

Cyber-Based Educational Software for Workforce Development

A Concept Proposal by the
Institute for the Sustainable Performance of Buildings (SU-PER-B),
Berkeley, CA

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Key Partners:

- Lawrence Berkeley National Laboratory.
- The emerging CC Statewide “Green” HVAC Program Network (see that proposal) and earlier collaborations with several CCs within that network such as Laney and SJCC.
- Collaborations with California community college architect, lighting, and environmental programs such as CCSF, De Anza, etc.
- UC Berkeley – Mechanical Engineering, Architecture/Center for the Built Environment.
- UC Merced – School of Engineering.
- Cal Poly, San Luis Obispo – Architecture.
- UCLA – Department of Architecture (to be explored)
- UC Davis – California Lighting Technology Center, Energy Efficiency Center, Western Cooling Efficiency Center
- PECI
- Energy Training Centers, PEC and Stockton (PG&E)
- Collaborate with IOU HVAC, Workforce Education & Training, Emerging Technology programs, and the Technology and Diagnostics Advocacy Sub-Program (to be explored)
- Various Industry Advisory Groups (HVAC, Lighting, Architecture, sustainable, etc)
- Building owners and facility Managers (e.g., Target, etc)
- New energy ‘academy’ at SCE (to be explored)
- CUNY, both 2-year and 4-year programs
- Texas A&M, Departments of Architecture and Mechanical Engineering
- Iowa Energy Center
- Two national networks, the Advanced Technology Environmental and Energy Center (ATEEC) and the Partnership for Environmental Technology Education (PETE).
- Trade Unions
- Several software development firms

Collaborations and software development activities leading to this proposal have been underway for a number of years, and the above list indicates a number of ongoing informal or formal collaborations, except for desired future collaborations that are indicated by the phrase “to be explored” in parenthesis.

The problem

Saving energy in buildings involves not just added new widgets and technologies. High efficiency equipment that is not properly installed, calibrated, tested, operated or maintained will typically save far less energy than estimated. Thus, a critical need today and into the future is to

train skilled people to design, construct, operate, and maintain the increasingly complex buildings and systems. This discussion is applied to commercial buildings, but many aspects extend as well to residential buildings.

Today, many large commercial buildings use sophisticated building automation systems (BASs) to manage a wide and varied range of building equipment. While the capabilities of BASs have increased over time, many buildings still do not fully use their capabilities and are not properly commissioned, operated or maintained, which leads to inefficient operation, increased energy use, and reduced lifetimes of the equipment. Further compounding the problem is the lack of properly trained building operators and managers. Even systems for small commercial buildings increasingly include sophisticated computer-based controls. Many experts estimate the inefficiency in building operations range between 10 to 30%.

Several major trends are increasing the complexity and difficulty of properly operating and maintaining buildings.

- Climate change priorities require a strong focus to move toward zero net energy solutions as quickly as possible.
- At the same time effective building delivery and management is becoming increasingly more complex.
- Digital control technology is becoming pervasive on both new and existing buildings. Thus, building operators and technicians must master a new set of computer-related skills (e.g., hardware, software, database management, and local area networking) in addition to their traditional skills of HVAC management and repair.
- Regulations and policies are increasingly involved, including new commissioning and sustainability factors.
- Energy performance monitoring, commissioning and retro commissioning address increasing cost of energy but require advanced capabilities to be effective.
- Security is increasingly important since 9/11 and operators must monitor advanced security systems, initiate emergency response plans, and shut down complex system in the event of environmental attacks.

Currently, there are very few such software resources that can provide such system- and building-level integrated views.

Addressing the problem

We propose a major initiative to provide Cyber-Based Education software tools for workforce development to increase skill levels as a major means of increase the operational efficiency and sustainability of existing and new buildings. Our major objective is to transform commercial building design, delivery, and operations by raising the energy efficiency knowledge levels and the problem-solving, troubleshooting abilities of technicians, building operators, commissioning agents, architects, engineers, and other building industry professionals.

One path to improved building performance is to raise the level of understanding of (1) proper, energy-efficient HVAC and lighting operations and controls on the part of building operators and technicians, and of (2) proper system-level troubleshooting methods and approaches to solve problems when they occur. The proposed energy enhancements to the software tools in this

proposal focus on teaching system-level troubleshooting skills along with skills in communications and teamwork. Such awareness will help operators and technicians in the building industry to improve building operations, maintenance and energy efficiency.

We will develop and disseminate Cyber-Based Education (CBE) tools to California technicians, building operators, educational institutions including K-12, 2-year, 4-year, and post-graduate, plus organizations with in-house energy education programs. All products we develop are either open source or web-based public domain delivery platforms, ensuring their widespread use and their potential extension and modification by others.

All tools and resources developed are intended to be available at no cost to users.

Public benefits

Commercial buildings in California consume about 67,077 GWh of electricity and 1,279 Mtherms of natural gas. HVAC systems contribute approximately 28% of the entire electricity consumption and about 38% of the gas consumption in commercial buildings. Although there are no reliable data nationwide, or in California, on energy impacts associated just with inefficient operations, there is a general consensus that 10 to 30% of the energy is being wasted (Ardehali and Smith 2002, Claridge et al. 1996). Also, during design and construction, a recent study indicates that from 10 to 50% of potential energy savings identified by simulation during design can be lost just via inadequate construction documentation and specification (Viadya, etal 2008).

The improved education and training from an advanced suite of CBE software could substantially improve the distribution and depth of knowledge and skills in the workforce about energy efficiency and could thus help to transform both the delivery and the operations and maintenance of commercial buildings in the State of California.

Key Technical and Pedagogical Features

Such CBE software has some key technical and pedagogical features:

1. Software is driven by accurate simulations (in SPARK, Modelica, EnergyPlus, Radiance, etc)
2. Animated Graphic User Interfaces (GUI) present users with easy to understand pictures of how the building and its systems operate; the complexity of the simulations is hidden from the user
3. A user who wishes can “drill down” to view underlying model structure, building descriptions, equations, and concepts.
4. Depending on the learning objectives, building operations can be viewed from widely varying time perspectives:
 - Second-by-second real time view of components and control dynamics
 - Diurnal patterns
 - Weekly, monthly and annual operations.
5. The software is imbedded in a solid pedagogical framework that includes:

- Extensive use of Problem Based Case Study (PBCS) scenarios that can be tailored by faculty of curriculum developers to address current and emerging building industry problems.
 - Use of videos to present complex, real world problems.
 - Use of an optional six-step learning process that promotes simultaneous learning of business, communication, and technical skills as part of team or individual problem solving exercises.
 - Assistance in trouble-shooting methods
 - Ability to link to various course management systems such as Moodle or Blackboard.
6. Web-based community-building features are being planned in order to facilitate the remote sharing and development of resources and PBCS scenarios plus potential remote teaming on solving problems.
 7. A web-based “administration” capability that enables course instructors to edit and create PBCS scenarios, including selecting one or more “faults” that impair component and system operation, hiding the faults from students, and creating “problem” videos that describe the impact of the faults that the students must then identify and solve.

Educational Settings

The software can be used in a variety of settings:

- As part of classroom lectures
- For individual and team problem-solving classroom exercises.
- As part of seminars and workshops at energy centers.
- As part of instructor-assisted or directed online or hybrid courses
- As part of online “virtual” team problem-solving exercises, where team members are in different locations
- For just-in-time, self-directed learning situations.

A “sustainable” Software Resource

Learn HVAC, and future planned software resources, are open-source software, and intended to be widely available at no cost. Preparations for the first open source release of Learn HVAC are now underway.

Because they are open source and free, Learn HVAC and similar tools now being planned (e.g., for lighting, daylighting, building envelope, natural and hybrid ventilation, whole-building integrated design and operations, etc.) can be adopted by a community of users and developers for further refinement and expansion over time. This will facilitate their modification over time as new technologies appear and as issues change. Thus, these tools are structured to become a “sustainable” enduring set of education resources.

Moodle (www.moodle.org) is a good example of the potential for long-term sustainability of useful, free, and open-source software. Moodle is a free and open source e-learning software platform, or course management system. Moodle originated in Australia and has been evolving now for about 10 years. It has a significant user base with 49,256 registered sites with 28,177,443 users in 2,571,855 courses (as of February, 2009) (Wikipedia).

Background and Status

A working version of Learn HVAC, a Cyber-Based Education software for HVAC system-level troubleshooting, has been developed over 5 years with primary funding from grants from NSF and CEC. Learn HVAC users can gain a basic understanding of how generic HVAC systems work, both when they are operating normally and when one or more “faults” are causing the system to operate outside of normal parameters.

The NSF-funded version was designed primarily for community college technician-in-training users. More recent refinements funded by CEC focus on a broader set of users within the building industry.

Demonstrations and early field-tests with both community college and high school students indicate that the current software works well and is effective. Its dissemination is supported by the Institute for the Sustainable Performance of Buildings (SU-PER-B) and by LBNL. It may be downloaded at no cost from www.learnhvac.org.

It has been developed to be open-source software, and the intention has been to make it widely available at no cost. Preparations for a first open source release are now underway.

Learn HVAC provides a highly graphical interaction with a virtual HVAC system. Two time perspectives are presented. The user can:

1. Interact with an accurate, second-by-second simulation of a generic HVAC system plus the dynamics of its controls that is coupled to a series of 3D animations that present the system’s performance in a visually realistic way.
2. Activate annual, monthly, or diurnal EnergyPlus simulations that compare energy and load impacts of initial and current HVAC system conditions.

The 3D animations display air and water movement using colors to represent temperatures and the 3D graphic presentations are updated every few seconds by output information from the simulation running in the background.

The user may chose from a number of system or component level views of an air handling unit (AHU) including conditioned space, economizer/mixing box, filter, heating coil, cooling coil, fan, VAV box with reheat, diffuser, and for the conversion equipment including boiler, chiller, cooling tower and associated pumps. Key numerical data from the simulation is superimposed on each of the 3D views, and additional numerical data is presented within input and output panels on the graphic user interface. Simple time series charts are displayed of system behavior, and the user can select and display additional time series and X-Y charts.

Learn HVAC users can gain a basic understanding of how generic HVAC systems work, both when they are operating normally and when one or more “faults” are causing the system to operate outside of normal parameters.

The NSF-funded version focused on the operation of air-handling systems, while the CEC-funded version has added basic heating and cooling systems, energy and peak demand analysis, and 3D interactive generation of EnergyPlus load files of a prototypical office building.

Status

The development team is now preparing a major new software release with the new CEC features. After several years of development Learn HVAC is now poised for the potential of widespread distribution and use throughout California and the US, and an accelerated preparation effort is now being initiated to facilitate its widespread dissemination and to plan to expand its features to a broader set of users in the workforce.

Pedagogy

Learn HVAC is imbedded in a pedagogical approach developed by NSF-funded research. The current version of Learn HVAC has the elements listed below, can more are planned:

1. Extensive use of Problem Based Case Study (PBCS) scenarios that can be tailored by faculty of curriculum developers to address current and emerging building industry problems.
2. Use of videos to present complex, real world problems.
3. Use of an optional six-step learning process that promotes simultaneous learning of business, communication, and technical skills as part of team or individual problem solving exercises.

Learn HVAC uses a series of problem-based case-study scenarios that contain different starting conditions for student use – e.g., summer, winter, and spring scenarios that present systems either behaving normally or when impacted by various sets of faults. Students can also activate faults themselves to learn how each fault or set of faults will impact the behavior of components, controls, and the overall system. Instructors can create scenarios with one or more hidden faults that students can as troubleshooting case studies.

Learn HVAC encourages users to learn to troubleshoot faulty systems in order to solve real-world problems in buildings by: (1) recognizing the patterns of normal and faulty operation of equipment and systems; (2) identifying actions to fix faulty systems; and (3) using communication and teamwork skills to help address causes and implement solutions.

Learn HVAC also provides instructors with a password protected interactive website where the instructor can modify existing scenarios, created new scenarios, manage courses and student access, and even modified details of the system variables being used in the simulations.

The NSF project has had an Advisory Board of over 30 members drawn from the California building industry. The Advisory Board helped to: (1) identify the types of problems most important to the industry as well as specific potential case-study problems, and (2) review the software as it has been developed.

Learn HVAC is built on previous products and techniques funded by over the past dozen years by US DOE, US EPA, and others.

Concept for Cyber-Based Education Software Resources for Workforce Development

Goal:

We propose a major initiative to provide Cyber-Based Education software tools for workforce development to increase skill levels as a major means of increase the operational efficiency and sustainability of existing and new buildings. Our major objective is to transform commercial building design, delivery, and operations by raising the energy efficiency knowledge levels and the problem-solving, troubleshooting abilities of technicians, building operators, commissioning agents, architects, engineers, and other building industry professionals.

Objectives:

One path to improved building performance is to raise the level of understanding of (1) proper, energy-efficient HVAC and lighting operations and controls on the part of building operators and technicians, and of (2) proper system-level troubleshooting methods and approaches to solve problems when they occur. The proposed energy-related enhancements to the software tools in this proposal focus on teaching system-level troubleshooting skills along with skills in communications and teamwork. Such awareness will help operators and technicians in the field to improve building operations, maintenance and energy efficiency.

