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Los Angeles Region

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CENTERS OF EXCELLENCE

Los Angeles Region

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An Initiative of ECONOMIC & WORKFORCE DEVELOPMENT through the CALIFORNIA COMMUNITY COLLEGES

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Mission: The Centers of Excellence, in partnership with business and industry, deliver regional workforce research customized for community college decision making and resource development.

Vision: We aspire to be the premier source of regional economic and workforce information and insight for community colleges.

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Centers of Excellence, Economic and Workforce Development Program

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The Centers would also like to thank the firms in the energy efficiency sector who took the time to complete the survey, which provided critical information about the workforce needs and requirements of employers. This information will be vital for Los Angeles Region community colleges in developing training and education programs.

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Based on a 2009 survey of Los Angeles Area firms who employ Energy Efficiency workers, employers are projected to add over 6,500 new jobs over the next three years in eight demand occupations.

Source: BW Research Partnership/Centers of Excellence

Executive Summary

The Centers of Excellence have recently concluded a research study to better understand the projected demand for energy efficiency occupations and the workforce needs of employers in the energy efficiency sector. The research was conducted in partnership with Lawrence Berkeley Labs and employers representing major industry segments of the industry. A statewide workforce survey produced over 2,000 responses which became the basis for regional reports detailing the key findings. This report focuses on findings in Los Angeles County.

The industry segments of the energy efficiency sector that were studied include:

- Utilities and energy resource management, including municipal agencies
- Design and/ or construction of new buildings or residences
- Energy retrofitting, improving energy efficiency in existing homes
- Retro-commissioning, improving energy efficiency in existing buildings and facilities
- Facility or building operations and maintenance

The research objectives of this study were to:

- Estimate the current number and size of firms, as well as geographic concentration.
- Project future job growth over the next one-to-three years in energy efficiency occupations relevant to community colleges.
- Identify employer needs and challenges for hiring and training employees
- Define skill sets and education requirements needed for key occupations.
- Identify career ladders and lattices.
- Obtain current and future salary ranges for the key occupations.
- Identify industry interest in accessing community college education and training programs.

Eight energy efficiency occupations that are most relevant to community colleges were the focus of the employer survey.

Over 183 employers responded to the survey, which yielded a rich set of data that is highlighted in this report. Employers in the energy efficiency sector are projected to increase employment substantially over the next three years, creating several thousand jobs with an energy efficiency focus. Many of these new jobs will be created to weatherize and retrofit homes and buildings, fueled in part by the hundreds of millions of dollars coming to California and Los Angeles from the American Recovery and Reinvestment Act of 2009.

Out of the eight occupations studied, building performance/retrofitting specialists is expected to add the most jobs, over 1800 in the next three years. This occupation, along with energy auditors, showed the fastest growth at 69 and 39 percent respectively over the same time period.

The survey results also indicate that the majority of employers are having difficulty finding qualified candidates in all eight energy efficiency occupations. Employers reported the highest level of difficulty hiring compliance analysts/energy regulation specialists, and building performance/retrofitting specialists.

Employers also expressed strong interest in education programs that can be developed by community colleges, including student internships.

Seven community colleges in Los Angeles were identified as offering or planning to offer courses and/or programs related to energy efficiency occupations within the next year. While many of these colleges have well established HVAC programs, most of the remaining programs connected to energy efficiency occupations are newly developed such as energy auditing and building retrofitting. Colleges may be well positioned to build a pipeline of skilled workers, create and expand industry partnerships, and provide additional professional development opportunities for college faculty who will teach energy efficiency courses. Many grants are being newly acquired to assist colleges in this effort.

The findings from this report support the creation, adaptation and expansion of energy efficiency courses and programs at Los Angeles community colleges to meet the projected employer demand for skilled workers, and provide additional employment opportunities for students.

Introduction

The California Community Colleges System has charged the Economic and Workforce Development (EWD) Network with identifying industries and occupations with unmet employee development needs and with initiating partnerships that hold potential for college programs.

Why study Energy Efficiency occupations? Workers who make new and existing homes and buildings more energy efficient perform valuable work in our economy and can make a good living doing so. Their work helps homeowners and businesses save energy and money. Research shows that the money saved is used to buy goods and services, which stimulates the regional economy and creates more jobs across all industry sectors. And, using less energy (which is still primarily generated by fossil fuels) also reduces green house gas (GHG) emissions and reduces our dependence on foreign oil. Everything invested in creating a more energy efficient environment can have a positive impact on our society and economy.

The construction and operation of residential and commercial buildings in the U.S. accounts for 39 percent of our total energy use. This compares to the industrial sector at 33 percent and the transportation sector at 28 percent of total U.S. energy use.[1] Because buildings are such a significant consumer of energy and contributor to greenhouse gas emissions, they also need to be a focal point for any potential solutions.[2] As California's legislation and policy move in the

[1]Energy Information Administration, www.eia.doe.gov, 2008.
[2]Research from the USGBC found LEED-certified buildings use 32 percent less electricity than non-certified buildings and save 305 metric tons of GHG emissions every year.

direction of requiring that buildings become more energy efficient, the cluster of energy efficiency jobs that perform this work will be in great demand.

In 2009, the Centers of Excellence (COE) partnered with multiple utilities agencies including Southern California Edison, Southern California Gas Company, Pacific Gas and Electric (PG&E), and others. It also worked with multiple industry associations, Lawrence Berkeley National Laboratory (LBNL), multiple industry associations,[3] the California Community Colleges Environmental Training Centers (ETC), and BW Research Partnership to survey local firms who most likely employ individuals in the eight energy efficiency occupations that are the focus of this report. This study focuses on findings from Los Angeles area employers. Additional regions can be accessed at www.coeccc.net/energy.

The study was designed to identify the workforce needs and requirements of employers related to these occupations so community colleges can develop the courses and programs most needed by employers. The segment of the energy efficiency workforce being studied in detail in this report is primarily the technician level/mid-level occupations most closely aligned with community college education programs, as opposed to professional level occupations.

Primary research was conducted with firms in the energy efficiency sector in the Los Angeles Area.[4] Employers were surveyed from March 2009 through May 2009, resulting in 183 responses. The workforce study focused on gathering the following information using both quantitative and qualitative data:

- The current number and size of firms, as well as geographic concentration.
- Future job growth over the next one to three years in energy efficiency occupations relevant to community colleges.
- Employer needs and challenges for hiring and training employees.
- Skill sets and education requirements needed for key occupations.
- Career ladders and lattices within the energy efficiency sector.
- Current and future salary ranges for the key occupations.
- Industry interest in accessing community college education and training programs.

In addition, the Centers surveyed community colleges to identify programs related to energy efficiency occupations. The survey results identify existing as well as planned college courses and programs, and can be used to inform program expansion and/or adaptation in the region.

[3]United States Green Building Council (USGBC), Los Angeles Chapter; California Association of Building Performance Contractors (CABPC); Building Owners and Managers Association (BOMA), Los Angeles Chapter; American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Southern California Chapter; California Commissioning Collaborative Building Commissioning Association;
[4]See definition of energy efficiency sector on page 7.

Industry Overview

Defining the Energy Efficiency Sector

A central challenge in preparing this report about emerging energy efficiency occupations was identifying the employers that hire technical and mid-level energy efficiency workers. Although most of the secondary research examines the different job titles and occupations that are affected by the new focus on energy efficiency, there is less discussion about which industries employ these occupations.

