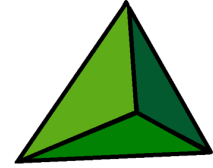




**ECONOMIC &
WORKFORCE
DEVELOPMENT**
through the
CALIFORNIA
COMMUNITY
COLLEGES

**BUSINESS AND WORKFORCE
PERFORMANCE IMPROVEMENT INITIATIVE**



**Strategic Possibilities Report
Bay Region**

**Energy Efficiency Occupations
At-a-Glance**



Center of Excellence

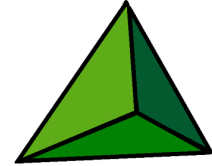
City College of San Francisco

September 2007



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Strategic Possibility Summary for Bay Region Community Colleges

Energy Efficiency Occupations

September 2007

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THE BUSINESS AND WORKFORCE PERFORMANCE IMPROVEMENT INITIATIVE IS FUNDED IN PART BY THE CHANCELLOR'S OFFICE, CALIFORNIA COMMUNITY COLLEGES, ECONOMIC AND WORKFORCE DEVELOPMENT PROGRAM. THE TOTAL GRANT AMOUNT (GRANT NUMBER 06-305-012 FOR \$205,000) REPRESENTS COMPENSATION FOR MULTIPLE DOCUMENTS OR WRITTEN REPORTS THROUGH THE CENTERS OF EXCELLENCE.

OUR MISSION IS TO STRENGTHEN CALIFORNIA'S WORKFORCE AND ADVANCE ECONOMIC GROWTH THROUGH EDUCATION, TRAINING AND JOB DEVELOPMENT.

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A STUDY CONDUCTED BY THE AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY PROJECTS THAT IF A HIGH EFFICIENCY ENERGY STRATEGY WERE IMPLEMENTED NATIONALLY, HUNDREDS OF THOUSANDS OF JOBS WOULD BE CREATED AND WORKERS ACROSS MOST SECTORS OF THE ECONOMY WOULD BENEFIT WITH HIGHER PERSONAL INCOMES.

Executive Summary

Increasingly states and cities are turning to energy efficiency programs as the “first-fuel” in the race for secure and clean energy sources. A combination of economic and political forces, along with technological advances has put energy efficiency efforts front and center recently. California is leading the way on greener building codes, appliance standards, energy efficiency resource standards, and other key policies that drive energy efficiency investment. The state’s drive to reduce greenhouse gas emissions (CA Assembly Bill 32) and business and industry’s need to manage rising energy costs has spurred investment in energy efficiency and clean technologies.

California is ranked by the American Council for an Energy-Efficient Economy (ACEEE) as the top state in the U.S. (tied with Vermont and Connecticut) on energy efficiency policies and programs. Increasingly, new construction projects and retro-commissioning projects of existing buildings will occur under tougher Leadership in Energy and Environmental Design (LEED) standards. This will create an increased demand for skilled energy technicians who can implement these new building codes that regulate heating, ventilation and air conditioning (HVAC), lighting, water heating, building envelope, and mechanical systems requirements. As new, more advanced energy efficiency technologies are transferred from research labs to the marketplace, manufacturing jobs will also be created to produce these new products. Trained technicians will be needed to install and monitor these new devices in buildings, homes and industrial settings.

This report will focus on occupations related to energy efficiency in the residential, commercial and industrial buildings sector. These jobs are projected to grow significantly in the Bay Region as employers and individuals invest more in energy efficiency projects. Transportation systems are another critical area of the economy that impact energy use. The effort to make transportation systems – auto, trucking, shipping, rail and aviation – more fuel and energy efficient and the role community colleges are playing in that transformation will be covered in a future report. Similarly, renewable energy holds significant promise as a way to diminish the use of fossil fuels in our state’s energy portfolio. Two reports written by the Bay Region Center of Excellence on the solar industry and wind industry¹ have addressed key areas of the renewable energy sector, and serve to complement this report.

¹ Download the reports at www.ccewd.net/industryscans

Energy efficiency occupations and their skill requirements are well defined by the Partnership for Environmental Technology Education (PETE)². These occupations are high-wage jobs and career advancement opportunities are available for workers who gain additional training, certifications or a four-year degree. Professional associations such as the Association of Energy Engineers (AEE) provide industry standards for training and certification in specialized areas of energy efficiency and management.

Energy efficiency occupations are clearly relevant to the role of community colleges. Colleges with engineering, technology and construction related programs can create, expand or adapt energy education and training programs from existing curriculum to meet the labor market need for skilled energy technicians. Colleges serve the population of students who are a natural fit for these jobs. Community Based Organizations, like the Ella Baker Center in Oakland, believe that this “New Energy” economy should provide job opportunities for low-income residents. These community organizations will be likely partners for colleges who will need students to enroll in new courses or programs that are developed.

An important next step will be surveying regional employers to identify the projected job growth for the specific occupations related to energy efficiency and energy services. Unfortunately, the California Employment Development Department (EDD) does not track the occupational titles (SOC codes) for the jobs which industry experts have identified as the demand occupations in the field. Also, it is difficult to project the increase in manufacturing jobs that can be attributed to the projected increase in the production of energy efficient products, devices and equipment. Community colleges may want to see more specific regional labor market data before moving ahead to adapt or create new programs.

In sum, once regional labor market data specific to energy efficiency occupations is obtained, colleges will have more detailed information to drive program development and industry partnerships. Employers, industry associations, Workforce Investment Boards (WIBs) and initiatives of the Economic and Workforce Development (EWD) Network of the California Community Colleges can join with colleges to respond to what appears to be a growing need for skilled technicians in the energy efficiency field.