We will develop and disseminate Cyber-Based Education (CBE) tools to California technicians, building operators, educational institutions including K-12, 2-year, 4-year, and post-graduate, plus organizations with in-house energy education programs.

All products we develop are either open source or web-based public domain delivery platforms, ensuring their widespread use and their potential extension and modification by others. All tools and resources developed are intended to be available at no cost to users.

Job creation potential

- Software development, field-testing, documentation, dissemination (contractors hired)
- Software field-testing involves part-time hiring in each institution involved in testing of an instructor to oversee field-testing and of several students to participate in and report on the testing.
- Widespread dissemination of software into high school, 2-year, 4-year, union, and graduate programs involves part-time hiring of instructors and students to become local experts in use of the software and application to the curriculum.
- For incumbents, online, and hybrid, software-facilitated education and training will accelerate career path skill and knowledge upgrading in response to advancing technologies.
- Software-based education and training has potential for learning content 30% to 40% faster, allowing for potential of more students trained and placed in workforce for given amount of instructor resources.

- The software makes extensive use of problem-based case studies, which will involve hiring of faculty and students to develop and refine.
- Refinement, enhancement, and updating of the open-source software provides opportunities to hire faculty, students, and contractors at various location to do further open-source software development.
- Focus on software applications for high school programs, via CC supporting programs, and self-taught with community-building collaboration features, encourages young people into building energy efficiency and sustainability technical and professional career paths.

Energy efficiency potential

- Provides relatively low-cost education software, and related resources that can potentially save 10% or more energy.
- Students who are better trained in energy efficiency “best practices” will help to significantly improve building performance once they enter the workforce.
- Well-trained design professionals will enable building energy potentials to be achieved
- Well-trained technicians will enable building energy potentials to be actually realized during operations.
- Incumbent workers can continue to upgrade their energy-related skills to meet ongoing advances in technology

Key Proposed Development Activities

We propose the following major development and dissemination program activities:

1. Field Test/ Refine Existing Learn HVAC
2. Major Dissemination of Existing Learn HVAC
3. Enhance Learn HVAC – New Users Types, and Related Pedagogy & User Feature Development
4. Enhance Learn HVAC - Technical Features
5. Dynamic 3D Environment for Additional CBE Software Tools
6. 3D Green Lighting and Daylighting Education Tool
7. 3D Green Natural & Hybrid Ventilation Tool
8. 3D Green Envelope and Whole-Building Integration
9. Field Test and Distribute Each New Tool

The key program areas might be funded independently or in coordination.

Major sub-activities for these program areas are listed below.

Program Areas and Sub-Activities:

1. Field Test/ Refine Existing Learn HVAC

1.1 Field Test Existing Learn HVAC

- 1.1.1 Field test for original audience at several community colleges
- 1.1.2 Refine Learn HVAC from field testing
- 1.2 **Short Term Refinements to Aide in Dissemination**
 - 1.2.1 Open Source Version - Publish & Maintain
 - 1.2.2 Enhance Documentation of Use & Concepts
 - 1.2.3 Add troubleshooting module
 - 1.2.4 Add sensor selection module
 - 1.2.5 Refine Website login / download structure
 - 1.2.6 Other short-term refinements identified in field testing
- 2. **Major Dissemination of Existing Learn HVAC in California**
 - 2.1 **Major Dissemination of Existing Version**
 - 2.1.1 Plan dissemination & technology transfer effort
 - 2.1.2 Implement program for 10 community college HVAC programs across California
 - 2.1.3 Implement online "just-in-time" learning program for building operator incumbents
 - 2.1.4 Explore Use of Learn HVAC within several commissioning certification programs
 - 2.1.5 Implement program for an energy centers
 - 2.1.6 Implement program for one or more certification programs
 - 2.1.7 Implement program for 5 K-12 programs as outreach from the 10 community college HVAC programs
 - 2.1.8 Implement program for several Building Owner Groups
 - 2.2 **Provide Assistance to the Dissemination Efforts**
 - 2.2.1 Set up Wiki's, Forums, and related online support
 - 2.2.2 Establish and maintain a "help Desk"
- 3. **Enhance Learn HVAC – Adapt to suit new User Types, Especially students in undergraduate and graduate architecture and engineering programs.**
 - 3.1 **Refine Pedagogical Approaches**
 - 3.1.1 Seek update on key industry problems
 - 3.1.2 Define pedagogical approach for each key new user groups
 - 3.1.3 Define use cases for key new user groups
 - 3.1.4 Enhance Instructor Use Cases
 - 3.1.5 Develop new online delivery mechanisms and certifications as necessary
 - 3.1.6 Explore in detail the conversion from SPARK modeling to Modelica modeling
 - 3.2 **Add New Problem-Based Case Study Scenarios**

- 3.2.1 Seek update on key industry problems
- 3.2.2 Define new Problem-Based Case Studies (PBCS) and their KSAs
- 3.2.3 Adapt Scenarios to Various User Types
- 3.2.4 Develop the new Problem-Based Case Studies (PBCS) and related content
- 3.2.5 Link the new case studies to existing curricula / courses/ content
- 3.2.6 Add concepts, content, modules and links to lab equipment as necessary to support the new case studies
- 3.2.7 Enhance Instructor Use Cases & Features for the scenarios

- 3.3 **Refine Key New Features of Learn HVAC**
 - 3.3.1 Obtain ongoing feedback from dissemination
 - 3.3.2 Refine the new faults for AHU and plant
 - 3.3.3 Refine the new Troubleshooting Feature
 - 3.3.4 Refine the new Sensor Selection Feature
 - 3.3.5 Refine the user experience via the graphic user interface (GUI)
 - 3.3.5 Refine other aspects based on feedback
 - 3.3.6 Add links to other tools & resources

- 3.4 **Add Building Physical Science Modules**
 - 3.4.1 Refine objectives and pedagogical approach
 - 3.4.2 Define links to CBE Tools (via PBCS scenarios?)
 - 3.4.3 Construct modules and links for building physics: heat transfer fundamentals, thermal comfort, properties of light and visual comfort.
 - 3.4.4 Construct modules and links for improving bldg efficiency via applied building physics: data collection, storage, & analysis, how sensors work, problem solving, & self assessment.
 - 3.4.5 Construct modules and links to explain principles underlying operation of components and systems.
 - 3.4.6 Construct module on how to formulate and test ideas

- 4. **Enhance Learn HVAC - Technical Features**
 - 4.1 **Add New Simulation Models**
 - 4.1.1 Add rooftop unit simulation & graphical models w/ direct expansion cooling and direct fired gas
 - 4.1.2 Extend the VAV simulation & graphical models to explicitly treat multiple zones.
 - 4.1.3 Extend existing single boiler / chiller plant models to include multiple boilers, chillers & cooling towers w/ pumps and piping.
 - 4.1.4 Add a steam heating coil option to the built-up air handling

- unit model.
- 4.1.5 Add VFD to fan simulation & graphical models
- 4.1.6 Add VFD to chiller simulation & graphical models
- 4.1.7 Add VFD to Cooling tower pump models
- 4.1.8 Add variable flow laboratory fume hood models.
- 4.2 **Expand "Faults" Addressable by Learn HVAC**
- 4.2.1 Expand SPARK (or Modelica) AHU Faults from 20 to 60 plus.
- 4.2.2 Identify & Add Faults with Energy Impacts
- 4.2.3 Add "faults" to E+
- 4.2.4 Add faults to chiller, boiler, & cooling tower models
- 4.3 **Refine Integration of Energy Plus & Learn HVAC**
- 4.3.1 Allow space load definition in either E+ or Spark
- 4.3.2 Access More Energy Plus Prototypes
- 4.3.3 Add Sketchup-E+ link with Learn HVAC
- 4.4 **Add Building Metering as option to real-time analysis**
- 4.4.1 Add metering capability
- 4.4.2 Develop pedagogy
- 4.4.3 Develop PBCS scenarios
- 4.5 **Add Cost Capabilities**
- 4.5.1 First cost capability
- 4.5.2 O&M cost capability
- 4.5.3 LCC capability
- 4.5.4 Cost I/O & data handler
- 5. **Dynamic 3D Environment for Additional CBE Software Tools**
- 5 **Develop interactive 3D Environment**
- 5.1 **Develop Environment**
- 5.1.1 Select 3D modeling environment
- 5.1.2 Transfer Existing Models to full 3D environment
- 5.1.3 Develop new GUI approaches
- 5 **Enhance Software Structure**
- 5.2 **Enhance structure and communications**
- 5.2.1 Enhance Flash-SPARK (Modelica) communications API
- 5.2.2 Refine Scenarios for New User Types
- 6. **3D Green Lighting Education Tool (Develop, Test, & Disseminate)**
- 6.1 **Define Pedagogical Approaches**

- 6.1.1 Seek input on key industry problems for HP Green lighting in buildings
- 6.1.2 Define pedagogical approach and functionality for each key user group
- 6.1.3 Define use cases and interactivity for key user groups
- 6.1.4 Define key Problem-Based Case Studies (PBCS) to guide development

- 6.2 **Implement Component Level Functionality**
- 6.2.1 Create simulation components with modeling tools (SPARK, E+, Radiance, etc)
- 6.2.2 Add Sketchup to E+ link
- 6.2.3 Create 3D animated models of the components
- 6.2.4 Setup data and GUI links so the animations respond to the simulations
- 6.2.5 Develop supporting GUI capabilities to relate the animations/ simulations to the PBCS.

- 6.3 **Implement System Level Functionality**
- 6.3.1 Integrate and test combined functionality of all models and helper applications

- 6.4 **Implement GUI and Data Functionality**
- 6.4.1 Refine and expand upon existing capabilities from Learn HVAC to develop building wide data models, server code, and client/server communication code to support integration of all simulation and helper applications.

- 6.5 **Integration of all systems and tools**
- 6.5.1 Integrate all animations, simulations, tools, and helper applications into a seamless functioning whole.
- 6.5.2 Integrate system & tools with the PBCS scenarios, and refine all

- 6.6 **Quality Assurance**
- 6.6.1 This task will test the developing version of the LGB tool, both internally and with users from the target audiences.

- 6.6 **Prepare documentation**
- 6.6.1 Document the LGB architecture, features, operation and use.

7. 3D Green Natural and Hybrid Ventilation Education Tool

- 7.1 Define Pedagogical Approaches**
 - 7.1.1 Seek input on key industry problems for HP Green lighting in buildings
 - 7.1.2 Define pedagogical approach and functionality for each key user group
 - 7.1.3 Define use cases and interactivity for key user groups
 - 7.1.4 Define key Problem-Based Case Studies (PBCS) to guide development
- 7.2 Implement Component Level Functionality**
 - 7.2.1 Create simulation components with modeling tools (SPARK, E+, etc)
 - 7.2.2 Add Sketchup to E+ link
 - 7.2.3 Create 3D animated models of the components
 - 7.2.4 Setup data and GUI links so the animations respond to the simulations
 - 7.2.5 Develop supporting GUI capabilities to relate the animations/ simulations to the PBCS.
- 7.3 Implement System Level Functionality**
 - 7.3.1 Integrate and test combined functionality of all models and helper applications
- 7.4 Implement GUI and Data Functionality**
 - 7.4.1 Refine and expand upon existing capabilities from Learn HVAC to develop building wide data models, server code, and client/server communication code to support integration of all simulation and helper applications.
- 7.5 Integration of all systems and tools**
 - 7.5.1 Integrate all animations, simulations, tools, and helper applications into a seamless functioning whole.
 - 7.5.2 Integrate system & tools with the PBCS scenarios, and refine all
- 7.6 Quality Assurance**
 - 7.6.1 This task will test the developing version of the LGB tool, both internally and with users from the target audiences.
- 7.7 Prepare documentation**
 - 7.7.1 Document the LGB architecture, features, operation and use.
- 8. 3D Green Natural and Hybrid Ventilation Education Tool**
 - 8.1 Define Pedagogical Approaches**
 - 8.1.1 Seek input on key industry problems for HP Green lighting in buildings

- 8.1.2 Define pedagogical approach and functionality for each key user group
- 8.1.3 Define use cases and interactivity for key user groups
- 8.1.4 Define key Problem-Based Case Studies (PBCS) to guide development

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- 8.5.1 Integrate all animations, simulations, tools, and helper applications into a seamless functioning whole.
- 8.5.2 Integrate system & tools with the PBCS scenarios, and refine all

- 8.6 **Quality Assurance**
- 8.6.1 This task will test the developing version of the LGB tool, both internally and with users from the target audiences.

- 8.7 **Prepare documentation**
- 8.8.1 Document the LGB architecture, features, operation and use.

9. Field Test and Distribute New 3D CBE Tools & Resources

The following is a generic process that will apply to each new tool

- 9.1 **Field Test Each New Learning Software Tool**
- 9.1.1 Test the application in actual places of use.