Although occupations like Resource Conservation/Energy Efficiency Manager could be found in just about any large business, this study focused on the industries with the greatest concentration of energy efficiency occupational opportunities. The following three industries fit this criteria: Building or Facility Operations and Maintenance; Building Design and Construction; and Public or Private Utilities or Agencies. See Appendix B for more information regarding these industries and the types of firms surveyed for this study.

Public or Private Utilities or Agencies	Building Design and Construction	Building or Facility Operations and Maintenance
Compliance, regulation, program administration, resource management, and auditing.	Project management, design, building, installation, auditing, and retrofitting.	Maintenance, operation, and systems controls.

For the purposes of this study, the energy efficiency sector was defined as those firms that:

a) Deliver energy efficiency services as their primary focus, [5] or

b) Are public or private utilities or agencies who hire energy efficiency workers, or

c) Are large customers of energy utilities who hire energy efficiency workers.[6]

U.S. Energy Efficiency Workforce

A 2008 study by the American Council for an Energy-Efficient Economy (ACEEE) estimated the size of the 2004 workforce in the U.S. energy efficiency market to be 1.6 million employees, with approximately one million of these workers employed in the buildings sector.[7]

Within the buildings category, investments in the appliance and electronics sector generated the most jobs (more than 370,000), followed by efficiency-related jobs in residential construction and renovation (316,000) and commercial construction and renovation (301,000). Other significant levels of employment are associated with investments in the industrial sector, which generated an estimated 351,000 jobs. Efficiency investments in the utility-sector employed roughly 139,000 workers. These estimates include jobs in manufacturing, sales, installation and other services.[8]

[5]Energy efficiency services include, but are not limited to: energy audits, installations, maintenance, operation, designing and/or building, resource management, compliance/regulation, and consulting.
[6]Includes commercial buildings, schools, retail facilities, industrial facilities.
[7]"The Size of the U.S. Energy Efficiency Market: Generating a More Complete Picture," American Council for an Energy-Efficient Economy, 2008.
[8]Ibid.

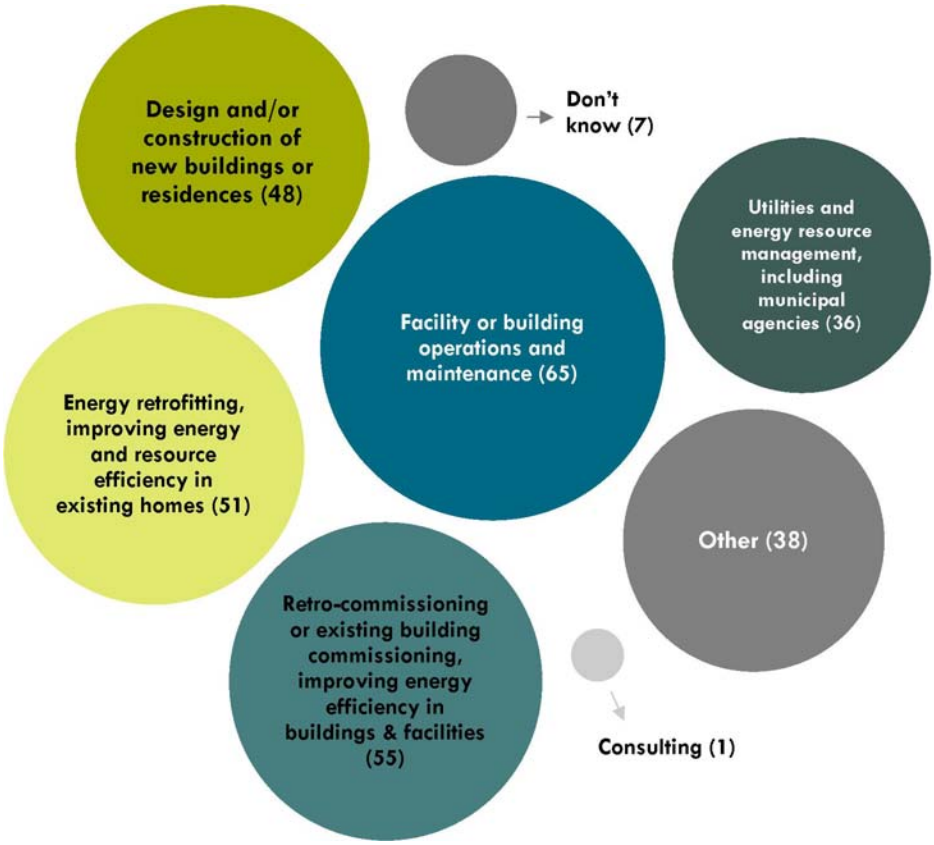
Types of Employers, Number and Location of Firms in the Los Angeles Area

In Los Angeles County, it is estimated that approximately 2,900 firms employ energy efficiency workers in one or more of the eight occupations studied. Of these, 183 responded to the survey. 61 percent of employers identify themselves as directly involved with energy efficiency work, while the remainder said they were indirectly involved.[9]

Eight Occupations Studied

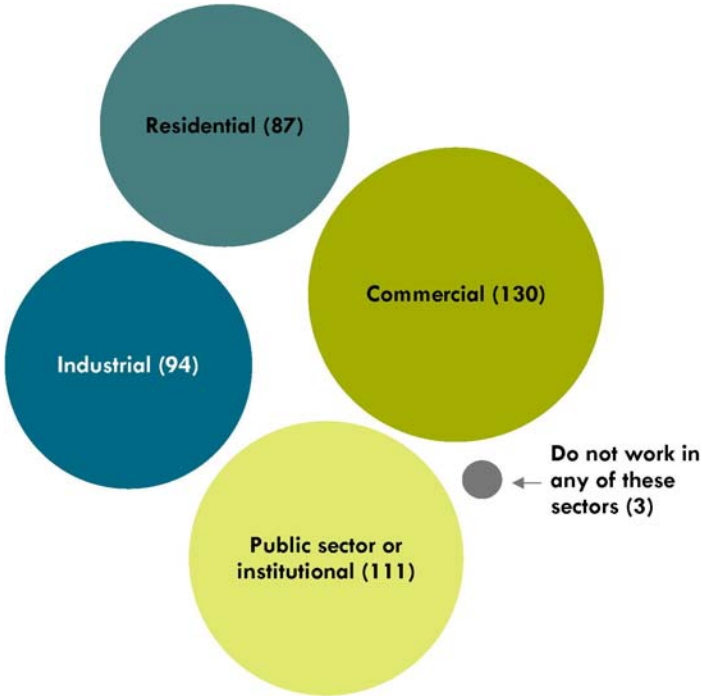
- Energy Auditor/Home Energy Rater
- Building Performance/Retrofitting Specialist
- Resource Conservation/Energy Efficiency Manager
- Compliance Analyst/Energy Regulation Specialist
- Construction/Design Project Manager
- HVAC Technicians/Installers
- Building Controls Systems Technicians
- Building Operators/Engineers

Employers were asked to identify their firm as part of one or more of the industries in the chart below. The chart shows that more firms are involved in the facility or building operations and maintenance than any other industry. (Note: Total exceeds 183 responses, since multiple responses were allowed.)