² PETE is a non-profit 501(c) (3) organization that helps facilitate, augment, and broker partnerships with educational institutions, industry, and government. PETE’s mission is to provide leadership in environmental education and training through community and technical college partnerships that include over 400 colleges nationwide.

Introduction

The California Community Colleges System has charged the Economic & Workforce Development (EWD) Network to strategically identify growing industries and occupations that have partnering potential for the college's programs. The EWD network aims to best serve our local communities by identifying industry sectors with empirically validated projected growth. Additional criteria to establish the value of a Strategic Possibility includes: relevance (to the community colleges), economic impact, the adaptability of colleges to respond, and the ability to build partnerships with workforce and industry leaders to create career paths and upward mobility.

Overview of the Industry and Strategic Possibility

The U.S. has less than five percent of the world's population but consumes 30 percent of the world's fossil fuels each year. Given the rising cost of energy and current energy shortages, energy conservation and efficiency have become a vital part of the energy industry. Investments in energy efficiency programs and policies create jobs and reduce energy use. State and City building sector policies that regulate the lighting and HVAC systems in commercial, government and residential buildings, as well as appliances used within those buildings, will have a major impact on the growth of energy efficiency occupations. According to the U.S. Green Building Council, buildings in the United States account for 36% of total energy use and 30% of greenhouse gas emissions. In the Bay Area, more and more cities -- including San Jose and Oakland; and counties, including Alameda and San Mateo now require that new public structures be built to standards established by the U.S. Green Building Council.³ Because energy that is not used does not have to be produced, making energy conservation and efficiency a priority has worked in California. Our state's per capita energy consumption over the past 30 years has remained relatively flat when compared to U.S. per capita energy consumption, which has increased by 50% over the same period.

The Energy Services career field utilizes principles of science, engineering, economics and communication to optimize the production, delivery and use of energy resources. Energy efficiency occupations within Energy Services focus on using energy resources more efficiently, thereby reducing the cost, environmental impact and consumption of natural resources.⁴ Practitioners in the Energy Services field seek to identify and implement cost-effective energy conservation measures. As more advanced energy efficiency technologies are transferred from research labs to the marketplace, manufacturing jobs will also be created to produce new products and trained technicians will be needed to install and monitor these new devices in commercial buildings, homes and industrial settings.

The Bay Region's economy is well positioned to drive the growth of the energy efficiency market. Major utilities such as Pacific Gas and Electric (PG&E) invest heavily in energy efficiency programs. Between 2006 and 2008, PG&E will invest nearly \$1 billion in energy efficiency programs for residential, commercial and industrial customers. Industry associations like the Silicon Valley Leadership Group (SVLG) have developed a "Clean and Green Energy Action Plan" for their member businesses. Cities like San Francisco, Berkeley,

³ SF Chronicle, SF Hopes to Set Example with New Green Tower, April 13, 2007

⁴ Energy Services Careers, page 10, PETE, 2000

San Jose and others have taken the lead in implementing tougher building codes that will make energy efficiency retrofits and green building mandatory.

Regional community colleges have a strategic opportunity to supply the skilled workers needed by employers in this high-growth field. This report will focus on the top six energy efficiency occupations as determined by a panel of industry experts. The panel was convened in 2000 by the Partnership for Environmental Technology Education (PETE) in conjunction with the Advanced Technology Environmental Education Center (ATEEC). (See Appendix B for a list of the panel participants.) Based on the input of these industry experts, PETE developed the *Energy Services and Technology Program*, a series of curriculum and educational resources to help the nation's community/technical colleges establish Associate Degree and Certificate programs for the energy services field.

The energy efficiency occupations outlined in this report are relevant to community colleges because they are high-growth and require skill sets that colleges can provide to new and incumbent workers. The occupations are as follows:

Energy Auditor: conducts energy audits (including investment grade audits) of buildings, as well as building and process systems.

Energy Analyst: analyzes energy and building data, researches energy saving opportunities, and recommends a prioritized list of energy conservation and renewable energy options.

Building Operator/Building Technician: manages all building operations.

Resource Conservation/Efficiency Manager: plans, recommends and supervises implementation of resource efficiency and conservation projects.

Measurement and Verification Technician: installs, maintains, and troubleshoots HVAC, electrical, and energy management instrumentation.

Systems Technician: integrates energy efficiency, energy management, and alternative energies into the operation and maintenance of facilities.

(See Appendix C for a description of the duties associated with each occupation.)

Qualifying the Strategic Possibility

In determining the extent of this opportunity, several critical factors were evaluated. The following sections examine energy efficiency occupations based on their size and capacity for growth, their relevance to community colleges' focus, the economic impact of these jobs, and opportunities for leveraging with community partners.

Size and Capacity for Growth

As a result of Pacific Gas & Electric's nearly \$1 billion investment in energy efficiency programs between 2006 and 2008, the utility will avoid the need for more than 600 megawatts

of new generation -- or roughly the amount of electricity produced at a large power plant. Rebates for installing energy-efficient technologies, "tuning" services for commercial and industrial facilities, and incentives for customized energy-efficiency projects and new construction are just some of the programs the utility offers. But, PG&E will need to replace thousands of workers soon because 68% of their 20,000 workers are baby boomers and 43% of these baby boomers are retirement eligible in the next five years.⁵ There are currently not enough skilled workers to fill these jobs. The company will also need to sub-contract energy efficiency work to energy firms that can help customers reduce their energy use through better management and conservation strategies.