- 9.1.2 Revise and revise the tool and resources as needed.
- 9.1.3 Revise, refine and publish the documentation
- 9.1.5 Publish the software as open source

- 9.3 **Widely Disseminate New Tool**
- 9.3.1 Develop Dissemination Plan

- 9.3.2 Disseminate to all recipients of Learn HVAC Vers.1
- 9.3.3 Disseminate at no cost to all likely potential users.



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May 18, 2009

VIA E-MAIL

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ATTN: Special Projects Office

Mr. Perez,

The Northern California Power Agency (NCPA), appreciates this opportunity to provide comments on the California Energy Commission's (CEC) proposed State Energy Program (SEP) and the Energy Efficiency and Conservation Block Grant Programs (EECBG). We understand that the information received from NCPA and others during the comment period will be considered by the CEC as the agency: 1) moves forward with the completion of its EECBG application to the U.S. Department of Energy next month, and 2) develops program guidelines for both the SEP and EECBG programs.¹

As a general matter, we are pleased with the range of program options being proposed and the various funding mechanisms being considered. That said, such offerings have some interesting nuances that provide opportunities for NCPA members as well as concerns. On the positive side, four NCPA members not already receiving a direct allocation from DOE will have legitimate access to the \$29.2 million of funds under the EECBG program, even though the details about how these dollars will specifically be allocated are still being drafted. We also recognize that SEP program funding opportunities will apply to the entire NCPA membership and that the use of a Joint Powers Agency like NCPA is being encouraged as a means of optimizing program design and minimizing administrative costs.

Turning to general concerns, NCPA questions a key theme contained in both program proposals: a heavy reliance on the use of loans as opposed to a distribution of grants. Our members fully understand the logic behind such an approach – loan repayments create revenue streams that make program offerings created and/or augmented by economic stimulus

¹ The cities of Biggs, Gridley, Healdsburg, and Ukiah have populations well below 35,000 and would qualify for funding under the program. The cities of Alameda, Lodi, Lompoc, Palo Alto, Redding, Roseville, and Santa Clara have already received funding under the U.S. Department of Energy large city/county allocation.

dollars sustainable over time. However, the reality of the current economic situation makes the theory behind that approach a bit tenuous, at least in the near-term. Plainly stated, any approach that relies too heavily on the use of loan and finds it acceptable to have additional debt be incurred by cities and individual consumers may be difficult to justify in the context of city budget discussions and heightened individual homeowner foreclosure rates.

Specific Comments About EECBG - Funding Proposals

As noted in the workshop presentation, the CEC is considering proposing five possible approaches to allocating the \$29.2 million in funding that is available under the EECBG. We comment briefly on each of these approaches.

- **Population-based approach** – Each entity is awarded an allocation equal to \$7 per capita under this approach. In this instance, all eligible entities get something, but the amount of dollars received by any given city/county may not be significant enough to have an impact on the range of programs being offered by a small utility. The administrative costs associated with these dollars could also be costly to entities if the CEC imposes reporting requirements above and beyond current energy efficiency reporting requirements of publicly-owned utilities.
- **Competitive Solicitation** – CEC awards funding based on highest quality proposals, including criteria such as cost-effectiveness, job creation, funding leverage, and the likelihood of success. Competitive solicitations are problematic for small utilities that simply do not have the resources to effectively participate in such activities. NCPA supports the ability of Joint Action Agencies to participate in such competitive solicitations on behalf of small cities as long as such applications clearly define how the dollars will be distributed among the cities participating in the aggregated application.
- **Competitive Solicitation with Split Funding for Small Jurisdictions** – In this instance, a separate funding pool would be made available for smaller jurisdictions, something NCPA would support.
- **Grants and Low Interest Loan Combo** – In this instance, the CEC has suggested that one-third of the project cost could be funded through a grant, with the remainder through a low interest loan similar to what the CEC already does for various energy efficiency projects under the Energy Conservation Assistance Account (ECAA) program. As noted earlier in these comments, NCPA has a general concern with an overreliance on loans in these tough economic times.
- **Low Interest Planning Loans** – With this approach, the CEC would provide funding to help small cities and counties develop energy elements of general plans. While the concept of providing incentives to develop energy elements of general plans might be a noble objective, the approach might be too limited in application.

Specific Comments About SEP - Funding Proposals

NCPA is pleased to see the vast majority of the funding dollars (\$195 million) under the SEP program targeted toward residential and non-residential energy efficiency retrofits. Our concern lies with the allocation of the remaining \$30 million, dollars that we believe should be used to further promote the energy savings envisioned by the retrofit program and create additional jobs.

Under the American Recovery and Reinvestment Act (ARRA), billions of dollars are being made available to states to promote the development of green jobs, some of which could easily be used by the CEC and its workforce collaboration partners at the California Workforce Investment Board, the California Labor and Workforce Development Agency, the Department of Education, the California Community Colleges System, and the Department of Community Services and Development. Each agency appears to be committed to green workforce development, and NCPA supports this effort. Such efforts, however, should be fully funded through other elements of the ARRA and not the SEP program.

Finally, NCPA argues that the CEC should minimize the amount of funding that is dedicated to itself to administer the SEP program. Since the SEP program is already an established program at the CEC, using another \$10.3 million of taxpayer dollars to administer an already-established program seems excessive. While we agree that the significant increase in SEP program allocations warrant additional staffing needs, NCPA questions whether nine additional "temporary" staff positions are really needed to process applications, provide technical support and guidance to stakeholders, as well as manage technical support consultants. A more reasonable amount of staffing should be considered as program guidelines are developed later this summer.

NCPA is committed to the success of the CEC's efforts to optimize the distribution of economic stimulus dollars allocated to the SEP and EECBG programs and look forward to working with you in this regard. If you have any questions, please contact me at (916) 781-4291 or at scott.tomashefsky@ncpa.com.

Sincerely,



Scott Tomashefsky
Regulatory Affairs Manager
Northern California Power Agency

Cc: Panama Bartholomy, Advisor to Chairman Douglas, CEC
James H. Pope, General Manager, NCPA
Jane Cirrincione, Assistant General Manager, NCPA



May 18, 2009

CITY COUNCIL
Roger S. Aceves
Mayor

Eric Onnen
Mayor Pro Tempore

Michael T. Bennett
Councilmember

Margaret Connell
Councilmember

Edward Easton
Councilmember

CITY MANAGER
Daniel Singer

California Energy Commission
Special Projects Office
1516 Ninth Street
Sacramento, California 95814-5512

RE: REGARDING EECBG & SEP FUNDS

To Whom It May Concern:

The City of Goleta (population 30,000) herein submits ten projects/programs for consideration by the California Energy Commission under the Energy Efficiency and Conservation Block Grant Program and State Energy Program. These projects and programs, taken collectively, create a lasting framework of leadership and commitment by Goleta to sustainable, environmentally friendly practices.

I believe that you will find that Goleta is ahead of the curve for small communities in that we are already engaged in several partnerships with other local communities, public agencies, utilities, private non-profit organizations and Chambers of Commerce on a wide range of energy conservation measures, including small business and home audits, structural retrofits and upgrades of appliances and lighting, and water conservation and integrated waste source reduction and recycling. We also work with businesses, large and small, on environmentally friendly procurement policies. Goleta's Old Town Neighborhood has benefitted from our environmentally oriented revitalization efforts, tied to CDBG and Home Fund programs. Our solar energy rebate clinics and seminars for residents, general contractors and architects have been well attended, locally and regionally. To compliment those efforts, our outreach to the community has also included simple actions, such as the Holiday Light Exchange Program and an Energy Efficient Light Exchange Program.

Goleta seeks funding for projects and programs that are identified in an attached table. They range topically from the expansion of public outreach programs, the preparation of green codes, the greening of public facilities, the removal of wells, piers and bulkheads that are orphaned remnants of the former Ellwood Oil Field, to our efforts to promote the discontinuation of onshore processing and transport facilities for oil and gas that are produced offshore at Platform Holly, the last of the State Tideland offshore platforms in the Santa Barbara Channel.

Also attached is a compendium of tables that outline Goleta's green policies and implementation actions in our General Plan/Coastal Land Use Plan. These are the policy directives that guide our day-to-day efforts and serve as the backbone of the funding requests at-hand.

I will serve as the primary contact for the application processes to come forward from the California Energy Commission. I may be reached at (805) 961-7541 or by email at schase@cityofgoleta.org.

Sincerely,



Steve Chase
Director of Planning & Environmental Services

Enclosures:

1. Table of Funding Requests for Projects & Programs
2. Goleta's Green Policies – General Plan/Coastal Land Use Plan
3. Goleta's GHG and Climate Change Policies & Implementing Actions
4. Other Environmentally Friendly Policies & Implementing Actions

CITY OF GOLETA CALIFORNIA

FISCAL YEARS 2009/10 & 2010/11

FUNDING REQUEST FOR EECBGP & SEP PROJECTS & PROGRAMS

1	Amortization Study	<p>Conduct an amortization analysis of Venoco, Inc.'s Ellwood Oil & Gas Processing Facility</p> <p>This matter relates to policy direction in the City's General Plan/Coastal Land Use Plan, under Policy LU 10, <i>"To promote the discontinuation of onshore processing and transport facilities for oil and gas, the removal of unused or abandoned facilities, and the restoration of areas affected by existing or former oil and gas facilities within the city."</i></p>	<p>Seeking \$75,000</p> <p>Conduct an update of a year 2001 amortization study by the County of Santa Barbara, followed by legal review, and hearing/decision-making by the City</p>
2	Energy Policy Planning	<p>Participate in Federal & State planning processes that study and decide upon:</p> <ul style="list-style-type: none"> • Leasing of offshore tidelands/outer continental shelf lands for oil & gas development in the western Santa Barbara Channel • Decommissioning of offshore oil & gas platforms, piers and pipelines • Rigs to reef projects • Rule-making for change of owner/operator, abandonment/decommissioning, and financial assurances 	<p>Seeking \$50,000</p> <p>Partial funding of Goleta staff member at \$25,000 per annum for two-years</p>
3	Energy Green Codes	<p>Prepare and adopt energy efficient/green codes for Inland & Coastal Zoning Districts and Building & Safety Codes that are responsive to AB32/SB375</p>	<p>Seeking \$75,000</p> <p>Goleta has match funding of \$90,000 to prepare it's first Inland Zoning Code and Coastal Zoning Code, the latter of which requires certification by the California Coastal Commission</p> <p>Goleta seeks an added \$50,000 for its Zoning Codes and \$25,000 for its Building Code</p>

4	Revitalization Efforts	<p>Broaden Goleta's revitalization efforts within the Old Town Neighborhood to emphasize energy efficient/green building construction and materials (900 households; 5,500 residents; >40% minority; mostly low to moderate incomes; 1,293 parcels; 595 acres)</p>	<p>Seeking \$50,000</p> <p>Partial funding of Goleta staff member at \$25,000 per annum for two-years</p>
5	Energy Efficiency Public Outreach	<p>Broaden Goleta's current public outreach efforts on energy efficiency to include green house gas reduction and sustainability measures as follows:</p> <ul style="list-style-type: none"> • Expand our instructional training of private sector architects and general contractors on green codes, energy efficient site planning, energy efficient construction techniques and materials, and GHG reduction measures • Expand our seminars for small business owners and residents on energy efficiency, GHG reductions and sustainability measures • Expand our solar energy rebate clinics in concert with Edison • Expand our Direct Install Program that provides energy audits and retrofits of lighting, appliances and equipment to small business, residents and mobile home parks • Expand our Holiday Light Exchange Program and Energy Efficient Light Program • Expand our Green Business Partnership program that provides integrated audits of transportation demand, integrated waste source reduction & recycling, water conservation, and environmentally friendly procurement • Provide match funding for our regional approach to energy efficiency and GHG reduction: South Coast Energy Efficiency Partnership and Green Business Partnership, involving 20-member public agencies, non-profit agencies, utility companies, special districts and Chambers of Commerce 	<p>Seeking \$50,000</p> <p>Partial funding of Goleta staff member at \$25,000 per annum for two-years</p>

6	Green City Facilities Planning & Engineering	<p>Goleta seeks to retrofit several existing public facilities, such as the Community Center and Library, and build a new City Hall, records storage facility and Fire Station</p> <p>The greening of Goleta's public facilities, old and new, is sought for purposes of energy efficiency, operational cost savings, and public modeling</p>	<p>Seeking \$200,000</p> <p>Partial funding of Goleta staff member at \$100,000 per annum for two-years for purposes of coordinating green capital improvement plan preparation, design engineering, fund acquisition, preparation of contract specs, bid solicitation and award</p>
7	Green City Facilities Capital Projects	Goleta seeks to retrofit and build anew public facilities that include the use of energy efficient/green equipment and materials, including solar systems for photovoltaic generation and water heating, thermal sealing and glazing, insulation and water conservation	Match funding for capital construction, equipment and materials costs, plus permitting, mitigation and monitoring costs, to be determined through planning & engineering studies
8	Well Abandonment Project	Goleta seeks to abandon 3-oil wells, 5-water wells and 1-groundwater monitoring well on a coastal open space area - the Sperling Preserve at Ellwood Mesa	<p>Seeking \$250,000</p> <p>Goleta has reserved match funding of approximately \$499,000</p> <p>The project involves preparation of a final action plan based on current geotechnical study, plus CEQA analysis and reporting, Coastal Commission permitting, mitigation, well abandonment, and environmental monitoring</p> <p>Total project cost is estimated at \$750,000</p>
9	Beach Hazards Removal – Planning, Permitting, Funding & Administration	In collaboration with the State Lands Commission, Goleta seeks to remove abandoned oil pier pilings, oilfield equipment, pipelines and bulkworks from the Sperling Preserve at Ellwood Mesa and adjoining State Tidelands (see attached photographs)	<p>Seeking \$50,000</p> <p>Partial funding of Goleta staff member at \$25,000 per annum for two-years for coordination of action plan, CEQA and permits</p>

10	Beach Hazards Removal – Capital Project	Removal of abandoned oilworks from the coastal bluffs and adjoining beach and tidelands waters that stem from the former Ellwood Oil Field, now the coastal public open space of the Sperling Preserve at Ellwood Mesa	Match funding for capital construction, equipment and materials, plus permitting, mitigation and monitoring costs, to be determined through planning & engineering studies
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COMMENTS ON STATE ENERGY PROGRAM

Thank you for the opportunity to provide comments to the Energy Commission's State Energy Program Funding Allocation from the American Recovery and Reinvestment Act of 2009.

