energy Institute in discussions, projects, etc.
- Participation: CSinE intends to engage the wider campus community in as many of its activities as possible. It is anticipated that at least one principal from CSinE will be involved in any sustainability-related campus activity initiated elsewhere.
- Collaboration: Efforts will be made to find way to collaborate wherever possible because sustainability is inter-disciplinary and also provides many opportunities to break down traditional disciplinary barriers.

State of California Memorandum



To: Warren 1. Baker President Date: April 12, 2005

From: Robert C. Detweiler

Copies: Peter Y. Lee Alypios Chatziioanou Susan Opava

Subject: Establishment of the Center for Sustainability in Engineering

At its meeting on April 11, 2005, the Academic Deans' Council recommended approval of the establishment of the Center for Sustainability in Engineering. The Academic Senate also endorsed the establishment of this Center at its October 24,2004 meeting (Senate Resolution AS-623-04). It is my recommendation that you formally approve the establishment of this Center, effective immediately.

If you approve, please sign below. Thank you.

Warren J. Baker

I

Warren J. Bake President

4/15/05 Date