Studies have shown that investments in energy efficiency programs and policies create jobs and reduce energy use. A study conducted by the American Council for an Energy-Efficient Economy (ACEEE) projects that if a high efficiency energy strategy were implemented nationally, hundreds of thousands of jobs would be created and workers across most sectors of the economy would benefit with higher personal incomes. Based on their analysis, the construction, retail and service sectors would gain the bulk of the jobs because these sectors install energy efficiency measures and would gain new business orders from the re-spending of energy bill savings. Interestingly, less than 10% of the net jobs created are associated with direct investment in efficiency measures while more than 90% are associated with energy bill savings and re-spending of those savings.⁶

New building codes that require Leadership in Energy and Environmental Design (LEED) standards will drive the creation of new jobs and require upgrade training for current energy workers in the field. Retrofits of existing state and local government buildings across the country could create up to 300,000 jobs in the areas of design, construction, installation, manufacturing, and maintenance.⁷ In California, Governor Schwarzenegger's Green Building Initiative (Executive Order S-20-04) has directed state agencies to make state-owned facilities 20% more energy efficient by 2015.

In San Francisco, Mayor Gavin Newsom recently proposed the nation's most environmentally rigorous building standards. These new standards would not only include public buildings, but would affect private developers and commercial projects as well. LEED standards would apply to all new construction and major alterations of large and mid-size commercial buildings, plus high-rise residential buildings. Private commercial developers would need to meet the gold LEED standard by 2012.⁸

The occupations that PETE has identified as the high demand occupations for the energy efficiency field are not occupational titles tracked by the California Employment Development Department. The most relevant SOC codes to the jobs found in the field are listed in Figure 1 below:

⁵ Panel presentation by Tom Bottorf, Senior VP for PG&E at "Building the New Energy Workforce" conference, February 23, 2007.

⁶ Energy Efficiency and Job Creation, ACEEE, 1992

⁷ Apollo Alliance communication with Donald Gilligan, National Association of Energy Saving Companies, from May 2006

⁸ SF Chronicle, Eco-tough S.F. code proposed for buildings, July 11, 2007

Figure 1: Projected Job Growth, Wages and Training Required for Energy Efficiency Related Occupations, Nine County Bay Region, 2004-2014

Occupation	2005 Jobs	2016 Jobs	New Jobs	Replacement Jobs	Total Job Openings	Avg. Wage	Education & Training Level
<i>Heating, Air Conditioning and Refrigeration Mechanics/Installers</i>	6,025	7,093	1,068	853	1,921	\$22.19	Long-term OJT
<i>Control and Valve Installers & Repairers</i>	623	633	10	171	181	\$25.51	Moderate-term OJT
<i>Plumbers, Pipefitters, and Steamfitters</i>	11,186	12,550	1,364	2,771	4,135	\$26.97	Long-term OJT
<i>Electricians</i>	15,437	16,552	1,115	3,312	4,427	\$29.28	Long-term OJT
<i>Insulation Workers – Floor, Ceiling, Wall</i>	744	821	77	247	324	\$19.12	Moderate-term OJT
<i>Sheet Metal Workers</i>	4,947	5,170	223	1,270	1,493	\$24.35	Long-term OJT
<i>Electrical and Electronic Engineering Technicians</i>	8,361	7,633	0	1,923	1,923	\$26.60	Associates Degree
Totals	47,323	50,452	3,857	10,547	14,404	\$24.86	

Source: California Employment Development Department and CC Benefits

An important next step will be surveying regional employers to identify the projected job growth for the high demand occupations in the energy efficiency field outlined on Page 7 of this report.

Economic Impact

The Apollo Alliance is a national policy organization that is calling for rebuilding America's infrastructure and energy supplies with a new clean technology economy. Apollo's proposed "High-Performance Buildings for Community Redevelopment Act", if adopted, would create incentives for greater energy efficiency in new buildings, both public and private, over a ten year period. In addition, comprehensive energy efficiency retrofits of existing government buildings, schools, hospitals and other public infrastructure would occur through scheduled building audits, continuous commissioning and procurement guidelines which require energy efficient lighting, appliances and fixtures. The act would create hundreds of thousands of jobs nationally in the building trades, the energy services field and in the manufacturing of efficient HVAC systems and other energy saving technologies.⁹

A 2005 study by the Alliance to Save Energy concludes that an ambitious set of building efficiency policies implemented across the country would save consumers \$56 billion per year by 2020, while reducing national energy growth by 27% and growth in carbon emissions by 28%. The 2007 Energy bill being proposed by House of Representatives Speaker Nancy Pelosi raises energy efficiency standards for appliances and lighting, offers tax breaks and grants to help local governments and homeowners reduce their energy use, and offers new

⁹ State Leadership for a New Energy Future: A Four-Point Initiative for Clean Energy and Good Jobs, Apollo Alliance, 2006

incentives to build green. If the bill passes, the economic impact projected by the Alliance to Save Energy could become a reality.