SMUD commends the Energy Commission in their desire to extend the longevity of the stimulus funding by focusing the State Energy Program (SEP) on loan programs. However, SMUD's experience recently with its energy efficiency (EE) loan program has been less positive regarding repayment due to the slowing economy in the Sacramento area. SMUD's EE loan portfolio is worth \$67 million with more than 10,000 active loans. Although the vast majority of SMUD's loan customers continue to make their payments on time, some have fallen behind. Over the past three years, customer payment arrears have significantly increased. In 2007, the amount of arrears increased by 50% compared to 2006. In 2008, the amount increased by 61% compared to 2007. With the state of the economy, Californians may not be willing to take on additional debt.

Also, although the application to DOE states that the "program funding would be leveraged to provide energy efficiency retrofit program and cost effective clean energy systems (including combined heat and power systems)...", the workshops were focused on EE. Clean energy systems that address the state energy and environmental mandates while creating jobs appear to be missing in the workshop. The table below from the document, "Clean Energy Jobs in California", located on <http://www.apollochallenge.org/CA-Clean-Energy-Jobs.doc>, gives an idea of the potential job creation in California from clean energy.

Economic Benefits to California under National Climate Stabilization			
	Qualified Manufacturing Firms	Investment (\$ million)	New Jobs
Solar	1,788	\$12,115.9	48,896
Wind	1,943	\$5,449.5	32,046
Geothermal	348	\$2,181.1	8,465
Biomass	1,330	\$1,615.3	6,209
Total	5,409	\$20,911.8	95,616

Because of the above, SMUD recommends a balanced and diverse approach to the allocation of SEP funding. The SEP should have the following:

- A clean energy systems component (including renewable energy, CHP and district energy) to the SEP in addition to energy efficiency
- Both grants and loans
- Funding allocated at 50% to end use applications and 50% to energy supply applications

COMMENTS ON STATE ENERGY PROGRAM

Specific Recommendations:

A Grant Program for Renewable Energy Generation, CHP and District Energy Applications

This program would consist of leveraged projects that provide cost effective renewable energy that helps address the states energy and environment mandates such as the Renewable Portfolio Standard, AB-32 and the California BioEnergy Action Plan

Proposal criteria include the following:

- One or more generation technologies that utilize any eligible renewable resource or fuel as defined in the CEC RPS Guidebook, including hybrid systems that utilize eligible renewable resource or fuel; and/or
- One or more CHP and/or district energy project with eligibility requirements consistent with SB-1613; and
- A ceiling of \$5 Million of SEP funds requested per proposal

Program benefits include the following:

- Using renewable generation to displace natural gas generation results in approximately 900 lbs/MWhr of CO2 reduction.
- Job creation as exemplified in the table above
- Assist in achieving mandated Greenhouse Gas Reduction and Renewable Portfolio Standard goals
- Meet or exceed standards set by the State Air resources Board, local air pollution control districts, or local air quality management districts regarding air contaminants or emissions
- Meet or exceed standards set by the State Water Resources Control Board or regional water quality control boards regarding discharge to surface waters or ground waters of the state
- In compliance with all applicable laws, regulations and ordinances

SMUD has a long history of collaboration with the Energy Commission on clean energy projects. We hope to continue this collaboration through the State Energy Program.

SEP - Comments on CEC's initial ARRA plans

From: "Alison ten Cate" <atencate@rsgroup.com>
To: <sep@energy.state.ca.us>
Date: 5/18/2009 3:04 PM
Subject: Comments on CEC's initial ARRA plans
CC: "Lauren Casentini" <lcasentini@rsgroup.com>

To the Commission:

After review of the CEC's initial plans for the American Recovery and Reinvestment Act (ARRA) State Energy Program (SEP), Resource Solutions Group supports the general concepts and plans outlined at the regional meetings during the week of May 4th. However, we feel strongly that the CEC must maintain oversight of both the quality of the implementers - as well as the implementation - to truly advance California's energy goals.

By way of explanation, Resource Solutions Group offers over 60 years of combined experience in resource efficiency policy development, market-based technology support, program design, and program implementation. Our team specializes in the design, development, technical analysis, strategic marketing and delivery of programs that promote resource efficiency to a wide variety of market sectors. Our team has worked with a wide range of industries, including the agricultural, commercial and industrial sectors, resulting in saving over 9 million kWh for California (as of December 2008).

We believe the CEC's approach will help to qualify a broad range of players to expand energy efficiency and clean energy retrofits - as well as green workforce development - but we also believe that recipients of ARRA funds must be held to the highest standards. As most of the Commission's initial suggestions will be focused on leveraging ARRA dollars through loans and matching funds, it is imperative that the small businesses, commercial buildings, local governments and industrial plants that seek to take advantage of these funds must have access to quality resources and proven contractors.

Given that there is wide diversity of potential energy efficiency and green building contractors that will try to service Stimulus projects, we urge the Commission to identify ways to both (1) audit all work done with ARRA funds to both prove savings and ensure quality and (2) coordinate and facilitate access to the qualified solutions providers, such as Resource Solutions Group. Some of the relevant tactics may include a clearinghouse database of qualified efficiency businesses, a "matching program" between contractors and interested parties, or a regional directory of energy efficiency service providers.

Finally, we urge the commission to maintain clear communications. We are not the only stakeholder that has been confused by this process (i.e., the example of May 12th as a CEC deadline, not a deadline for all interested applicants). We hope that once the plans are approved, the CEC will identify guidelines that create a fair and transparent competitive process.

Alison ten Cate
Resource Solutions Group
60 Stone Pine Road, Suite 100
Half Moon Bay, CA 94019
www.rsgroup.com

direct: 650-726-2875
mobile: 650-678-5392
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fax: 650-726-7620

Awareness Action Sustainability

From: "Connie Gallippi" <connie@csgcalifornia.com>
To: <sep@energy.state.ca.us>
Date: 5/13/2009 4:14 PM
Subject: Public Comments on State Energy Program
Attachments: ladwptreesprogram.pdf; STF 5 mill trees.docx; Energy Saving Facts.pdf; Sacramento Shade One Pager.pdf

On behalf of California ReLeaf and TreePeople, I hereby submit the following comments regarding the California Energy Commission's State Energy Program:

- o We are very excited that California is receiving funding for the State Energy Program through the American Recovery and Reinvestment Act. This is a unique opportunity to fund a myriad of different projects that will help make California a more energy-efficient place to live and work.

- o As you develop the specific criteria and guidelines for each of the non residential/small business, residential, and green jobs programs, we strongly encourage you to include energy efficiency projects and techniques that may be incorporated into the building site and surrounding environment, through both retrofits and new building design.

- o Urban forests, shade trees, and other types of green infrastructure are energy efficiency and conservation techniques that can be incorporated into a home, business, or commercial site design to provide energy savings. Tree planting and installation of green infrastructure is also a viable technique for green jobs and workforce training programs to include.

- o Urban forests conserve energy by providing shade to buildings, homes, and businesses -- thereby reducing energy demands and greenhouse gas emissions both at the building site and at the power plant. Urban trees also provide significant co-benefits such as improving air and water quality in our local communities.

- o Several utilities in California have formalized energy saving shade tree programs due to their proven results in saving energy on site and in reducing overall energy demand at the power plant. The Sacramento Municipal Utility District's Sacramento Shade program, and the Los Angeles Department of Water and Power's Trees for a Green LA program are two successful examples of such programs. Information on these programs is attached.

o Many non-profit organizations across the state help to manage such programs for utilities as well as run their own programs for planting trees for energy savings, and other environmental benefits. California ReLeaf represents a network of over 100 of these groups across California. The Sacramento Tree Foundation and TreePeople in Los Angeles are two examples of such organizations that have been serving their communities with such projects for several decades through obtaining and maintaining sustainable stable staffing and funding.

o To that end, we would like to stress the importance of considering urban forestry and shade tree programs as eligible projects in the State Energy Program. We are aware that there are many valuable and important projects that the Energy Commission could pursue with these funds, and we thank you for your time and consideration.

For more information on California ReLeaf, please visit www.californiareleaf.org

For more information on TreePeople, please visit www.treepeople.org

Respectfully Submitted,

Connie M. Gallippi

Conservation Strategy Group

1100 11th Street, Suite 200

Sacramento, CA 95814

916-558-1516 x 121

916-397-0065 cell

916-553-3071 fax

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SEP - Letter to Pat Perez and John Sugar

From: Nick Goodwin Self <nick@goodwin-self.com>
To: <eecbg@energy.state.ca.us>, <sep@energy.state.ca.us>
Date: 5/13/2009 12:33 PM
Subject: Letter to Pat Perez and John Sugar

May 13, 2009

Dear Mr. Perez and Mr. Sugar:

We know that right now you are developing the programs to administer the ARRA programs. Our company, GOODWIN SELF ECO CONSULTING helps transition businesses to sustainable energy through energy efficiency and renewables. We work as a consulting energy manager overseeing financing, installation and design. We are aware that the single most significant way to encourage individuals and businesses in California to transition to sustainable energy is through the CSI. At present the rebates and step programs are only teasers. They're not substantial enough or permanent enough to be valid. The industry needs incentives to be high – a minimum of 22 kWh – and they need to be in place over the long term.

In addition, Feed-in-Tariffs at the same rate or higher will transform people's desire and capability to transition to sustainable energy. FIT's in California will also allow us to keep energy local which means a great savings because we won't need a huge grid nor have to pay the cost of transporting energy.

Finally, the 2% solution: renovating or replacing just 2% of the building stock per annum, and making all new builds zero energy buildings. Upgrading existing homes is a huge challenge - but it can be done incrementally - 2% a year will have the desired effect. Insisting on new builds being 'green from the ground' up will see immediate results.

Thank you for taking this into consideration - and thank you for all the good work that you are doing.

Sincerely yours,

Nick Goodwin Self

--

Nick Goodwin Self
(310) 488 2305
www.goodwin-self.com

**“Public Comment”
Statement for the Record
May 8, 2009**

**Clean Energy Commission (CEC)
State Energy Program (SEP) and
Energy Conservation Block Grants (EECB)
Under the American Recovery and Reinvestment Act (ARRA)**

Submitted By

**Aristides A.N. Patrinos, Ph.D.
President, Synthetic Genomics Inc.
San Diego, CA**

The U.S. Congress along with the leadership of President Obama crafted and enacted a historic financial stimulus plan that will create jobs and spur economic growth and competitiveness in states all across the country with California leading the way. The CEC has been allocated \$275.6 million from the Department of Energy through ARRA stimulus funding for energy efficiency and renewable energy programs, where the two main areas of concentration will be the State Energy Program and the Energy Efficiency and Conservation Block Grant Program.

Transitioning to a low-carbon economy means investing in a wide range of renewable energies with the potential to enhance economic competitiveness while saving our planet in the process. As the state of California implements its critically important allocation of the Recovery Act, we urge the CEC to not overlook biology, which is emerging as the science that will most likely contribute the positive “disruptive” technologies.

Synthetic Genomics, Inc. (SGI) is a San Diego-based company founded by Dr. J. Craig Venter. We are aggressively pursuing the conversion of plant feedstocks (sugar and cellulose) into a wide range of next generation fuels that are superior to biofuels (ethanol and diesel), are more adapted to the existing infrastructure, and compete successfully with gasoline and other fuels. Genomics-driven technology will not only help us produce fuels from renewable feedstocks (biofuels) but also will accomplish more effective carbon capture storage (CCS). Our technology holds the promise of addressing the twin challenges of producing a clean renewable fuel while also solving some of the problems of CCS.