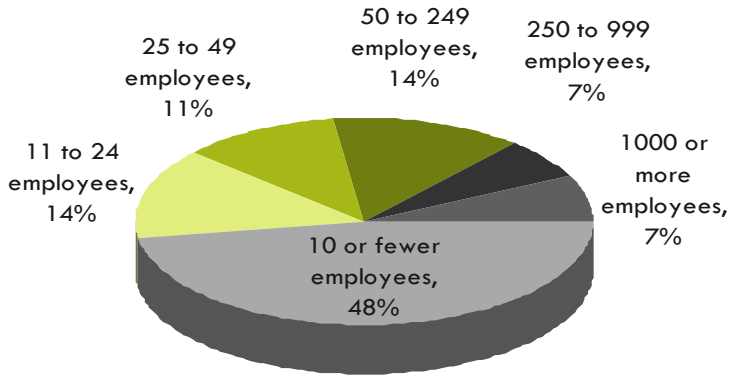
[9]See Appendix C for methodology on estimating number of firms.

Employers were also asked to identify the sectors within energy efficiency that they serve. Firms were allowed to pick all sectors that apply to their firm's services. The chart to the right shows that more firms provide services in the commercial sector than in the public sector or institutional sector. (Note: Total exceeds 183 responses, since multiple responses were allowed.)



The survey data reveals that most firms are relatively small – 62 percent employ fewer than 25 employees – with a significant portion (48%) employing 10 or fewer employees. More data on the size of firms is shown in the pie chart below.

Los Angeles hosts the highest concentration of energy efficiency occupations in Southern California. A map of employer concentrations in Southern California can be found in Appendix D.



Follow-on Study with Lawrence Berkeley National Lab (LBNL)

Because more than 2,000 employer responses were collected for this study statewide, there is much more analysis that can be done to understand the characteristics of the energy efficiency sector. Towards that end, the Centers of Excellence will conduct a follow-on study in partnership with Lawrence Berkeley National Lab (LBNL) that will focus in greater detail on the characteristics of the energy efficiency sector and the workforce needs and requirements to educate, train, and mobilize a highly skilled workforce.

Current Forces Driving Growth in Energy Efficiency

Federal Legislation

On February 17, 2009 President Obama signed into law the American Recovery and Reinvestment Act of 2009. The new law makes major investments in energy efficiency, totaling **approximately $30 billion**. This is a major commitment from the federal government — both in terms of spending on projects and tax incentives to homeowners — that will create hundreds of thousands of jobs in the U.S. and tens thousands of jobs in California. A summary of the Energy Efficiency related provisions in the Reinvestment Act can be found in Appendix E.

State Legislation and Policy

California has moved aggressively to establish a legislative and policy framework that puts energy efficiency center stage in the effort to meet the state's increasing energy needs and fight global warming.

In 2005, the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC) released their "Energy Action Plan II" which clearly identified energy efficiency as California's top priority energy resource. The report states that "cost effective energy efficiency is the resource of first choice for meeting California's energy needs. Energy efficiency is the least costly, most reliable, and most environmentally-sensitive resource, and minimizes our contribution to climate change." California's Public Utilities Code requires utilities to first meet their "unmet resource needs through all available energy efficiency and demand reduction resources that are cost effective, reliable and feasible."[10] A summary of California's key legislative and policy initiatives related to Energy Efficiency can be found in Appendix F.

Utility Energy Efficiency Programs

During 2006-08, California's Investor Owned Utilities (IOUs) embarked on the single-largest energy efficiency campaign in U.S. history, with a $2 billion investment by California's energy ratepayers for energy efficiency programs. Edison International's regulated electric utility, Southern California Edison (SCE), is a national leader in energy-efficiency savings. From 2006-2008, SCE's energy-efficiency programs have saved 4.12 billion kilowatt-hours – enough energy to power 591,954 homes for an entire year. In this period, the programs have reduced greenhouse gas emissions by 1.5 million metric tons – the equivalent of removing almost 300,000 cars from the road. SCE provides reliable electric service to central, coastal and southern California and has invested nearly $800 million during 2006-2008 towards energy efficiency programs for these customers. Programs range from residential energy efficiency incentives to demand response initiatives to efficiency programs for commercial and industrial customers. In July of 2009, SCE filed proposed programs with the CPUC for 2009-2011, with a possible budget of $1.35 billion. A summary of SCE's energy efficiency programs for customers can be found in Appendix G.

Southern California Gas Company (SoCalGas) provides natural gas service to much of Southern and Central California. Energy-efficiency programs, ranging from residential energy-efficiency rebates to incentives for large energy-efficiency projects up to $1 million each, accounted for $120 million between 2006-2008. For 2009-2011, SoCalGas is looking to expand their set of energy-efficiency programs to meet the needs of more residential and commercial customers. Additional resources for customers can be found in Appendix G.

[10] Public Utilities Code Section 454.5(b)(9)(C)

The Department of Water and Power (DWP) has a similar list of resources that can be found in Appendix G.

Regional Energy Efficiency Initiatives

The City of LA is playing a significant role in the development of new policies to promote energy efficiency on a local level. On April 15, 2009, Mayor Villaraigosa signed Ordinance 180636, the Green Building Retrofit Ordinance, requiring all municipal buildings larger than 7,500 sq ft. or built before 1978 to be retrofitted with the goal of achieving LEED for Existing Buildings Silver certification. The Ordinance will also establish a pipeline to green careers by disadvantaged workers, ensure that local green products are being used, and foster inner city economic development by supporting local minority and women-owned green business development.

In 2008, the Private Sector Green Building Plan was signed into law. This requires all private development of 50,000 square feet or greater to earn LEED Certification and provides expedited plan review and permitting for all projects seeking LEED Silver.[11] As LEED building standards continue to be integrated, the market for energy efficiency services will grow and create local jobs.

Technological Innovation and Venture Capital

Energy generation is the largest U.S. Cleantech segment, accounting for 59 percent of total U.S. cleantech venture capital investment with energy efficiency being at 8 percent. According to cleantech.com, the year 2008 was unprecedented for clean technology and for the first time led all other sectors in venture capital with $3.3 billion invested in California companies. Overall, $5.9 billion was invested in clean technology in North America. Los Angeles hosts multiple research centers that are developing advanced energy efficiency technologies. As more advanced technologies are transferred from research labs to the marketplace, manufacturing jobs will 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. Appendix H lists the major institutions in Los Angeles working on energy efficiency research.

Significance of Energy Efficiency for the State and Regional Economy

The economy is in a crisis not seen since the Great Depression. Banks are failing, credit markets are frozen, home foreclosures are on the rise and consumer purchasing power is in decline. The Los Angeles Area unemployment rate is at 11.9 percent as of July 2009. Between June 2009 and July 2009, total nonfarm employment in Los Angeles County decreased by 43,500 jobs to arrive at 3,872,600.[12] Most economists predict that the recession will continue through 2010.

The energy efficiency sector has great potential to be a positive economic driver in Los Angeles and in every region of California at a time when the economy is in desperate need of job creation. Investments in energy efficiency programs will create jobs for thousands of people performing energy audits, retrofitting homes and buildings, installing advanced HVAC systems, and managing energy resources.