In addition, there are manufacturing sector jobs associated with more energy efficient buildings, most notably the production of more efficient HVAC equipment, appliances, lighting, motors, pumps, and controls. UC Davis’s new Energy Efficiency Center (EEC) will play a major role in supporting the development of viable businesses that will produce the next generation of energy efficiency products. The EEC will bridge the gap between researchers and the marketplace by developing business models that translate research results into viable business ventures.¹⁰

Conserving energy reduces the energy bills paid by consumers and businesses, thereby enabling greater purchases of non-energy goods, equipment, and services. The result is a shift of economic activity away from energy supply industries and towards sectors of the economy which employ more workers per dollar received.¹¹

Leveraging

There are excellent opportunities for regional colleges and EWD Initiatives to partner with industry, workforce partners and community organizations to meet the workforce needs of employers. It will take well-developed partnerships to prepare the thousands of skilled workers that will be needed in the energy services field. The chart below summarizes the existing and potential partnerships that can be leveraged:

Partner	Type of Organization	Contribution to Partnership
Silicon Valley Leadership Group* (SVLG)	Industry Association	Access to Employers Clean & Green Energy Action Plan Partnership Development
Pacific Gas & Electric (PG&E)	Employer	Industry Standards, Job Descriptions, Access to Employees for Training
Building Owners Management Association (BOMA)	Industry Association	Access to Employers Industry Standards, Job Descriptions
Workforce Investment Boards	Workforce Development	Access to Job Seekers Training Funds Employment Resources
Regional Colleges* and Bay Area Community College Consortium* (BACCC)	Workforce Training and Development	Education and Training (AA Degrees, Certificates, Basic Skills)
Four Energy Project (ATTE, EAC, SBDC, CACT)	Community College EWD Program	Technical Assistance Curriculum Development, Workshops
COEs – Bay Region & Greater Silicon Valley	Community College EWD Program	Forecasting Industry Workforce Needs Labor Market Information Linkages to Industry Partnership Development
Apollo Alliance	National and California Policy Organization	High-Performance Buildings for Community Redevelopment Act
Ella Baker Center	Community Based Organization	Oakland Green Jobs Corps

* Existing Partnership

¹⁰ UC Davis Energy Efficiency Center web site, <http://eec.ucdavis.edu>

¹¹ Energy Efficiency and Job Creation, ACEEE, 1992

Relevance and Ability to Adapt Programs

Energy efficiency occupations are clearly relevant to the role of community colleges. All six of the occupations outlined in this report require no more than an Associate Degree education and are technician level jobs. Some regional community colleges already have programs that can prepare workers for the occupations in the energy efficiency field described in this report. If specific programs in Energy Systems Technology or Environmental Control Technology (HVAC) do not exist, most colleges have the engineering, technology and construction related programs from which programs can be adapted to meet the labor market need for skilled energy technicians. Working closely with industry associations and employers will enable colleges to adapt programs to meet regional labor market needs.

Community colleges serve the population of students who are a natural fit for these jobs. The Ella Baker Center's Oakland Green Jobs Corps, which builds off of the policy work of the national Apollo Alliance, takes an approach that the "New Energy" economy should provide economic opportunity for all. Their goal is to provide job training and living wage jobs in clean technology for low-income residents in urban areas. This is consistent with the mission of California's community colleges.

The occupations highlighted in this report also provide workers with career advancement opportunities as they gain additional training and certifications in the Energy Services field. Providing new and incumbent workers with the training and certifications required by industry for career advancement is clearly relevant to the role of community colleges.

Validation of the Strategic Possibility

The Bay Region and Greater Silicon Valley Centers of Excellence partnered with the Silicon Valley Leadership Group, Silicon Valley Works, and the Bay Area Community College Consortium to organize a regional partnership meeting on February 23, 2007 in Santa Clara. The "Building the New Energy Workforce" meeting brought together employers, industry associations, community college faculty/deans and workforce development leaders in an effort to build strategic partnerships to address industry workforce challenges. Panelists from business and industry expressed the following workforce development needs and opportunities for the developing "New Energy" workforce:¹²

Forces Driving Change

- PG&E's energy priorities are: 1) Energy Efficiency, 2) Demand Response (smart meters with time and price sensitive signals), 3) Renewable Generation, and 4) Transportation Initiatives.
- PG&E has a \$200 million dollar annual effort in energy efficiency, which will grow as both greenhouse gas emissions (GHG) and energy reduction become a more prominent element in business operations. This is being driven by California's new

¹² We are indebted to our panelists for their contributions: Alan Gartner, VP Western Region, Energy Connect, Inc.; Tom Bottorf, Senior VP, Pacific Gas & Electric; Derrick Rebello, President, Quest Energy Group

Greenhouse Gas Reduction law (AB 32) and bottom-line concerns about rising costs of energy.

- Retro-commissioning is a growing area of the energy field that focuses on “tuning up” a building to make it more energy efficient.

Occupations in Demand/ Opportunities for Advancement

- Job growth opportunities for Energy Connect, Inc. are:
 - Power Engineering (mechanical, civil)
 - Computer Science (systems engineering, semiconductors)
 - Economics & Business (new approaches to markets)
 - Physicists and Nuclear Engineering
- There is a career ladder opportunity for technicians to advance to engineers and/or managers.
- Utilities will have excellent job opportunities into the future.

Education/Skill Sets Required

- Technicians who can understand building monitoring systems and the technology associated with them are in demand. Workers are needed who know how to use these tools to help buildings become more energy efficient.
- Top three skills workers need: knowledge of Excel (i.e. spreadsheets), good writing, basic knowledge of electricity. Analytical skills are needed to take the data and then make recommendations to building managers.
- Building Owners Managers Association (BOMA) – is an industry association with great need for building engineers and technicians who have diagnostic skills, energy management skills and computer skills.
- PG&E skills needed: customer focused, analytical skills, computer skills, openness to change, diversity awareness.
- A two-year degree in energy management would be valuable to employers.

Interest in Partnering

- PG&E values partnerships -- working with industry partners and education partners to build the college curriculum that matches skills with market needs.
- Building technicians and engineers need a way to give the colleges feedback on how to align their college curriculum to better serve industry needs.