We recognize the challenges of scaling up the production of biofuels to match the current supply and infrastructure of the fossil fuel industry, but we are optimistic that we can pilot our liquid biofuels within two years and embark on large-scale production within five years. We are also confident that our technological approach to using carbon dioxide (CO₂) as feedstock for our biofuels will go a long way toward accomplishing the zero net

emission of carbon into the atmosphere and enable the stabilization of the concentration of CO₂ in the atmosphere much below 550 parts per million.

Moving away from oil and creating new green industries with the potential to launch thousands of new jobs across the state will require a variety of solutions from a variety of companies. Synthetic Genomics is right now working to secure financing in the private sector where we could leverage federal dollars at a 10:1 ratio in the capital markets. The global credit crisis has delayed our timeline somewhat, but with financial assistance from the CEC, we can launch very quickly into creating these long term jobs in the state while establishing the infrastructure that will have lasting value throughout the 21st century.

In this country's ongoing efforts to achieve energy independence, California has always been a leader in the fuels and environment debate. While producing clean renewable fuels locally is a powerful engine of economic growth, they must be developed and used in a way that limits environmental impact. We are developing game-changing biofuels technology in San Diego in which we are confident that SGI will be a vitally important partner to the CEC by energizing our state – *and our country* - with a new industry that is also creating additional jobs in the area while addressing energy security and climate change in our nation.

Thank you.

RE: State Energy Program Funding Allocation from the American Recovery and Reinvestment Act of 2009

Contact Information: Terry Schuster, Director of Sales with HyRadix, Inc.

Background:

According to the DOE Energy Efficiency and Renewable Energy, *"the State Energy Program (SEP) provides grants to states and directs funding to state energy offices from technology programs in DOE's Office of Energy Efficiency and Renewable Energy. States use grants to address their energy priorities and program funding to adopt emerging renewable energy and energy efficiency technologies."*

And specifically, *"the Recovery Act is intended to stimulate the economy, create jobs, and help retain jobs. Incorporating these requirements into the eligible uses of SEP funds includes programs, projects and measures designed to:*

- *Save energy.*
- *Create or retain jobs.*
- *Increase energy generation from renewable resources.*
- *Reduce greenhouse gas emissions.*

DOE also has provided the following guidance to the states:

- *States should plan for and maximize efforts toward achieving the specific goal of reducing per capita energy consumption by at least 25% of the state's 1990 per capita energy use by 2012. This is a minimum goal; higher or more stringent goals are encouraged.*
- *DOE has a strong preference for proposals designed to permanently transform markets. States are uniquely positioned to stimulate innovative solutions that have broad and lasting impacts across a variety of institutions, resulting in measurable and meaningful changes in how energy decisions are made at a fundamental level. Accordingly, strategies such as revolving loans, on-bill financing strategies, and performance contracting are strongly encouraged."*

Questions:

1. Given this description, is it conceivable that an application to install equipment to process a methane-rich biogas (landfill, digester, etc.) into hydrogen for use in alternative fuel vehicles will be looked upon favorably in the SEP ARRA Program?
2. If the answer to Question 1 is "yes" and we are encouraged to apply for a SEP grant, are these funds considered to be Federal Funds wherein they can be matched using State of California ARB, AQMD or CEC funding?

Independent business owner support of Green Workforce Education and Training through California Community Colleges

I would like to offer my perspective on green workforce / HVAC/R training as both an independent business owner and an adjunct community college instructor. My focus is on residential and small commercial building systems, including HVAC/R. My education and background is in engineering and systems management. Many of the “new” energy efficiency and sustainability technologies I see coming down the pike are strongly based on established applied physics and HVAC/R principles and practices. Community colleges are well positioned to take us to the next level or two, although they need some immediate, significant assistance from the state and federal government.

When I looked at expanding parts of my business, and as I continue talking with other service business owners, there seems to be a lack of well qualified new employees that have enough experience to be productive in a short timeframe and have a good foundation to build upon. As small service-based businesses, we cannot put enough emphasis on employees and employee development; however, given the economy and nature of the business, we cannot afford to take an extensive amount of time to train a person on the job without getting some revenue return. Frequently, new hires can barely do the basics, and those that do often lack the skills or background to take it to the next level.

Even with the gaps, I am very fortunate to have many community colleges within a commutable distance that teach the skills for which I hire. That is not true state wide. A friend from Redding would love to see an HVAC/R – sustainable technology program, but the local college does not have the funds to support it nor enough students to run a program year round.

In conversations with other HVAC/R and physical sciences instructors, perennial needs include:
Staffing - Dedicated dollars for additional full and part-time instructors and support staff
Modern Equipment and trainers – dollars to purchase and resource sharing
Curriculum development and updating – for green building / Building Science/ HVAC/R
Articulation agreements -- with local high schools to ensure readiness of incoming students

Most colleges are significantly understaffed. Finding well qualified instructors with some field experience, as well as experience working with adult students, the curriculum and the equipment to difficult. Paying for such is often even harder. Many courses take a couple of times through to get really good at teaching specialized material. For courses like that, particularly with extensive equipment needs, I think it would be highly advantageous to use a mobile “classroom” approach. A base college with an existing program would provide the instructor, equipment, curriculum, etc on a loaned basis to another college as a package, forgoing the need to develop duplicative programs and equipment and the instructor would already be up to speed. The host college would provide the classroom and other logistics. Geographically close colleges could share resources like that during the school year. For outlying colleges, other arrangements would need to be made, perhaps during winter and summer breaks. Instructors would need the ability to move between college districts without additional interviews and colleges would need to agree to a common curriculum for these specialized courses. Each college interested in receiving the

traveling instructor/equipment/curriculum package should not have to go through the funding and FTE hoops. That should all be handled centrally for a three year pilot period including Salaries, travel, meals, hotels, expendable materials, advertising, etc.

Equipment needs are immediate and the majority of the cost for one year grants. Some programs may be well equipped, but I have not seen any yet that are where they need to be. Most have outdated equipment, older controls, and are not current with what industry is using or will be using in the future. There should be some leading edge component to our training. We should also explore community colleges serving as a lending library for specialized tools for small contractors and business operators.

Curriculum at almost all community colleges needs updating or developing from scratch. It makes sense for templates to be developed centrally state-wide and used locally either as-is or adapted to local needs. Further, I see a strong need to coordinate with industry, such as those offering HERS training and green home energy classes, as well as national certification organizations, like NATE. These links need to be developed and perhaps credit toward industry certifications given for classes taken at community colleges. Much of material needs a lot of hands on practice to master. For some classes, it may be appropriate to invest in web based training for the theory and provide the hands on portion with the mobile classroom.

Articulation – A significant portion of the students entering the HVAC/R and other technology programs are not equipped coming out of high school. One of the observations I have made from years in engineering and the trades is that it takes a very similar mindset and thought process to be a good engineer or a good technician, one of the main differences is the tools used. For most modern equipment and certainly the new products coming down the road, students need a decent background in physical sciences and math, as well as communication skills. We need to work with high schools throughout the state to help this happen. Community Colleges must also have strong articulation agreements with their fellow community colleges, and with four year colleges. Several four year colleges have engineering technology or construction management programs and we should be equipping students who may want to move on after a few years in the field. A specific HVAC/R class taken at one college should be very similar among the colleges so we can articulate the same needs and support the high schools on a more strategic basis.

When developing potential grant opportunities, make the process as streamlined and simplified as feasible. Most community colleges do not have excess resources to write proposals and extensively monitor grants.

Community colleges are one of the greatest assets that California has to offer. They have and will continue to handle the challenges of the coming decades in training and equipping students for a sustainable future, but need some assistance to be successful. Speaking for small business, we are critically dependent on the community colleges to provide students who have the skills for today as well as the lifelong learning attitude to stay updated in their field.

Thank You,

John Henry

Green Workforce Education and Training through California Community College Heating Ventilation Air Conditioning (HVAC) Programs

These proposal priorities were developed based on the California Energy Efficiency and HVAC Symposium on March 20, held at Laney College, where a new statewide network of HVAC instructors met to address challenges and opportunities for Heating Ventilation Air Conditioning Refrigeration (HVACR) programs. Since the symposium, several conference calls have been held by available HVAC instructors and supporters to further develop ideas discussed at the symposium. More than 10 HVAC programs from across the State have contributed input to this proposal.

Background and Opportunities:

There is an unprecedented need to strengthen HVAC programs in community colleges. Improved energy efficiency in HVAC quality installation, operations, maintenance, and building optimization is one of the key objectives of the California Public Utilities Commission (CPUC) Big Bold Initiative, and the California Energy Efficiency Strategic Plan.

A new statewide network of HVAC programs has formed at the recent California Energy Efficiency and HVAC Symposium. Over 10 HVAC programs were represented from across the State. All participating instructors agreed that there is a need for statewide collaboration and significant infusion of resources to support HVAC programs in their alignment with the State's aggressive energy efficiency goals.

Opportunities for supporting HVAC programs toward this end include:

- HVAC is now recognized as an integral component of green workforce development and the new energy economy. Operations, Optimization, and Maintenance (O&O&M) are instrumental for ongoing energy efficient building performance.
- The job requirements of HVAC technicians and building operators have undergone a perception shift in recent years. Increasingly, technicians are expected to become energy building professionals with sophisticated skill sets, including critical thinking and problem solving, troubleshooting, communication, in addition to technical and hands-on skills. HVAC programs need support to upgrade their programs to meet the State's energy efficiency goals and the changing requirements of HVAC technicians and building operators.
- Demand for HVAC technicians and control systems technicians is projected to grow in spite of the economic downturn, according to the new study in Energy Efficiency Workforce Development by the California Community Colleges Center of Excellence (www.cccoe.org/energy).
- Most Community College HVAC programs are well established both at their colleges and within the communities they serve. Many have been in existence for over 40 years and have extensive industry advisory boards.

- Community Colleges offer a versatile structure that allows for training of entry level workers, incumbent workers returning to college for upskilling, as well as displaced workers from industries suffering from economic downturn, such as airline professionals.
- CC HVAC programs also have the capacity to design customized trainings for building professionals, compliance professionals, and a general audience. With adequate support from the State, they can become showcases and training centers for much needed broad-based training of building operators to address the State's energy efficiency goals. Customized training also provides a much needed revenue stream for community colleges in these difficult economic times.
- With the State's priority to bring career & technical skills training into the high schools, HVAC programs offer both existing high school linkages as well as program expansion capacities to strengthen the bridge between high school and Career Technical Education (CTE) programs.

Challenges and Needs of HVAC program

- Existing programs are understaffed and cannot accommodate current training demand (continuously have to turn away students) even though schedules and lab space availability could allow for much higher student enrollments. There is an urgent need for additional instructors (both full-time and part-time) and instructional assistants to meet the enrollment pressure.
- Lack of administrative staff for program coordination, grant writing, partnerships
- A severe lack of funding resulting in outdated equipment, as well as safety issues.
- There is a great opportunity for curriculum coordination, articulation, and alignment between colleges. Programs have different areas of focus (some focus more on residential, others more on commercial HVAC/R). Increased collaboration between HVAC programs could dramatically increase program effectiveness (sharing of instructors, equipment, curricula, creating pathways articulating residential courses with advanced commercial courses in other colleges).

Proposal for Statewide "Green" HVAC Program Network and Resource Development

Goal:

Develop statewide Community College HVAC program network to optimize collaboration, resource sharing, and energy efficiency integration.

Objectives:

Establish two CC HVAC Centers in Northern and Southern California within the California Community College Economic Workforce and Development Division. The centers will work closely with existing energy centers in California (e.g., PG&E-SF & Stockton, UC Davis, SCE, etc) to implement HVAC programs to:

- 1) Develop an information sharing and communications clearinghouse
- 2) Align HVAC curriculum and program development
- 3) Develop standardized lab equipment, curricula, and related resources

- 4) Develop high quality public domain HVAC curriculum content usable by all 30 HVAC programs
- 5) Develop public and customized trainings in building performance, HVAC operations, optimization, and maintenance for incumbent workers, building professionals, and the general public, utilizing CC HVAC curriculum resources

NOTE: Each of these five program areas could be funded independently or in coordination.

Strategies:

1) Develop an information sharing and communications clearinghouse

- Organize quarterly regional instructor and partner meetings for program coordination, alignment, and sharing of best practices
- Invite all 30 HVAC programs to participate.
- Develop statewide Advisory Board
- Coordinate monthly web conferences for instructors for program coordination, alignment, and sharing of best practices
 - Establish subcommittees to seek solutions to key issues and challenges and to report out progress during monthly web conferences
- Create and maintain website and electronic communication mechanisms including
 - Clearinghouse for proposals
 - Resource sharing directories (curriculum, training, lab resources, emerging cyber-based education software resources with related problem based case study scenarios)
 - Customer education as part of CC College Websites
 - Equipment swap opportunities

2) Align HVAC curriculum and program development

- Develop standardized learning outcomes for all CA CC HVAC programs for optimized program coordination, resource sharing, and college-to-college articulation
- Align curriculum to support the CPUC Big Bold Initiative and California Long Term Energy Efficiency Strategic Plan, including Workforce Education and Training Emphasis, Code Compliance, and Quality Installation and Maintenance Initiative
- Integrate curriculum development and training with the proposed Statewide HVAC Program Implementation Plan including the HVAC Workforce Education & Training Sub-Program, the Residential and Commercial Quality Installation and Maintenance Sub-Programs, the Technology and Diagnostics Advocacy Sub-Program, and with the Investor-Owned Utilities (IOU) Emerging Technology Program.
- Integrate opportunity to teach Air Conditioning Contractor's Association (ACCA) quality installation standards, North American Technician Excellence (NATE) certification preparation and Industry Competency Exam (ICE) preparation.
- Assist in the development of model Certificate and Associate degree programs in energy efficiency and sustainability.