Investing in energy efficiency initiatives can become a regional and state-wide economic development strategy. Some renewable energy industries, such as wind, are only viable where the energy source exists in abundance. In contrast, energy efficiency initiatives can be executed

[11] For more info on local, state green building policies, see http://www.usgbc.org/PublicPolicy/SearchPublicPolicies.aspx?PageID=1776

[12] EDD Labor Market Information Division, July, 2009 http://www.calmis.ca.gov/file/lfmonth/la$pds.pdf

everywhere — in every home, every commercial or public building, and every industrial facility. And energy efficiency jobs can't be outsourced. As Van Jones, former President of Green For All says, "…you can't take a building you want to weatherize, put it on a ship to China, and then have them do it and send it back."[13]

Appendix I contains a summary of the 2008 report by the Center for Energy, Resources and Economic Sustainability (CERES) at UC Berkeley. The report outlines the job creation that has resulted in California from energy efficiency investments over the past thirty years. The report also highlights the potential for even greater job creation in the future, when continued investments and technological innovation are combined.

[13]Van Jones quoted in "Hot, Flat, and Crowded," Thomas L. Friedman, p. 306, 2008.

Occupational Overview

Occupations Studied

The occupations chosen for inclusion in the survey had to exist in the energy efficiency sector (as defined on page 9 of this report) and one that community colleges could address in their education offerings.[14] The eight occupations studied, as well as current and projected employment in Los Angeles, are listed in Table 1 on the following page. Occupational profiles for the eight occupations can be found in Appendix J.

Qualifying the Employment Estimates

The combined occupational employment in Los Angeles for the eight energy efficiency occupations studied, totals at least 1,600 jobs (count of known employment from the 183 survey respondents) and could be as high as 20,730 jobs.[15] The latter figure is an extrapolated estimate of employment, based on survey responses and an estimate of the total number of firms in the energy efficiency sector in Los Angeles (2,900).

Several factors may influence how close actual employment levels are to the employment estimates included in this report. The estimated occupational employment totals and projections included here assume that the sample of firms who responded to the survey is representative of the population of firms in terms of occupational staffing and job outlook.

However, there are several ways the sample may differ from the population. These include 1) survey respondents may be more engaged in Energy Efficiency work than non-respondents, 2) some firms included in our estimate might not self-identify as a firm that hires energy efficiency workers, and/or some firms who would self-identify as a firm that hires energy efficiency workers might have been excluded, and 3) the size of responding firms in the sample may be different in some way from the population of firms that hire energy efficiency workers.

Projected Growth for Each Occupation

Based on projecting survey responses to the population of firms, the estimated combined growth of the eight occupations over the next 12 months could result in as many as 1,670 new jobs for Los Angeles.[16]

Based on projecting survey responses to the population of firms, the estimated combined growth of these eight occupations over the next three years could result in as many as 6,580 new jobs for the Los Angeles economy.

Employers expect the anticipated economic recovery to strengthen the demand for energy efficiency occupations, as all eight occupations show employment growth expectations of 19 percent or higher over the next 3 years.

[14] Occupations were identified through executive interviews with industry leaders, ETC Statewide Director, community college faculty and Deans, and the Energy Services occupational framework developed by ATEEC in 2008.
[15] Employment data from the 183 survey respondents is summarized in Appendix C.
[16] Employers were asked how many additional employees they expected to hire over the next 12 months and three years for each of the eight occupations studied. Their responses and the distribution of employers employing each occupation were used to project the number of new jobs to be added in Los Angeles.

Table 1: Estimated 2009 Employment and Projected 12-month and 3-Year Growth for Each Occupation

Energy Efficiency Occupations	2009 Employment Estimate	12-month Projected Growth	Growth Rate	3-year Projected Growth	Growth Rate
Project managers for construction or design work are responsible for communicating with project partners and ensuring that the project is completed in a timely manner and within budget.	5,000	280	6%	970	19%
Building operators or building engineers troubleshoot, install, replace, and repair building energy systems and controls to optimize energy efficiency.	3,270	10	0%	940	29%
HVAC mechanics, technicians or installers install, repair and maintain heating, ventilation, air-conditioning and refrigeration systems.	3,010	310	10%	1,020	34%
Building performance or retrofitting specialists are contractors who improve the energy efficiency of homes or buildings by installing insulation, windows, lighting and other energy efficient products.	2,710	620	23%	1,870	69%
Building controls systems technician combine some of the traditional skill sets of building technicians with advanced skills in controls programming, networking, and systems integration.	1,970	60	3%	410	21%
Resource conservation or energy efficiency managers assess current energy and resource consumption and develop strategies to reduce usage.	1,820	140	8%	480	26%
Compliance analyst or energy regulation specialists evaluate if projects are meeting regulatory requirements and/or incentives and provide recommendations as needed to meet compliance.	1,620	130	8%	370	23%
Energy auditors or home energy raters are responsible for collecting, analyzing and validating energy usage in the field and preparing reports on a building or home's total energy profile.	1,340	120	9%	520	39%
Total, All Occupations (totals may not add due to rounding)	**20,730**	**1,670**		**6,580**	

Other highlights include:

- The largest growth occupations **over the next 12 months** are Building Performance or Retrofitting Specialists with as many as 620 new jobs projected, followed by HVAC Mechanics, Technicians, or Installers with as many as 310 new jobs projected over the same period.
- These occupations also showed the largest growth **over the next three years:** Building Performance or Retrofitting Specialists project as many as 1,870 new jobs, followed by HVAC Mechanics, Technicians, or Installers with as many as 1,020 new jobs projected, over the same period.

- While the fastest **growth** rate over three years is projected for Building Performance or Retrofitting Specialists (69%), the second fastest is projected for Energy Auditors or Home Energy Raters at 39%.
- Close to three out of Four employers had difficulty finding qualified Compliance Analysts or Energy Regulation Specialists.
- Project Managers for Construction or Design Work had the largest 2009 concentration of employment of the eight occupations at 5,000.

Occupational Skill and Knowledge Requirements

Employers were asked to identify the industry segment with which their firm is most closely aligned. They were then asked about the skills and areas of knowledge important to them when hiring employees. The survey results for the five industry segments are found in the figures below.

Figure 1: Utilities and Resource Management

- Employers who work in utilities and resource management responded that the ability to communicate with customers, in writing and in person, is the most valued skill in an employee (91% important).
- Employers indicated that additional "very important" skills are: understanding local and state energy efficiency requirements and incentives for new and existing buildings (52%); and ability to identify and apply regulatory codes when conducting energy assessments (57%).