Industry Training Needs & Challenges

Younger workers with experience in energy and other clean technologies are needed to replace a “bubble” of experienced retiring workers. As mentioned previously in this report, PG&E’s aging workforce is a prime example. There are currently not enough skilled workers to fill these jobs.

In addition, several industry panelists at the “Building the New Energy Workforce” meeting in February 2007 mentioned that the high cost of living in the Bay Area makes it difficult to recruit experienced energy professionals for job openings. Panelists from labor, business and industry expressed the following skill needs and aptitudes for the developing energy workforce:

- ✓ Basic skills in math, writing, communication, and analysis
- ✓ Skilled in computers and networks
- ✓ Technical skills in power circuits, power and energy technology
- ✓ Experienced with energy skills, including solar
- ✓ Concerned about the environment and their community
- ✓ Ability to communicate technically and plainly with customers
- ✓ Ability to be flexible and adapt to change

(See Appendix C for a complete list of the job duties associated with the energy efficiency occupations outlined in this report.)

The Energy Services field has a number of certifications related to energy efficiency that are a standard in the industry and which require that workers complete certain coursework to demonstrate skills or knowledge. Three examples are listed below:

All new homes, additions and alterations to existing homes, and most commercial buildings within California are required to meet the minimum energy efficiency standards contained in Title 24, Part 6 of the California Code of Regulations. The *Energy Efficiency Standards for Residential and Nonresidential Buildings* were established in response to a legislative mandate to reduce California’s energy consumption. Individuals can attain specialized certifications through the California Association of Building Energy Consultants (CABEC) to demonstrate they understand what is required to achieve compliance with these standards and can proficiently perform calculations. These two certifications are the Certified Energy Plan Examiner (CEPE) and the Certified Energy Analyst (CEA). A summary of these certifications can be found at: <http://www.cabec.org/ceavscepe.php>

Also, the Association of Energy Engineers (AEE) offers a number of certifications that enable individuals to establish a standard of professional competence which is recognized throughout the industry. Certified Energy Manager (CEM), Certified Building Commissioning Professional (CBCP), and Certified Measurement and Verification Professional (CMVP) are just three of the thirteen (13) certifications offered by the AEE. A summary of these certifications can be found at: www.aeecenter.org/certification

The International Facility Management Association (IFMA) has two certifications: Facility Management Professional (FMP) and Certified Facility Manager (CFM). A summary of the certifications offered by the IFMA can be found at: http://www.ifma.org/learning/fm_credentials/index.cfm

Workers who enter the Energy Services field will have greater opportunities for advancement by attaining these certifications. The role colleges can play in preparing students for these industry certifications will be proposed in the next section of this report.

Opportunities and Implications for Community Colleges

Fifty (50) Bay Area Community College leaders spent the morning on February 23, 2007 listening to energy industry experts describe workforce development challenges and opportunities. College participants then spent time in the afternoon discussing the challenges that educators face in addressing the workforce needs of the “New Energy” industry. Some of the key challenges expressed by participants were:

- How to demonstrate to college administrators that setting up education programs to train students for New Energy jobs is a viable long-term enrollment opportunity.
- How to develop New Energy programs that are aligned with industry standards when faculty are already fully extended. Where will the “people power” come from to get it started?
- How to get colleges to work regionally and not duplicate programs and efforts.
- How to compensate for the loss of many vocational programs in high schools and community colleges around the Bay Area, which has compromised our ability to supply trained technology workers to industry.
- Attracting youth and early career jobseekers into New Energy programs in order to build a pipeline of younger workers for this industry.

In light of these challenges, the sense of the group was that community colleges can more effectively plan and coordinate regional programs by working together to avoid inefficient duplication of programs. Having good labor market data from employers about the jobs that are in greatest demand is critical to this process. Colleges could also partner with regional Workforce Investment Boards to perform accurate labor market analysis and develop workforce development strategies.

With accurate labor market data, colleges can coordinate to evaluate the available resources, faculty and curriculum at colleges needed to train students for the different jobs available in this industry. By identifying training needs, sharing instructors, and sharing employer resources/facilities for training, colleges can more swiftly and efficiently match program offerings to need. Besides partnering with local Workforce Investment Boards, Regional Industry Advisory Boards could be formed to maintain open discussion between colleges and industry.

Some regional colleges have programs that are aligned with industry needs – notably:

- DeAnza College has a program in Energy Management and Climate Policy. The Kirsch Center at De Anza provides energy management and renewable energy courses and certificates.
- Merritt College has a program in Environmental Design and Energy Technology.
- San Jose City College has several programs related to energy efficiency:
 - Facilities Maintenance
 - Energy Conservation
 - Green Construction
- Laney College has a program in Environmental Control Technology and currently has a National Science Foundation (NSF) grant to review the program. Laney will develop

updated curriculum for this occupational area which is changing due to more sophisticated technologies being introduced.

- Cabrillo College has Associate Degree and Certificate programs in Construction and Energy Management. Electives related to energy efficiency are offered in these programs.
- Several regional colleges have Environmental Controls Technology Programs (HVAC) – which can be expanded and adapted to meet industry needs.
- Four Energy, a state-wide collaboration of four EWD initiatives (Transportation, Manufacturing, Business and Environment) is developing three courses - *Introduction to Energy Efficiency*, *Green Building* (building design & operation) and *Green Construction* (waste prevention, life cycle, environmental products and methods) for an Energy Efficiency Technician program of study. (www.fourenergy.org)

However, a gap still exists between what industry defines as the occupations and skill sets they need and what most colleges offer. This is easy to understand since the shift to clean energy and energy efficiency is still in process and has only gained significant momentum in the past year or two. Deciding when and how to build programs that respond to the needs of industry is challenging for colleges since the forces that are driving change – economic, political and social – are very much in flux.