3) Develop standardized lab equipment, curricula, and related resources to strengthen HVAC education and training in community colleges

3.1.) Develop lab equipment for existing and new programs that is standardized, modular, easy to store, works for small spaces, can be portable, and can serve as a showcase for public and customized education and training

- Develop lab specifications
 - Develop “wish list” of different types of units based on state-wide instructor dialogue
 - Includes: commercial trainers (customized or off-the-shelf, including controls)
 - Residential and light commercial HVAC trainers
 - A residential flat-bed demonstration trailer simulating whole house conditions
 - Refrigeration trainers
 - State-of-the-art modular units on quality installation (residential and commercial)
 - Examine drawings and templates of portable training units developed by the PG&E Energy Training Center – Stockton and integrate as applicable
 - Develop industry partnerships for lab implementation
 - Example: Commercial HVAC unit including 90 ton chiller, 300,000 BTU condenser boiler, 20 ton Air Handling Unit, heat exchanger, and DDC controls (\$350,000 for development; then \$300,000 per unit)
 - Example: Commercially produced trainers
- Clarify logistics (ownership, cost, share ability, power and gas needs)
- Purchase/install labs for each active HVAC program
- Purchase/build additional portable units to be shared among community college programs

3.2) Develop curriculum/course outlines/lesson plans for utilizing lab equipment and other resources in community college curriculum as well as customized training

- Develop curriculum utilizing standardized lab units (learning outcomes, lesson plans, projects, problem-based learning case studies, software and other resources)
- Align curriculum to support the CPUC Big Bold Initiative and California Energy Efficiency Strategic Plan, including Workforce Education and Training Emphasis, Code Compliance, and Quality Installation and Maintenance Initiative
- Integrate opportunity to teach ACCA quality installation standards, NATE certification preparation and ICE preparation
- Integrate curricula in existing CC HVAC courses
- Develop common rubrics for achieving objectives and Student Learning Outcomes

4) Develop high quality public domain HVAC curriculum content usable by all 30 HVAC programs.

- Training in advanced building energy efficiency concepts, techniques, and operating procedures;
- Applied technology, financial, energy auditing, commissioning, and life cycle cost counseling on a project basis;
- Training in the latest emerging energy efficiency technologies and procedures;
- Develop and offer online and hybrid career-ladder energy efficiency training for incumbent building operators, and technicians for HVAC, lighting, commissioning, performance monitoring, and other systems, etc.
- Develop advanced energy efficiency pedagogical content and curricula, in association with national efforts such as Advanced Technology Environmental And Energy Center (ATEEC) and Partnership for Environmental Technology Education (PETE), with an emphasis on problem-based case studies that address emerging building industry concerns,
- Develop and disseminate, open source cyber-based education (CBE) software tools, resources and guidelines; do this in association with ongoing efforts such as that of the Institute for the Sustainable Performance of Buildings and others.

5) Develop public and customized training in building performance, HVAC operations, optimization, and maintenance for incumbent workers, building professionals, and the general public, utilizing the new CC standardized lab modules

- Utilize labs, curriculum, software, and related resources to train municipality building professionals, including inspectors, auditors, compliance officials
- Utilize labs, curriculum, software, and related resources to develop customized training for building engineers of large facilities (municipalities, universities, schools, hotels, hospitals)
- Utilize labs, curriculum, software, and related resources to develop training for displaced workers (e.g. airline engineers, military)
- Utilize labs as a showcase to the general public and offer public education courses

Key Partners:

- CCC Economic Workforce Development Division
- Energy Training Centers (PG&E)
- CC Industry Advisory Groups
- New energy 'academy' at Southern California Edison (SCE)
- UC Davis Energy Efficiency Center, Western Cooling Efficiency Center
- Lawrence Berkeley National Laboratory
- Trade Unions
- Advanced Transportation Technology & Energy Center (attec.colleges.org)

Job creation potential

- Lab development and installation (contractors hired)

- Customized training resulting in up-skilling of building professionals
- Optimized program utilization of facilities/equipment resulting in more courses offered, instructors hired, and students trained and placed in workforce
- Need for additional community college staff/instructors for program coordination and implementation
- 2 – 4 coordinators/administrators of HVAC network
- 2 – 4 full-time instructors for curriculum alignment/development
- Support staff and instructors at individual community colleges
- Optimized program utilization of facilities/equipment resulting in significantly more students trained and placed in workforce
- Expansion of HVAC programs – new programs created, existing programs expanded – more instructors hired, more students trained and placed in workforce

Energy saving potential

- Labs, curriculum, software, and related resources will be aligned to support the CPUC Big Bold Initiative and California Long Term Energy Efficiency Strategic Plan, including Workforce Education and Training Emphasis, Code Compliance, and Quality Installation and Maintenance Initiative.
- Customized training has the potential to produce potential energy savings of 10% or more:
 - Customized training of municipality building professionals, including inspectors, auditors, compliance officials will result in energy savings in public facilities
 - Customized training of building engineers of large facilities will result in significant energy savings
 - Customized training of displaced technical workers will result highly qualified workforce resulting in significant energy savings.
- Better qualified graduates trained in best energy management practices
- Increased number of graduates placed in workforce
- Upgrade local building officials (inspectors) skills for more efficient inspections
- Better trained CC graduates will significantly improve building performance once placed in workforce. Well-trained technicians will result in better maintained and optimized buildings; this will produce energy savings and will enable building energy potentials to be actually realized.

Mark M. Hamilton
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April 27, 2009

California Energy Commission
Special Projects Office MS-23
RE: SEP Workshop
1516 9th St.
Sacramento, CA 95814

RE: Submittal of Comments and/or Questions on-line for the scheduled workshops dated Thursday 5/7/09
Block Grant and Appliance Rebate Program 1-4 PM
State Energy Program Funded by ARRA 2009

To Whom It May Concern:

The following questions or comments are being submitted for review for the scheduled meetings as stated above. Please forward to appropriate person(s) to review.

- What programs are in place that assists in jumpstarting the economy on a local level in the Bay area?
- What incentives programs are available to small businesses to assist in reducing their energy bill on a day to day basis?
- What, if any incentives are available to homebuilders to become more involved and build greener homes?
- What incentive programs are available to contractors to remodels old homes/buildings to be more energy efficient? I think that there should be a major focus on renovating old structures, since they are one of the biggest violators of GHG omission.
- **Are there any programs in place to subsidize companies for energy efficient renovations?** I feel that it may stimulate the economy on a local level and be more effective than rebates. Rebates are a great incentive, but at this time, most people do not have the money to pay up front / then wait to for a rebate to help pay for the more energy efficient features in their homes/buildings. Maybe if there were subsidized programs in place with energy efficient trade contractors where consumers are paying a percentage on every dollar, there would be more interest on actually making the energy efficient renovations to their property now rather than later.
- What programs are being created to target the middle income or high income households, which is another big energy consuming industry? The consumers in that fall in middle or high income house holds who have more gadgets, drive bigger cars, own more and usually have fewer occupants per home than many low incomes, therefore using more energy per person. Some of these consumers are also the small businesses that can reinvest the funds back into the economy by employing workers on a local level, making a bigger impact and use of what the funds are intended for. Otherwise, what else encourages them to make energy efficient changes?
- Is there ONE place that people can access all the funding programs in place? What about making the submittal process more simple and streamlined? The programs I have seen so far have complex applications and paperwork is extremely difficult to understand. Currently most companies or individuals would have to hire a consultant familiar with government funding applications to assist in filling out these forms. This adds more costs out of pocket and frustration that most would finally give up on trying to access funds whether it is a business or as a private citizen. We are the taxpayers that are paying for these programs therefore it should be relatively easy for a normal person to be able to access programs in place and funds available per program. The programs should have a positive impact on every person. TAXPAYING INDIVIDUALS ON ALL LEVELS should be able to, in some way, reap the benefits of one of the many energy efficient programs regardless without discrimination INCLUDING their income levels.

I would like your feedback and would like to know how I can get involved as a private citizen to make a difference on a local level. Please forward information and or contacts to assist in my crusade to make our state/country/world a greener place. I am willing to become involved because I think this is a very important issue and that we need to make programs more available to ALL tax payers at ALL levels to make changes for the better. I look forward to your comments.

Regards,

A Tristen Watkins
The Hofmann Company
twatkins@hofmannhomes.com
925-682-4830 ext 102

California Commissioning Collaborative

Shades of the Green Workforce: The Need for Green Professionals in the New Energy Economy



Submitted to:

California Energy Commission

Staff Workshop on the State Energy Program Funding
Allocation from the American Recovery and Reinvestment
Act of 2009

Submitted by:

Phil Welker, Executive Director
California Commissioning Collaborative

April 27, 2009

Introduction

The California Commissioning Collaborative (CCC) respectfully submits the following comment in advance of the California Energy Commission's Staff Workshop on the State Energy Program Funding Allocation from the American Recovery and Reinvestment Act of 2009.

The CCC is a non-profit 501(c)3 organization committed to improving the performance of buildings and their systems. The CCC is made up of government, utility, real estate, and building services organizations and professionals who have come together to create a viable market for building commissioning in California.

Building commissioning is the process of ensuring that systems are designed, installed, functionally tested and capable of being operated and maintained according to the building owner's operational needs. Commissioning is performed in new construction projects and in major capital improvements or retrofits. Retrocommissioning or Existing Building Commissioning is the systematic investigation process applied to existing buildings to improve and optimize O&M procedures.

In California and beyond, building commissioning is increasingly recognized as a cost-effective process for optimizing building performance, reducing energy use, and improving indoor air quality, occupant comfort, and productivity.

Buildings, Energy Efficiency and Green Professionals

The demand for high performance energy-efficient buildings is increasing with the enactment of aggressive climate change and economic recovery policies and initiatives.

But simply installing retrofits in existing buildings will not solve the problem. Energy efficient equipment must be tested, calibrated, controlled, verified and maintained to ensure efficiency is actually achieved.

Combining retrofits with efficient operations and maintenance of building systems is the answer to meeting the long-term goals for energy efficient buildings

Energy Use in Buildings

- 72% of electricity consumption
- 39% of energy use
- 38% of all carbon dioxide (CO₂) emissions

(According to the U.S. Green Building Council)

High performance, energy-efficient facilities are designed and delivered by skilled professionals:

- **Architects and engineers** design and oversee the construction of new energy-efficient buildings.
- **Energy conservation consultants and engineers** work with building owners, operators and service technicians to develop and implement strategies for energy efficient buildings.
- **Commissioning consultants** are building systems integration experts who work on both new construction projects and in existing buildings to test, verify and monitor systems to ensure they are operating efficiently.

Currently, this workforce segment is made up of a small class of senior practitioners, few experienced practitioners at mid-career, and many young people entering the field.

Aggressive market drivers are increasing the demand for these **Green Professionals**:

- Federal and State Mandates
 - Energy independence and security
 - Economic recovery
 - Climate change actions
- State and Local Building Codes and Standards
- Consumer Demand
 - Owner/Occupant Preference for Green Buildings
 - Market value of LEED®, Energy Star® and other building certifications

While it is expected that demand for **Green Professionals** will exceed the current available workforce, this critical need has drawn little attention amidst the highly visible and vocal voices advocating for Green-Collar workforce development.

The Green Workforce depends on the health and vibrancy of both Green-Collar and **Green Professional** jobs.

Defining the Green Workforce

The 2009 California Green Innovation Index¹ characterized green jobs as those that provide products and services leveraging renewable energy resources, reducing pollution, conserving energy and natural resources, and repurposing waste. The breadth of the green workforce is vast, with no consensus on its definition.

What is clear is that a number of “shades of green” make up the Green Workforce.