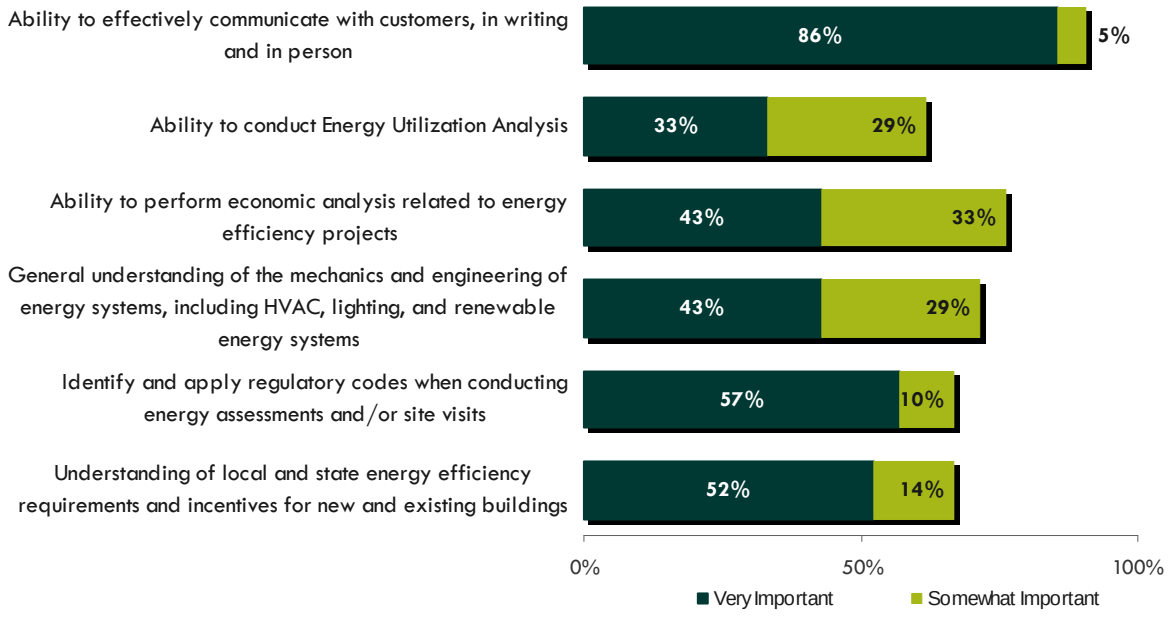


Figure 2: Design and/or Construction of New Buildings

- Employers who work in design and/or construction of new buildings responded that the ability to communicate with customers, in writing and in person, and general construction experience as the most valued skills in an employee.
- Employers indicated that additional "very important" skills are: general construction experience (55%); general understanding of the mechanics and engineering of energy systems (52%); and the ability to develop CAD or GIS drawings (52%).

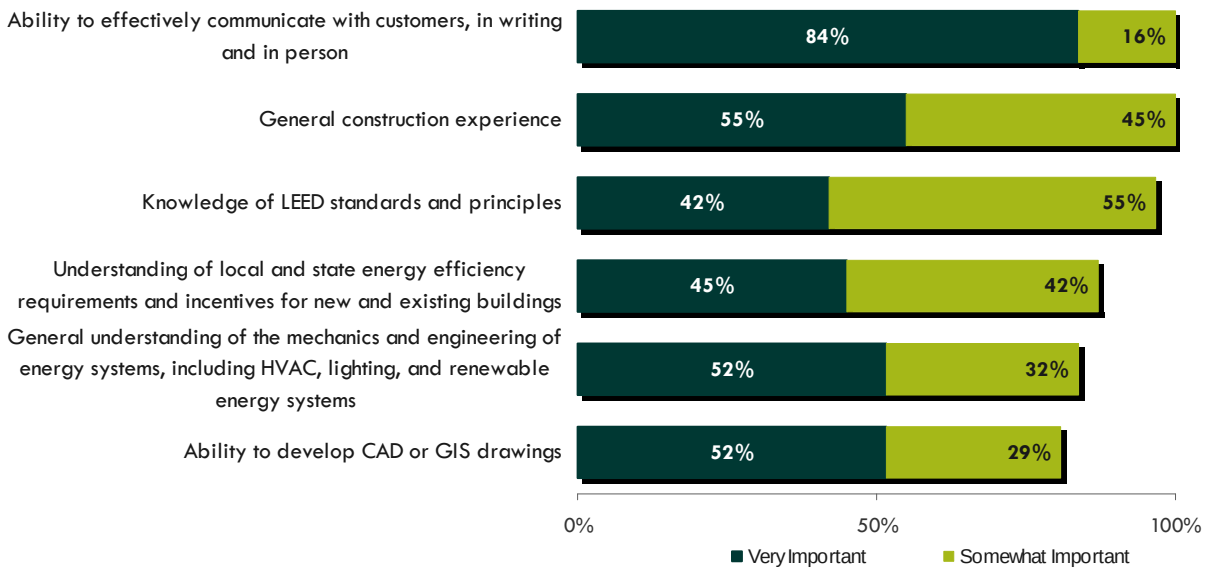
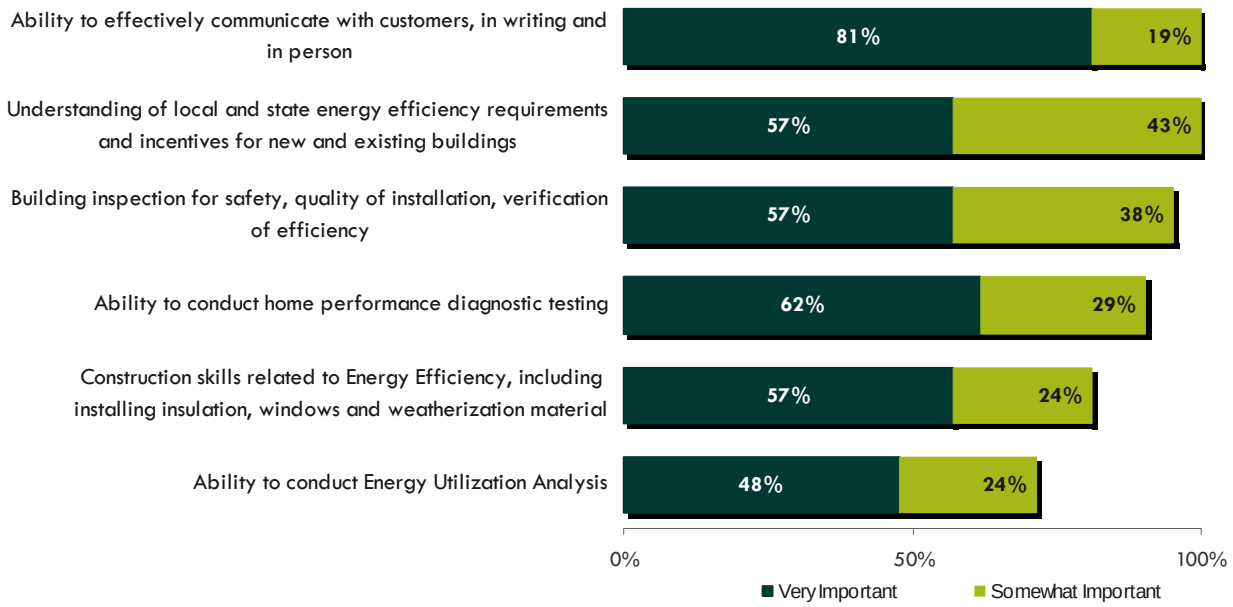


Figure 3: Improving Energy Efficiency in Homes (Retrofitting Homes)



- Employers who work in energy retrofitting responded that the ability to communicate with customers as well as understanding of local and state energy efficiency requirements and incentives are the most valued skills in an employee.
- Employers indicated that additional "very important" skills are: ability to conduct home performance diagnostic testing, (62%); and building inspection for safety, quality of installation, and verification of efficiency (57%).