One opportunity is for colleges to review and consider adopting the model curriculum developed by the Partnership for Environmental Technology Education (PETE). These courses teach students how to optimize the production, delivery, and use of energy resources. PETE conducted workshops with experienced energy services practitioners and educators to identify the knowledge and skills needed for work in the Energy Services field.

Another approach colleges could take is to integrate elements of the PETE curriculum into existing vocational/technical programs related to the energy field such as heating, ventilation, and air conditioning; facilities maintenance; construction; architecture; and environmental science/technology. (See Appendix D for the PETE curriculum outline and the link to the full curriculum.)

The Northwest Energy Education Institute (NEEI) affiliated with Lane Community College in Eugene, Oregon has developed an Associate Degree program in Energy Management and three Certificate programs: Energy Management Certification; Building Operators Certification and Residential Energy Certification. Graduates of these programs typically find employment as Facility Managers, Energy Auditors, Energy Program Coordinators and Control Systems Specialists. Regional colleges may want to review and consider adopting elements of these degree and certificate programs. (See Appendix D for the link to the curriculum outlines.)

Another opportunity for community colleges is to offer courses and/or certificate programs that would provide the prerequisite knowledge students need prior to enrolling in CABEC, AEE or IFMA certification programs mentioned on Page 13 of this report. A first step would be to review the requirements for these certifications to determine if colleges may want to pursue this approach.

Data Limitations

The occupations that PETE has identified as the high demand occupations for the energy efficiency field are not occupational titles that can be found in the SOC codes tracked by the California Employment Development Department. The most relevant SOC codes to the jobs found in the field are profiled in Figure 1 on Page 9. Also, it is difficult to project the increase in manufacturing jobs that can be attributed to the projected increase in the production of energy efficient products, devices and equipment. Surveying regional employers to identify the projected job growth for occupations related to energy efficiency and energy services will be an important next step toward understanding the changes taking place in the industry.

Conclusion and Recommendations

Based on the information gathered in this report, regional colleges may have an opportunity to respond to the industry's workforce development needs. An important next step will be surveying regional employers to identify the projected job growth for the specific occupations related to energy efficiency and energy services. Community colleges will need more specific regional labor market data before moving ahead to adapt or create new programs. However, the following recommendations will help colleges prepare for a response to what appears to be a growing need for skilled technicians in the energy efficiency field.

1. Create internal partnerships with regional colleges and EWD Initiatives to build the capacity to respond to industry needs.

- Work with regional colleges and EWD Initiatives to gather current labor market data from employers about the energy efficiency jobs that are in greatest demand.
- Work with regional colleges and EWD Initiatives to evaluate what resources, faculty and curriculum are already available at colleges for training students for energy jobs.
- Where possible, share instructors, curriculum and best practices among colleges.
- Engage credit faculty in Engineering, Technology and Construction Departments to assess their interest in developing courses, certificates and programs.
- Work cooperatively towards regional grants to fund activities related to meeting industry needs.

2. Partner with Industry Associations, Employers, WIBs and Community Based Organizations to assess the workforce development needs of the energy efficiency and energy services field.

- Work with regional Workforce Investment Boards to perform an accurate labor market analysis and develop workforce development strategies.
- Survey employers regionally to identifying the scope of workforce recruitment and training needs.
- Identify employer resources and facilities for training and coordinate their use with regional colleges.
- Develop Regional Industry Advisory Boards to maintain open discussion and planning between colleges and industry.
- Establish a process that regional colleges use to organize their efforts – with all stakeholders at the table – to set priorities, establish goals and develop a work plan.

- Conduct a regional follow-up meeting on New Energy Workforce (being planned for November 15, 2007) with colleges, industry and workforce partners to continue building the capacity for a regional response.
3. Create new classes, certificates and adapt existing degree and certificates programs based on labor market data and industry needs.
- Review PETE's *Energy Services and Technology Program* curriculum and determine what elements should be incorporated into college programs in order to meet the labor market needs of employers in the Bay Region.
 - Review NEEI's (Lane Community College) Associate Degree and Certificate programs in Energy Management and Energy Efficiency to determine what elements should be incorporated into college programs.
 - Develop courses to prepare students for CABEC, AEE and IFMA certifications. This would increase a student's ability to find employment and advance in the energy and facilities management fields.

In sum, preparing students for occupations in the energy efficiency field is a strategic possibility for Bay Region community colleges. The clean technology arena is complex in that there are multiple areas that intersect with energy efficiency: alternative energy, transportation systems and green building are examples. Regional colleges and California Community College Economic and Workforce Development (EWD) Initiatives such as the Advanced Transportation Technology and Energy Centers and the Environment, Health, Safety and Homeland Security Centers have an opportunity to work together to identify labor market data, existing curriculum, faculty leaders, and best practices in order to build the college capacity to respond to industry needs. As more accurate workforce projections become available, community colleges in the Bay Region will be well positioned to partner with industry associations and workforce development organizations to provide employers with the skilled workers needed in the field of energy efficiency.

References

Alliance to Save Energy, www.ase.org, ASE promotes energy efficiency worldwide to achieve a healthier economy, a cleaner environment, and greater energy security.