Green-Collar: “good local jobs that pay well, strengthen communities, provide pathways out of poverty, and help solve our environmental problems” (Van Jones, founder of Green For All)

Green Professional: traditionally “white-collar” professions that will be essential in launching the new energy economy. Examples include:

- Architects, designers and engineers who design high performance energy efficient buildings, oversee construction, test and verify system operations, and monitor building performance
- Scientists and engineers who invent, design and test new technologies and products

A Small Sample of “Green Jobs”

Construction worker
Power plant operator
Carpenter
Energy engineers and analyst
Computer technician
Soil and plant scientist
Mechanical and civil engineer
Plumber
Pipefitter and steamfitter
Hydrologist
Administrative personnel
Maintenance technician
Building Operator
Commissioning Consultant
Landscapers and groundskeeper
Equipment installer
Cost estimator
Pollution Control Technician
Ecologist
Toxicologist
Economist
Manufacturing Line Worker
Forester
Community Affairs Manager
Landscape Architect
Urban and Regional Planner
Wastewater Operator
Environmental Chemist

¹ http://www.next10.org/pdf/GII/Next10_GII_2009.pdf

Both Green-Collar and **Green Professionals** are needed in large numbers to bring energy-efficient buildings online and maintain their performance over time. The table below illustrates the need for a wide range of workers to deliver high performance, energy-efficient buildings.

Shades of Green: Workforce Requirements for Energy Efficient Buildings

	Green-Collar								Green Professional				
	Construction & Iron Workers	Sheet Metal Workers	Plumbers & Pipefitters	Carpenters	Equipment Installers	Controls Technicians	TABB Contractors	Building Operators	Architects	Design Engineers	Energy Engineers and Analysts	Commissioning Consultants	Researchers and Scientists
High Performance Energy-Efficient Building Projects & Activities													
New Construction & Major Renovations	●	●	●	●	●	●	●	●	●	●	●	●	
Retrofits & Retrocommissioning		●	●		●	●	●	●		●	●	●	
Operations & Maintenance						●	●	●			●	●	
Research & Development for New Technologies									●	●	●		●

Green Professional Workforce Development

Training programs and initiatives are needed for all segments of the Green Workforce. While there are significant efforts underway to address the need for Green-Collar job training, a substantial gap in training availability exists for the **Green Professional**. Current workforce development efforts need to expand to address the critical need for highly-skilled energy engineers and commissioning consultants, designers and architects.

Training Needs for Green Professionals

These professionals require a unique combination of engineering and design fundamentals and actual building operations knowledge that is not easily acquired. Some factors that limit the capacity of these job segments to grow include:

- Current senior and expert members of the profession, who train and mentor mid-level and junior engineers, are moving toward retirement.
- Four-year universities do not typically include essential building science courses and topics (HVAC, building controls, etc.) in the core engineering curriculum.
- New engineering graduates and engineers from other disciplines are excellent candidates for the field, though no formal training available to facilitate their entry.

- Current training programs provided to professionals in the field are largely process-based and do not include in-depth technical or hands-on practical applications nor do they teach the forensic tools and knowledge needed to identify and correct system integration and performance problems.

Addressing the Training Gap for Green Professionals

Training these **Green Professionals** must emphasize the design and operation of integrated building systems and technologies and engineering methods for analyzing performance – activities that ensure buildings and their equipment and systems are working efficiently.

Curriculum should focus on the fundamentals of conducting work in the field to support whole building and measure-level energy savings determined by on-site assessments and information-rich reporting.

Once trained, these engineers have advanced skills related to:

- Conducting audits, testing and diagnostics required to identify opportunities for energy efficiency – retrofits and operational improvements
- Performing energy savings calculations and cost estimating
- Providing technical guidance and oversight on implementation of energy efficiency improvement projects
- Verifying system performance; develop plans for monitoring performance and continuous improvement to ensure the energy-efficiency strategies persist

These **Green Professionals** become the top tier of engineers and consultants that will lead and manage teams of contractors, technicians and building operators in bringing energy-efficient buildings online, with strategies in place for long-lasting performance and continuous improvement.

Hands-on technical training will prepare **Green Professionals** with skills needed to design, test, verify and diagnose equipment and systems including:

- Chillers
- Towers
- Pumps
- Electrical power systems
- Lighting & Lighting Control Systems
- Emergency Power Systems
- Fire Alarm
- Building Security Systems
- Air Handling Systems
- HVAC Zones
- Cooling Systems
- Steam/Conditioning Systems
- Chilled Water Systems
- Conditioned Water Systems
- Heating Systems
- Plumbing Systems
- Fire Detection and Protection Systems

Sustainable Solutions for Energy Efficient Buildings

Training is needed for Green-Collar and Green Professionals to develop, deploy and maintain energy-efficient products and services.

Community colleges, trade associations and others have the mechanisms in place to train the Green-Collar workforce. The **Green Professional** needs its own initiatives and programs to ensure the long-term sustainability of energy efficiency initiatives:

1. Create and retain green jobs.
 - Increases the number of skilled engineers needed to deliver building energy efficiency through retrofits and commissioning
 - Offers retraining for engineers displaced from other disciplines (e.g. auto industry, military retirees)
 - Creates a career ladder for the top Green-Collar workers (controls technicians, TABB contractors, etc.) to advance their careers

2. Achieve lasting and measureable energy benefits aligned with California's energy policy goals as well as other federal, state, and local mandates for energy independence and economic recovery:
 - Emphasizes the optimization of building systems and establishes energy efficiency strategies for new and existing buildings
 - Ensures that retrofits are installed properly and performing efficiently
 - Employs practices for monitoring and diagnostics that lead to long-lasting energy efficiency and ongoing improvements

By supporting and funding technical hands-on training for **Green Professionals**, California can lead the way in developing far-reaching solutions to our nation's need for energy independence, economic recovery and reversing the effects of climate change on the environment.

For More Information

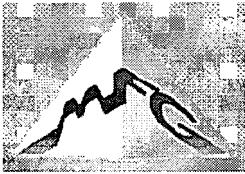
California Commissioning Collaborative

Phil Welker, Executive Director
Kirstin Pinit, Program Manager
877.306.CACX
<http://www.cacx.org/>

Additional Resources

The following reports illustrate some of the research and strategic planning the CCC has engaged in related to building commissioning training.

- *Retrocommissioning (RCx) Toolkit Outreach and Training Plan* (2008) - describes recommendations for commissioning provider training related to use of the CCC's RCx Toolkit and the application of these tools in investigating and identifying and calculating measures.
- *Making Connections: Analysis and Development of Educational Opportunities* (2007) - qualitative study to identify needs for commissioning education and training and opportunities for the CCC (and others) to address those needs.
<http://resources.cacx.org/library/HoldingDetail.aspx?id=471>
- *Cx Training Strategy Report* (2005) – review of existing commissioning training offerings in California. <http://resources.cacx.org/library/HoldingDetail.aspx?id=381>



MFG-West

22 April 2009

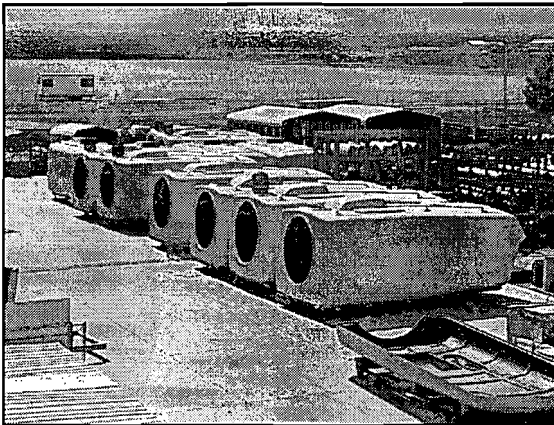
California Energy Commission
Special Projects Office, MS-23
Re: SEP Workshop
1516 Ninth Street
Sacramento, California 95814

Subject: Question for Public Workshop

Sir/Madam:

A recent email from your organization indicates that there will be three public workshops to discuss the ARRA and how the State of California will participate in allocating its share of Recovery funding through the State Energy Program (SEP). Because my company will not be able to participate in these workshops I am submitting my question in advance.

MFG-West (MFGW) manufactures large composite components for the wind energy industry. Called "nacelles," these structures house the turbine and generator assemblies that are mounted on top of wind towers and accommodate the spinner and blade assembly. MFGW has built almost 4,000 of these units for our prime customer, General Electric. MFGW employs approximately 150 people to keep up with the wind industry demand for this product and this demand is projected to remain in excess of supply into the foreseeable future.



1.5MW Nacelles staged for delivery



MFGW delivering 3000th nacelle

Current manufacturing processes involve considerable labor and materials. The resin systems employed contain styrene and these emissions are regulated and monitored by the local Air Resource Board and mitigated according to industry standards. As "wet" systems, these resins require careful handling and they can be challenging to recycle.

MFGW leads a California team of companies to develop new technology that will significantly impact the design and fabrication of future nacelles. The advantages of this effort include:

- Use of fully recyclable materials.
- Zero manufacturing emissions.
- Faster production cycle.
- Reduction in system acquisition cost.

We have outlined a 24-month development effort that will involve the design and fabrication of new equipment, materials development, test and validation that will culminate in the delivery of a second generation, fully qualified turbine nacelle.

This new technology will:

- Reduce the cost of wind energy systems.
- Create an *exportable* product.
- Expand of California's manufacturing base with clean energy jobs.
- Create "green" products.

MFGW would like to submit a proposal to secure California SEP funding to help further this development effort. My questions are:

1. Are there aspects of our program that might qualify for SEP funding?
2. Will there be award limits to SEP funding?
3. What is the anticipated cycle time between proposal submission and notice of award?
4. If an organization obtains partial ARRA funding for a project from a federal agency is the same organization excluded from participating in California SEP funding?

Thank you,

Tony Drake

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May 18, 2009

To: California Energy Commission, sep@energy.state.ca.us
From: Alameda County
Subject: Comments on State Energy Program Conceptual Proposals

Alameda County would like to thank the State of California for reaching out to local governments for input on the use of State Energy Program funds. Below we have outlined input on the funded areas and funding vehicles proposed by the CEC.

Comment on Program Goals

We recommend that transportation energy efficiency not be excluded from the SEP. The federal government permits the use of SEP funds for "programs to increase transportation energy efficiency" (DE-FOA-0000052, Section 9.5). Transportation efficiency, which local governments are in a unique position to promote, is a crucial area for integrated, long-term energy efficiency. We would like transportation efficiency to be included under the Energy Efficiency Retrofits and Clean Energy section of the SEP.

Transportation efficiency is an essential building block of transitioning to a clean energy economy. Local government can play a key role by promoting walking and biking, reducing need for personal vehicle travel, providing appropriate infrastructure, and influencing patterns of development. Eligible items should include projects such as bikeways.

Non-Residential Retrofit Program Concepts

The majority of the non-residential program concepts focus on loans. We recommend allocation of monies through vehicles other than loans.

Grants

Grants are necessary to create incentives for early adopters who create an initial market or for populations with lesser means or access to resources who would otherwise be left behind. Distributing funds primarily as loans limits localities' options in designing a projects or programs to meet constituent needs.

All programs should be flexible enough to allow localities to choose the best option for their context. This would include allowing for loans and/or grants from localities to their target program participants.

Local governments do understand the benefits of loan programs; in fact, counties and cities may choose to use grant funding received through formula or competitive grants as seed money to create new revolving energy funds for internal or community projects.

Grants for Staff Positions

The greatest need of local governments is staffing to implement programs. Therefore, we suggest the CEC also support local governments through providing grants for internal staff positions to manage and

coordinate energy and climate protection programs. These positions could become self-sustaining by the close of the grant period.

Matching Funds

In general, we support the concept of providing matching funds to local governments. Jurisdictions that are capable and willing to commit local resources to energy programs should be rewarded to encourage creative thinking.

Comment on Concept 3: Building Standards Enforcement

- *Local building departments enforce the complex state building energy efficiency standards.*
- *ARRA funds would fund an expert staff person at each building department that applied, to assist other personnel in standards education and enforcement.*

As a jurisdiction that has recently passed a community green building ordinance, we support the importance of building standards training. However, this training should cover local green building standards, where they apply, as well as state standards.

Residential Retrofit Program Concepts

Overall Comment: Matching Funds Needed for Program Infrastructure and Design

To reiterate our comments in the joint letter submitted by BKi, StopWaste.Org, and Alameda County jurisdictions regarding CEC support for AB-811-type programs, matching funds for program infrastructure and design are an essential element in making comprehensive residential retrofit programs a success:

In order to successfully implement AB 811-type programs and ensure significant market penetration, local governments need start up funds to help build program infrastructure and necessary program elements (e.g., administrative, workforce, marketing & outreach, quality assurance, etc.). Currently, local governments have many competing applications for their limited block grant funds. To promote regional consistency and prevent inefficient proliferation of different approaches to building energy efficiency and/or solar programs at the local level, aggregations of local funds into larger units such as county or COG-level units should be encouraged. To counter these obstacles, we recommend that the California Energy Commission offer dollar-for-dollar matching funds to local governments to complement their own funding contributions for regional AB811-type programs.

Start-up and staffing funds were not included in the six program concepts presented by the CEC, and they are our top priority.

Comment on Concept 5: Neighborhood-Based Weatherization and Retrofits

- *ARRA-funded low income weatherization and retrofits extend to 200 percent of poverty level*
- *Use SEP funding for low-moderate income neighborhoods*
- *Use preselected measures on homes*
- *Economies of Scale from focusing on neighborhoods*

We support the efficiency and scale of neighborhood-based retrofits, and need state assistance to help make participation attractive to households that are just above the low-income weatherization income qualification threshold. Subsidies for particular services for low-moderate income participants, or an interest-rate buy-down for loans to low-moderate income participants, would be helpful.