Figure 4: Improving Energy Efficiency in Existing Buildings (Retro-Commissioning)

- 94% of the employers who work in retro-commissioning/ existing building commissioning and who responded to this question indicated that the ability to communicate with customers, in writing and in person, is an important skill in an employee.
- Employers indicated that additional "very important" skills are: ability to perform measurement and verification of energy systems (72%); and the ability to test and troubleshoot building and process systems, including HVAC, electrical and electronic systems (72%).

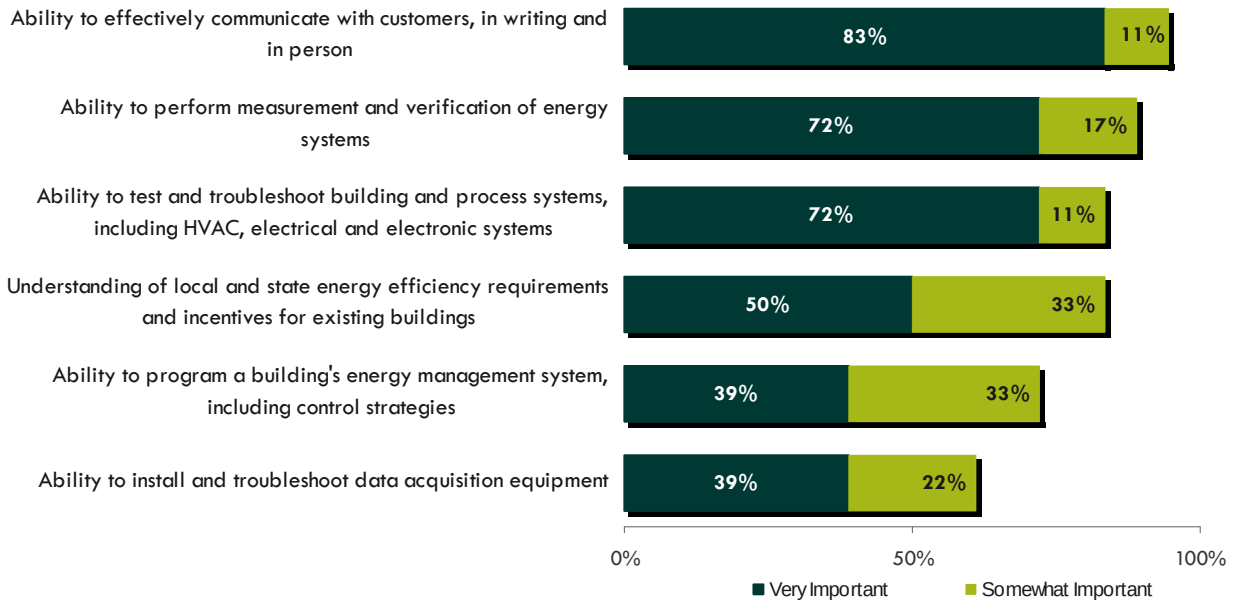
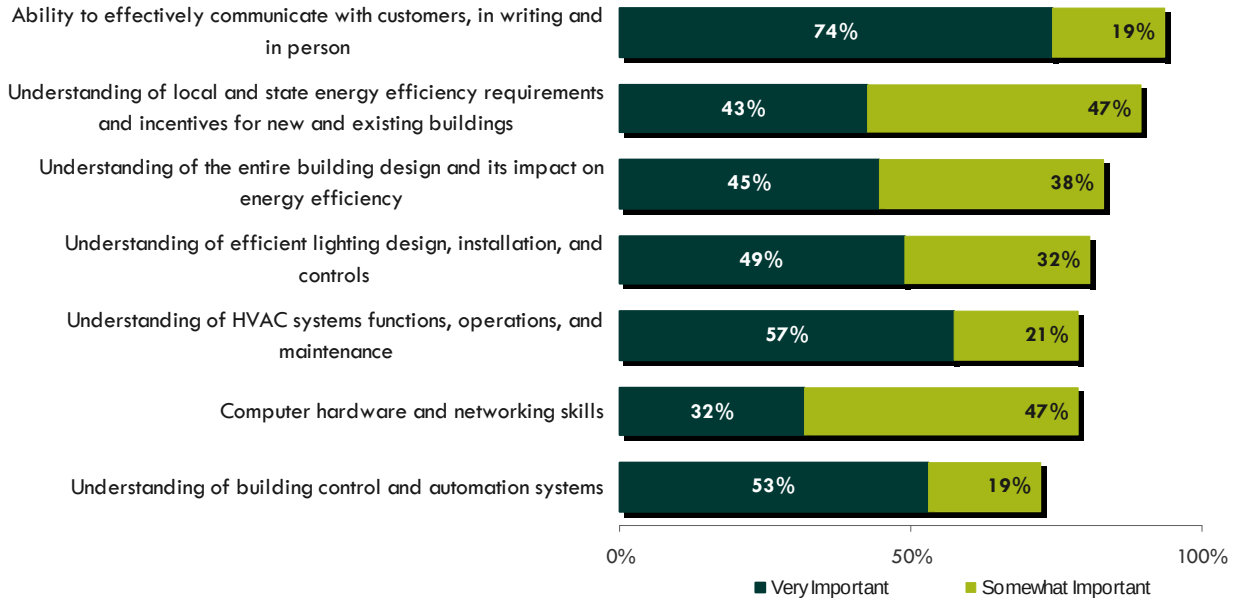


Figure 5: Facility or Building Operations and Maintenance

- Employers who work in facility or building operations and maintenance responded that the ability to communicate with customers is the most valued skill in an employee (74%).
- Employers indicated that additional "very important" skills are: understanding of HVAC systems functions, operations, and maintenance (57%); understanding of building control and automation systems (53%).



Career Pathways

The survey results show that in the near future, energy efficiency occupations will be in demand. Employers will need additional skilled workers for performing energy audits, retrofitting homes and buildings, installing advanced HVAC systems, and managing energy resources for businesses and public agencies.

Energy efficiency jobs pay well and provide opportunities for advancement along a career pathway of increasing skills and wages. Most are middle-skill jobs requiring more education than high school, but less than a four-year degree—and are well within reach for lower-skilled and low-income workers, as long as they have access to effective training programs and appropriate supports. Most of the eight energy efficiency occupations studied for this report are existing jobs that are changing as industries transition to a clean energy economy.[17]

Lawrence Berkeley National Lab (LBNL) is currently conducting a needs assessment of the energy efficiency services workforce in the U.S. and in eleven states, including California. One component of the research is estimating the size of the energy efficiency services industry (EESI) nationally and in the selected states. Early results indicate that there are over 5,500 jobs in California for Program Administrator Staff, Program Management Contractor Staff and Program Support Contractors. These positions represent the professional and management jobs in the EESI. Significant growth is projected for Program Management Contractor Staff and

[17] Adapted from "Green Collar Jobs," Green For All, www.greenforall.org

Program Support Contractors in the range of 65% from 2007-2010.[18] Technical workers who begin in the occupations studied for this report could pursue career advancement opportunities into these management and professional jobs with additional education and experience. Appendix K contains some examples of Industry Certifications that if attained, can help workers advance into more skilled positions with higher pay. Appendix L provides an example of a Career and Education Pathway for green energy occupations.