American Council for an Energy-Efficient Economy (ACEEE), Energy Efficiency and Job Creation, 1992

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Association of Energy Engineers (AEE). A summary of the certifications offered by the AEE can be found at: www.aeecenter.org/certification

California Association of Building Energy Consultants (CABEC). A summary of the certifications offered by the CABEC can be found at: <http://www.cabec.org/ceavscepe.php>

California State EDD LMID (www.calmis.ca.gov)

International Facility Management Association (ifma.org). A summary of the certifications offered by the IFMA can be found at: http://www.ifma.org/learning/fm_credentials/index.cfm

Northwest Energy Education Institute (NEEI) affiliated with Lane Community College (Eugene, Oregon) Associate Degree and Certification Programs (See Appendix D for more information.)

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APPENDIX A: How to Utilize this Report

About Us – Description of BWPI

The Business and Workforce Performance Improvement (BWPI) initiative is focused on building the capacity of the colleges in the area of economic and workforce development to enhance their ability to deliver education and training services to businesses and workers in high growth industries, new technologies, and other clusters of opportunities.

The Centers of Excellence (COE) within BWPI provide information regarding workforce trends, increasing awareness and visibility about the colleges economic and workforce development programs and services, and building partnerships with business and industry.

The difference this will make to the colleges is that it will position them as THE workforce partners of choice to business and industry and ensure that college programs are current and responsive. This will contribute to the overall economic vitality of the communities in which they serve.

How to Use This Strategic Possibility Report

The Centers of Excellence within the Business and Workforce Performance Improvement Initiative of the California Community College Economic and Workforce Development Program have undertaken Industry Scanning to provide targeted and valuable information to community colleges on high growth industries and occupations.

This report, while not a full industry scan, is intended to assist the decision-making process of California community college administrators and planners in addressing local and regional workforce needs and emerging job opportunities in the workplace as they relate to college programs. The information contained in this report can be used to guide program offerings, strengthen grant applications, and support other economic and workforce development efforts.

This report is designed to provide current industry data that will:

- Define potential strategic opportunities relative to an industry's emerging trends and workforce needs;
- Influence and inform local college program planning and resource development; and
- Promote a future-oriented and market responsive way of thinking among stakeholders.

This Industry Scan included a review of the California Regional Economies Project reports and Employment Development Department (EDD) Labor Market Information (LMID) projections that cover the communities in this region, as well as many other sources as listed.

Important Disclaimer:

All representations included in this Environmental Scan product/study have been produced from a secondary review of publicly and/or privately available data and/or research reports. Efforts have been made to qualify and validate the accuracy of the data and the reported findings. The purpose of the Environmental Scan is to assist the California Community Colleges to respond to emerging market needs for workforce performance improvement. However, neither the Business and Workforce Performance Improvement Centers of Excellence, COE host college or California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon this study including components or recommendations.

APPENDIX B: Industry Experts convened by PETE and ATEEC (2000)

WORKSHOP PARTICIPANTS

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APPENDIX C: Duties Associated with Energy Efficiency Occupations

Energy Auditor

Conducts energy audits (including investment grade audits) of buildings, as well as building and process systems.

- Assess customer's wants and needs.
- Establish/follow interview protocols for assessing customer's needs.
- Analyze energy bills (including utility rates and tariffs) for historical energy usage data.
- Inspect and evaluate building envelopes, mechanical systems, electrical systems, and process systems to determine the energy consumption of each system.
- Determine pattern of building use to show annual needs for heating, cooling, and lighting.
- Select and operate various energy analysis measuring and monitoring devices:
 - data logger
 - universal data recorder
 - light meter
 - slings psychrometer
 - psychrometric chart
 - flue gas analyzer
 - amp-probe
 - watt meter
 - volt meter
 - thermometer
 - utility meter
- Collect, analyze, and validate energy usage field data.
- Prepare total energy profile for a facility.
- Identify and analyze opportunities for improving the operation, maintenance, and energy efficiency of each system.
- Write energy audit reports that provide energy analysis results and recommendations for energy cost savings.
- Interpret operations and maintenance manuals and other technical documents.
- Demonstrate an understanding of building and process systems and the interrelationships of those systems.
- Understand and apply basic engineering principles regarding energy production and use, building construction, maintenance, operation, and systems, and process systems.

Energy Analyst

Analyzes energy and building data, researches energy saving opportunities, and recommends a prioritized list of energy conservation and renewable energy options.

- Perform or be able to perform duties of an Energy Auditor (see page 16 for a list of job functions).
- Investigate/analyze opportunities for energy savings and pollution reduction in the following areas: HVAC, lighting, motors and other building equipment (including power factor and

peak demand charge), the building envelope, maintenance procedures and operations, and industrial processes.

- Understand the costs and environmental impact of using different types of energy.
- Evaluate potential for special contracts.
- Educate consumers on energy consumption and energy conservation.
- Compare energy company tariffs and energy market prices and make recommendations.
- Maintain library of tariffs, rules and regulations, codes, Public Utility Act, etc.
- Monitor daily findings (i.e., follow dockets).
- Testify at Public Service Commission hearings.
- Participate in association activities to lobby for more effective rates.
- Use existing facility operation and energy consumption data in evaluating alternative rate schedules.
- Investigate energy usage scenarios to determine the optimal rate from energy supplier or to determine if the customer qualifies for an alternative rate
- Investigate/analyze alternative, renewable energy applications.
- Perform economic analysis by:
 - Determining and estimating operating costs, maintenance costs, and capital costs;
 - Conducting life-cycle costing;
 - Determining present worth and value;
 - Calculating cost-benefit ratio, payback period, and return on investment.
- Analyze energy audit reports and provide recommendations for energy cost savings.
- Present energy analysis findings and energy cost savings recommendations to promote adoption by client.