Overall Comment: Policy Support Needed

We also need state policy support to make regional/countywide energy-efficiency and clean energy community programs successful:

- As discussed at the April 29 CEC public meeting, legal validation of the structure of these programs would assist regions in moving forward. Perhaps the CEC could interface with the Attorney General's Office on this effort.
- A feed-in tariff could increase the amount of distributed clean energy, and help achieve the Governor's Million Solar Roofs goal. It is critical that the state move quickly on this issue. In the short term, net metering should receive continued support. Currently the net metering cap for the total amount of rooftop solar which can be connected to the electric grid is set at 2.5% of peak load. This cap will likely be reached next year, and will disrupt the growth of solar renewable energy generation and the rights of citizens to feed any surplus electricity back to the grid and receive credit on their bill. Legislation such as AB 560: Net Energy Metering aim to raise this cap.

We look forward to undertaking programs to achieve the State Energy Program goals of green jobs training and energy efficiency retrofits and clean energy systems. Please feel free to contact us for further information.

Sincerely,

Carolyn Bloede
Sustainability Program Manager
General Services Agency
Alameda County
(510) 208-9521

Albert Lopez
Planning Director
Community Development Agency
Alameda County
(510) 670-5426

SEP - Comments on Public Workshop Fresno May 6

From: Erik Jensen <jensen1987@sbcglobal.net>
To: <sep@energy.state.ca.us>, <jsugar@energy.state.ca.us>
Date: 5/18/2009 4:48 PM
Subject: Comments on Public Workshop Fresno May 6

I enjoyed the workshop presented in Fresno on May 6. We are a small (5 employees) home energy solutions company operating in the Fresno area. We are fanatical about home energy savings and have the skill and the equipment to participate in the Residential Program. We would love to grow and provide greater employment in this area.

We are concerned and hope, that as you put this program together that small businesses such as ours will be able to participate. We would recommend that an entity be set up that can provide clear and transparent guidelines and qualifications that will allow small businesses such as ours to take part and contribute to this great program.

Small businesses are a backbone of the economy and provide most of the job growth in the Central Valley. We have much to offer. Please keep us informed as the program unfolds.

Best Regard, Erik Jensen
Bright Ideas Home Energy Solutions
www.brightideasenergy.com
559 593-3825



Local Corps: A Large, Statewide Green Workforce

California is home to a valuable natural resource spread throughout the state: the largest, most well-established group of local youth conservation corps in the nation. These 12 organizations serve every major urban area. They constitute a workforce that is ready now to help the state maximize its federal stimulus funds by:

- Staffing projects that support the emerging green economy
- Training thousands of disadvantaged young people from communities throughout California
- Helping the state meet its climate change and other environmental goals

Who Makes Up this Green Workforce?

Young adults between 18 and 25 years old, most of whom *dropped out or aged out of school*, join a local corps program because they are ready to put their lives back on track. Before finding the local corps many got involved with drugs, gangs and other self-destructive activities. Others come from transient and low-income families. They have confronted greater turmoil in two decades than most of us deal with in an entire lifetime; and yet, they are hopeful, smart and ready to do what it takes to put their lives back together while serving their California community.

Federal Stimulus Dollars Well Spent

We ask that the state include local corps in the federally-funded programs now being defined to quickly create jobs, training, and education for young, at-risk women and men whose numbers are growing throughout the state. Local Conservation Corps programs could quickly *create 3000 new employment and training opportunities* while helping the state meet its environmental goals. Corpsmembers have the power to clean the air, clear the waters, combat climate change, and improve our communities and our lives, all while they are improving their own. Local corps are highly effective models that work for California and the state's most at-risk young people; our heritage goes back to the Civilian Conservation Corps of the 1930s and the California Conservation Corps founded in the 1970s.

Project Experience

Energy Efficiency & Renewable Energy

- Energy conservation and alternative energy retrofits
- Solar panel installation & cleaning
- Weatherization of low-income housing

Water Conservation

- Water-saving retrofits and native drought-resistant landscaping

Climate Change Mitigation, Adaptation, and Land Conservation

- Construction and maintenance of park facilities
- Restoration of wetlands and other fish and wildlife habitats
- Reforestation and soil stabilization
- Urban tree planting and environmental enhancement

Disaster Response

- Local disaster recovery response after wildfires, floods, oil spills, earthquakes, and agricultural pest infestations

Transportation

- Transportation enhancement and other infrastructure projects

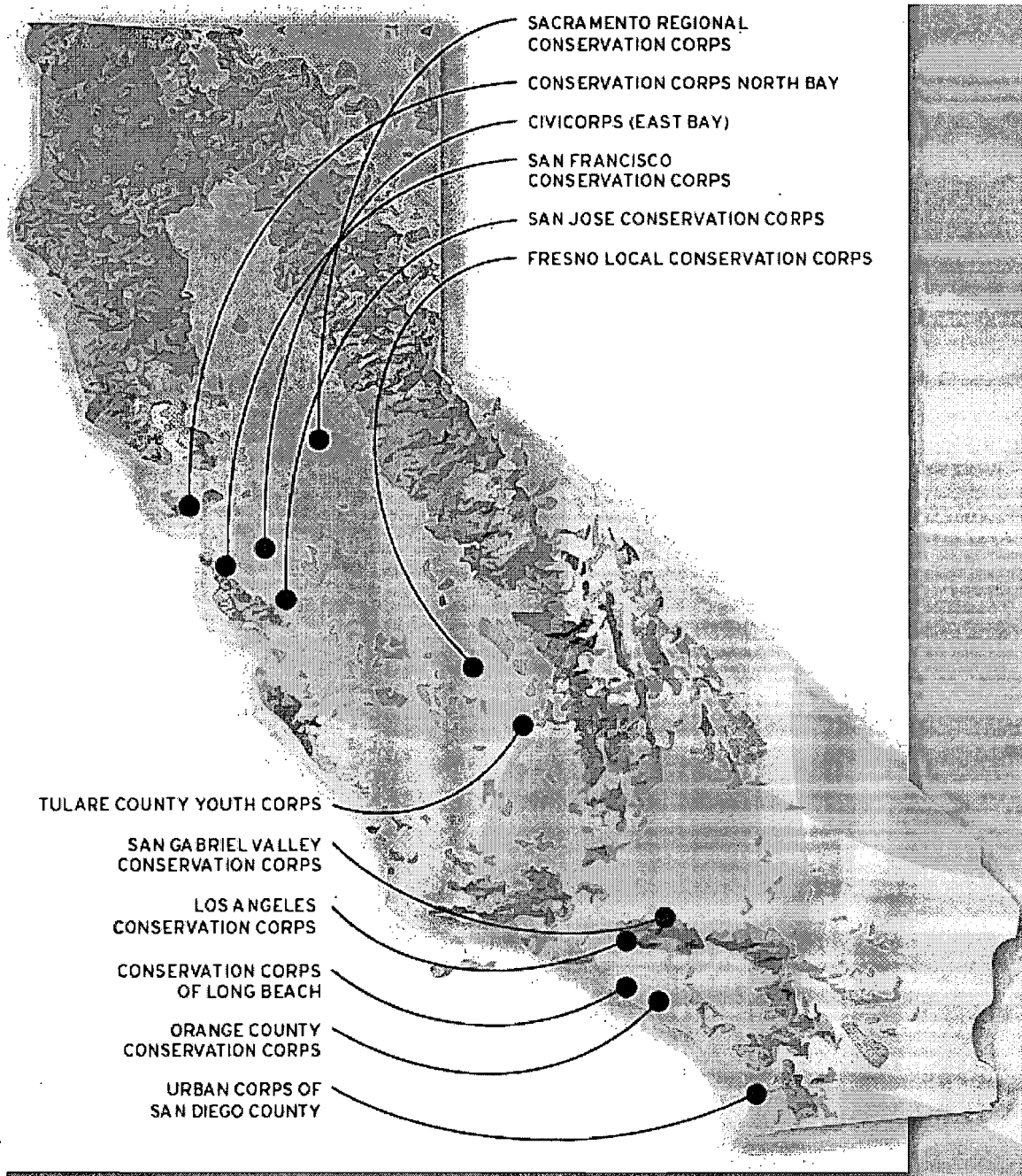
Recycling

- Beverage container recycling





Local Corps: Greening California



SEP - Comments to CEC re: SEP funding priority

From: "David Hochschild" <David@solaria.com>
To: <sep@energy.state.ca.us>
Date: 5/8/2009 11:32 AM
Subject: Comments to CEC re: SEP funding priority

May 8, 2009

California Energy Commission
 Special Projects Office
 1516 Ninth Street
 Sacramento, California 95814-5512
sep@energy.state.ca.us

To the Commission Staff;

Thank you for the opportunity to comment on the proposed use of the ARRA SEP funds. I'm with Solaria, a solar manufacturer in Silicon Valley and continue to serve, along with Rob Hammon, as Co-Chair of the CEC New Solar Homes Advisory Task Force, appointed by former CEC Chair Jackie Pfannenstiel. My comments below represent my views.

In the application that CEC submitted to DOE, it's clear there is not currently any plan to spend any SEP funding on solar. The solar industry strongly supports investments in energy efficiency, particularly stimulus funding, but believes that it would be a big mistake to elect to exclude solar from this opportunity. SEP funding should be broadly consistent with the position of the Legislature, Governor, CPUC and prior CEC decisions on this question (which have consistently chosen to fund energy efficiency and solar simultaneously reflecting CA's policy of both reducing our energy consumption and making the energy we consume cleaner).

More importantly, solar is particularly well suited to meet the objectives of the stimulus package:

- "shovel-ready" energy projects that can be completed and create jobs in weeks, not years
- The opportunity to lay a genuine foundation for CA job growth long-term (i.e. help California become a solar exporter)
- Zero emissions
- More jobs created per megawatt (24) than any other energy industry.^[i]

It is important to keep in mind that solar projects in California don't automatically receive funds elsewhere in the federal monies, whereas there are other ARRA funds dedicated exclusively for energy efficiency. The roughly \$20 billion in which solar is eligible are competitive funding pots with other renewable technologies and between states, not just solar in California. The ARRA also gives at least \$25 billion solely for energy efficiency beyond the SEP grant \$.

Finally, CA already spends very generously on EE and prioritizes EE policies under the loading order, compared to solar funding. The CPUC spends about \$1 bn per year in its IOU EE programs. IOU efficiency programs received \$2 billion in the 2006-2008 CPUC programming cycle. Moreover, regulated utilities have filed applications seeking authorization for over \$3.7 billion of energy efficiency programs for the 2009-2011

timeframe.^[iii] In contrast, the solar incentive program has a budget of only \$3 billion over ten years. Even though the one-time ARRA SEP monies may appear small in comparison to existing efficiency funding levels, efficiency altogether receives far more funding than solar receives.

We would like to ask that the CEC adopt an allocation of 1/3 solar, 2/3 efficiency in terms of allocating SEP funds. For the solar portion of the funds, I would like to suggest that the funds be divided into three pots:

- 1) adding additional funds to the current step in the CEC New Solar Homes incentive bucket to prevent the incentive level from dropping and unduly hindering solar market growth
- 2) Same thing for the CPUC's CSI solar retrofit program
- 3) Create a fund to support the installation of demonstration projects for new solar technologies, perhaps providing power to public buildings

By doing these three things, the CA stimulus funding can protect the growth of the new solar homes market, the solar retrofit market and provide support for technology development that will enable California to be a solar technology and cost leader and create job growth after the stimulus funds are gone.

In conclusion, we ask that a significant amount of the ARRA SEP funds be set aside for the shovel-ready solar demand that already exists. Doing so would immediately help federal policymakers demonstrate the achievements of the ARRA Act in fulfilling its goal to stimulate the economy.

Thank you for your consideration.

David Hochschild

[1]

Daniel M. Kammen, United States Senate Committee on Environment and Public Works. Testimony for the September 25, 2007 Hearing on Green Jobs Created by Global Warming Initiatives. Recheck—think this is the source.

2

Navigant Consulting. Economic Impacts of Extending Federal Solar Tax Credits. Final Report Prepared for the Solar Energy Research and Education Foundation (SEREF) September 15, 2008

3

CPUC February 13, 2009: "Energy Efficiency for California: Achieving Maximum Energy Savings in California for 2009 and Beyond"

4

http://www.energy.ca.gov/recovery/documents/SEP_Recovery_Act_Guidance_DE-FOA-00000521.pdf

David Hochschild / VP, External Affairs

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[i]

Daniel M. Kammen, United States Senate Committee on Environment and Public Works. Testimony for the September 25, 2007 Hearing on Green Jobs Created by Global Warming Initiatives. Recheck—think this is the source.

[iii]

CPUC February 13, 2009: "Energy Efficiency for California: Achieving Maximum Energy Savings in California for 2009 and Beyond"