Employer Needs and Challenges

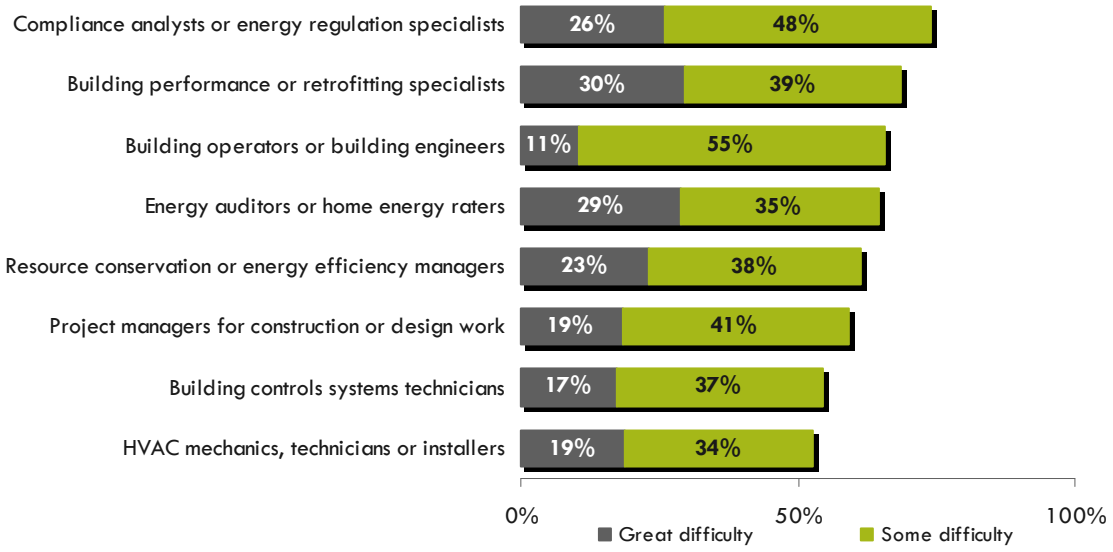
Utilities and energy efficiency service providers in California report a serious problem in attracting trained and experienced professional and technician personnel with expertise to perform energy efficiency work. The shortage of available and experienced personnel may be a key bottleneck constraining the ability of Energy Efficiency program administrators, service providers and facility owners to effectively ramp up their energy efficiency activities and efforts to meet growing demand.[19]

Hiring Difficulties

More than half of the employers responding to the survey indicated difficulty in hiring for all eight occupations studied as shown in Figure 6 below. The level of difficulty finding qualified applicants for the energy efficiency occupations only strengthens the overall demand for these positions.

- Close to 3 out 4 employers experience difficulty finding compliance analysts or energy regulation specialists.
- Three out of ten employers experience great difficulty finding qualified building performance or retrofitting specialists (30%) and energy auditors or home energy raters (29%).
- The majority of surveyed employers reported they experience great or some difficulty finding qualified applicants for all eight occupations.

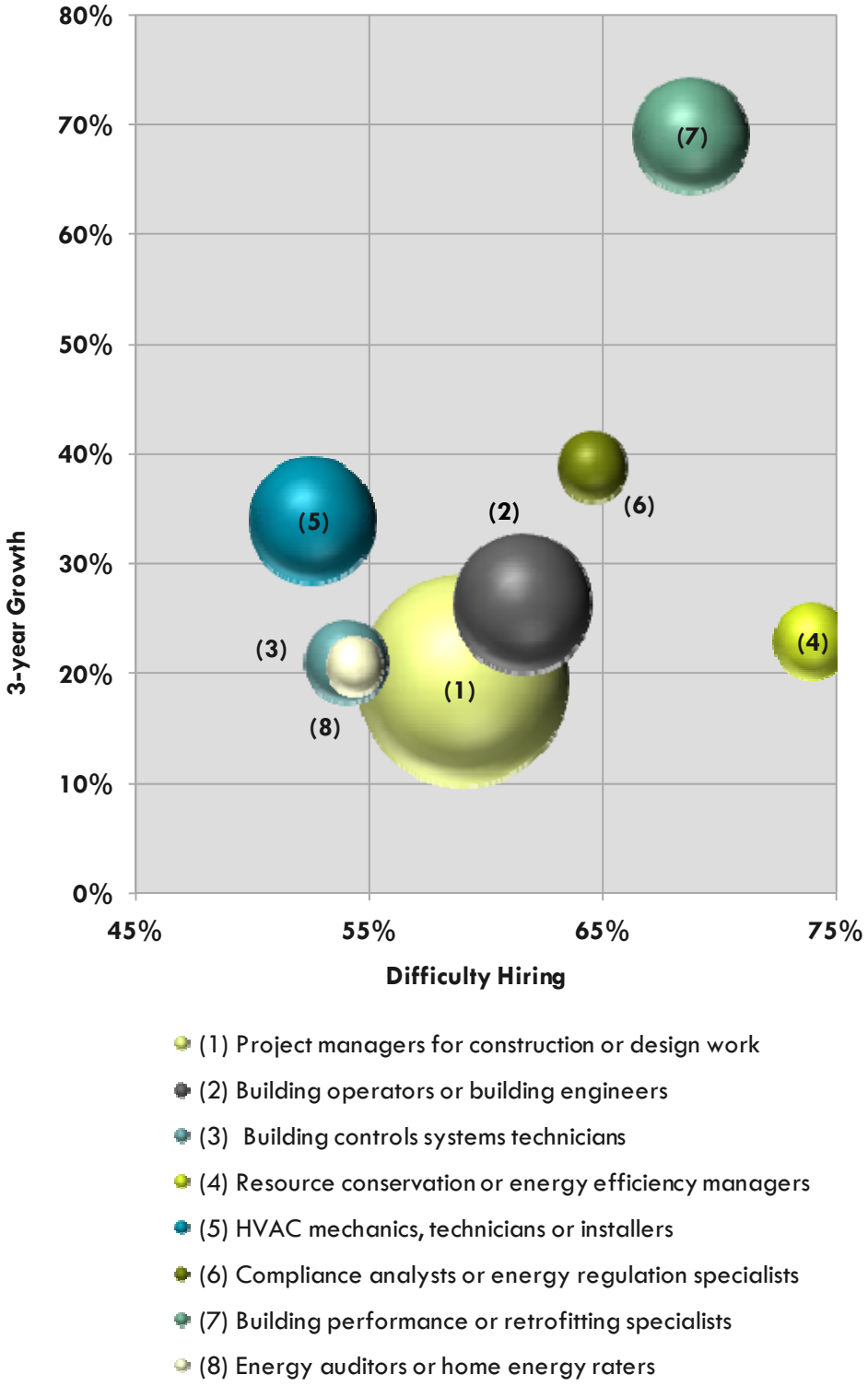
Figure 6: Difficulty in Hiring for Each Occupation



[18]"Energy Efficiency Services Industry: Commercial/Industrial Workforce Requirements," C. Goldman et al, 2009.
[19] Ibid.

In the bubble chart below, the relationship between difficulty in hiring and expected growth for each of the eight occupations is revealed. The area of each bubble represents the size of current employment for each occupation.