Systems Technician

Integrates energy efficiency, energy management, and alternative energies into the operation and maintenance of facilities.

- Support engineering, construction, and sales staff in designing energy management system (e.g., scope of work, estimating project costs).
- Develop project Measurement and Verification plan.
- Supervise installation of building and process systems.
- Help create sequence of operation for building and process systems.
- Execute sequence of mechanical systems operation.
- Program energy management system, including control strategies.
- Test and troubleshoot building and process systems.
- Verify field data.
- Train on-site staff in usage of system.
- Install and troubleshoot data acquisition equipment (i.e., data loggers).
- Collect data for evaluation and verification.
- Troubleshoot programming and electronic equipment.
- Read psychrometric charts.
- Read and interpret blueprints and operations and maintenance manuals.
- Apply troubleshooting skills in HVAC, electrical, and electronic systems.
- Understand and apply energy efficiency measures in HVAC system and all other equipment in the building.
- Understand energy controls (e.g., direct digital controls).

- Have a basic knowledge of instrumentation. (e.g., read meters, gauges, etc.)
- Possess basic programming skills.
- Be familiar with general construction.
- Obtain appropriate licenses (e.g., low voltage electrical).
- Work well with trades personnel.

Measurement and Verification Technician

Installs, maintains, and troubleshoots HVAC, electrical, and energy management instrumentation.

- Assess energy systems for buildings and process controls.
- Assess energy use of building systems and processes.
- Take measurements (e.g., flow/temperature/pressure).
- Verify data quality.
- Analyze measurement data.
- Select and operate testing equipment.
- Safely install, remove, and troubleshoot electrical and mechanical instrumentation.
- Read plans and drawings.
- Write technical reports.
- Understand energy system performance.
- Understand operation of measurement devices (e.g., data loggers, discrete systems).
- Understand basic system controls.
- Possess knowledge of applicable codes and guidelines, including the:
 - International Performance Measurement and Verification Protocol (IPMVP)
 - American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE),
 - Environmental Protection Agency (EPA).
- Possess data gathering and management skills.

Building Operator/Building Technician

Manages all building operations.

- Inspect facilities and equipment for proper operation and maintenance.
- Collect data for measurement, verification, and diagnostics.
- Troubleshoot equipment and systems for problems.
- Establish and maintain contact with energy companies and energy suppliers.
- Schedule and inspect new installations and maintenance work done in buildings.
- Supervise and schedule service personnel.
- Inventory equipment.
- Evaluate current control systems for HVAC and lighting and, when necessary, plan and/or install new control systems.
- Operate and monitor energy management systems (e.g., HVAC, lighting, controls system).
- Plan and administer overall budget (e.g., set baseline for energy use and compare actual use against budget).
- Negotiate rates and tariffs with energy companies.
- Prepare building reports for management.
- Install and calibrate controls and instruments.

- Read/interpret technical materials, including blueprints, and operations and maintenance manuals.
- Analyze graphs and trends.
- Understand and apply system commissioning concepts and procedures.
- Maintain accurate records and logs.
- Understand basic Computer-Aided Design (CAD).
- Understand usage of other equipment (e.g., office equipment, kitchen equipment) in the building.
- Understand instrumentation theory and application.
- Possess troubleshooting and diagnostic skills.
- Perform basic keyboarding and PC operation.
- Understand Facilities Management Control System (FMCS) programming and software.
- Be familiar with energy efficiency and renewable energy concepts.
- Be familiar with ecological footprint analysis and other environmental impact tools.
- Understand landscaping as it relates to energy and the environment.
- Possess basic knowledge of environmental, health, and safety regulations (e.g., air emissions, effluents).
- Possess basic knowledge of wiring techniques for line voltage and low voltage systems.
- Possess team building skills.
- Be familiar with water quality and chemistry.
- Be familiar with trade union rules.
- Possess knowledge of specification of parts procurement.
- Possess knowledge of controls theory and application.

Resource Conservation/Efficiency Manager

Plans, recommends and supervises implementation of resource efficiency and conservation projects.

- Identify areas of waste and optimize energy and resource efficiency.
- Monitor resource and energy use and cost.
- Plan and recommend resource efficiency and conservation projects.
- Develop financial plans for recommended projects.
- Analyze energy cost.
- Develop operational plans and budgets.
- Manage projects.
- Analyze utility rates and recommend energy procurement strategy.
- Understand system commissioning.
- Possess team building skills.
- Maintain records and logs.
- Be familiar with water quality and chemistry.
- Be familiar with trade union rules.
- Be familiar with energy efficiency issues.
- Possess knowledge of specification of parts procurement.

APPENDIX D: Model Curriculums focused on Energy Efficiency

PETE's Energy Services and Technology Program Curriculum Outline

1. Introduction to Energy Management Principles
2. Alternative and Renewable Energy Sources
3. Heating Systems
4. Cooling Systems
5. Electrical Lighting and Motors
6. Energy Control Strategies/Technologies
7. Energy Costs, Economic and Environmental Analysis
8. Energy Efficiency Methods
9. Energy Analysis Capstone

The complete *Energy Services and Technology Program* can be downloaded at the following link:

http://www.ateec.org/store/catalog/Bring-Energy-to-Your-Campus-_17.html

Northwest Energy Education Institute (NEEI) affiliated with Lane Community College, (Eugene, Oregon) Associate Degree and Certification Programs

http://nweei.org/pages/?page_id=3

http://nweei.org/pages/?page_id=4