Figure 7: Difficulty in Hiring and Expected Growth for Each Occupation

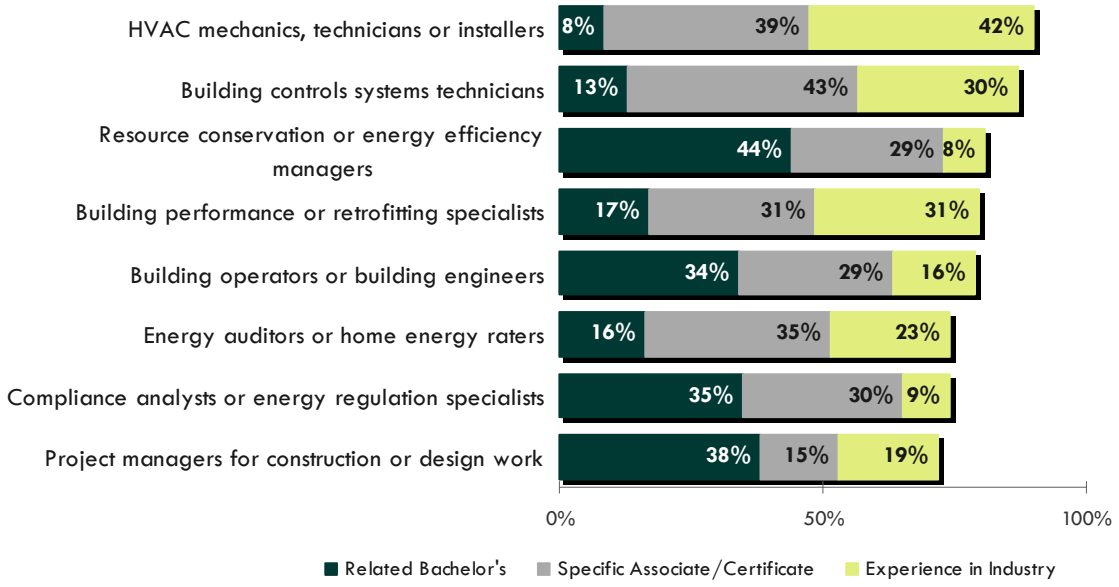


Education and Experience Preferences

When asked about their preferences for hiring candidates with different educational backgrounds, employers indicated that they are mixed on whether these occupations can be developed at a community college or if universities need to be part of the training mix. In particular:

- 43% of surveyed employers prefer building controls systems technicians have an associate degree or program certificate specific to the position.
- Four out of ten employers (44%) prefer resource conservation or energy efficiency managers to have a related bachelor's degree in a related field, but not necessarily specific to the occupation.
- Approximately four in ten employers surveyed prefer hands on experience in the industry for HVAC mechanics, technicians or installers (42%).

Figure 8: Education and Experience preferences for each of the eight occupations

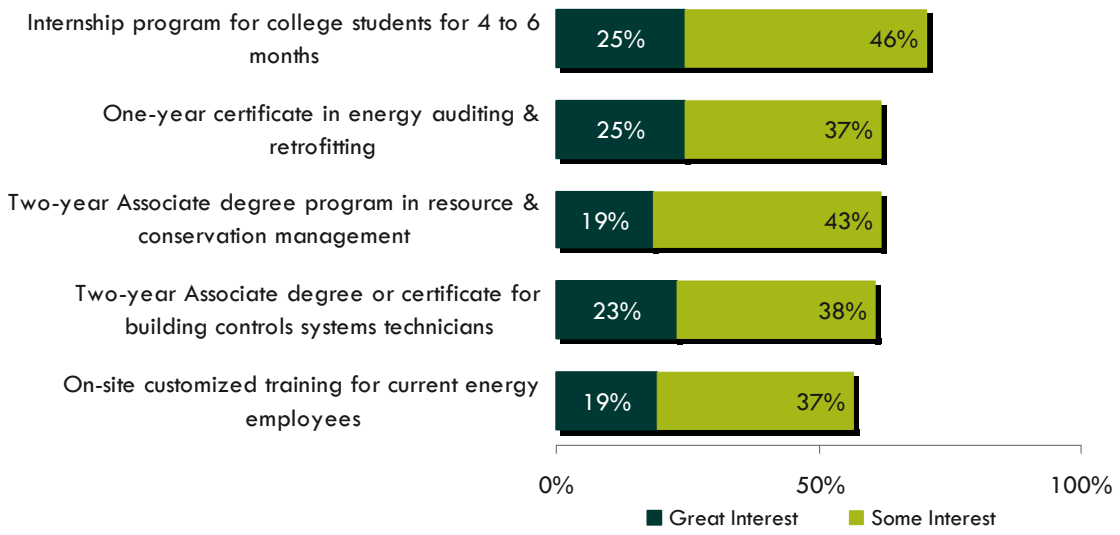


Workforce Development Opportunities

Employers expressed great interest in education and training programs that can be developed by community colleges. The employer responses are summarized in Figure 9 below:

- 71% of employers expressed great or some interest in an internship program for community college students.
- 62% of employers were interested in a one-year certificate program in energy auditing and retrofitting as well as a two-year Associate or certificate program for resource and conservation management.
- 23% of employers expressed great interest in a two-year Associate program for building controls systems technicians.
- More than half of employers surveyed expressed interest in on-site customized training for current energy employees.

Figure 9: Employer Interest in Community College Programs



College Response and Issues

The following section details the current and planned education and training programs offered by community colleges in the Los Angeles Area, to prepare the needed workforce identified in this report. Program challenges and issues were also analyzed.

College Program Selection Criteria

Only college programs or courses related to the eight energy efficiency occupations studied in this scan are included in this section. Programs that do not prepare students for these occupations were not included, such as: agriculture (horticulture, organic gardening), social science or earth science, and renewable energy (solar, wind, etc).

The task of identifying energy efficiency-related programs offered at Los Angeles Area Community Colleges was not easy, since potential courses, certificates and degrees are buried within a host of programs with differing titles. The initial search involved a review of the California Community College Chancellor's Office Inventory of Approved Programs.[20] The nine programs shown in Table 2 below are the most likely candidates related to the eight occupations studied, based on the Taxonomy of Programs (TOP) and their related codes.

Table 2: Potential Community College Programs Related to Energy Efficiency Occupations with TOP Code

Top Code	Inventory of Approved Programs
301.00	Environmental Science (Natural science, biology, geology) and mostly transfer degree oriented
302.00	Environmental Studies (Social science based, or biological/earth science based)
303.00	Environmental Technology (Hazardous materials control, environmental compliance, pollution control technology)

[20]https://misweb.cccco.edu/webproginv/prod/invmenu.htm

Top Code	Inventory of Approved Programs
945.00	Industrial Systems Technology and Maintenance (Facilities Maintenance Technology/Management)
946.00	Environmental Controls Technology (HVAC/Commercial HVAC)
946.10	Energy Systems Technology (Energy Management/ Energy Technology)
952.00	Construction Crafts Technology
957.00	Civil and Construction Management Technology
957.20	Construction Inspection

To further identify college programs, a survey was conducted to colleges in the Los Angeles area during April and May of 2009.

Los Angeles Region College Programs Related to Energy Efficiency Occupations
Seven colleges out of the 19 located in the Los Angeles Area were identified as offering/developing programs, certificates, or courses using the selection criteria (see bullets below). Appendix M contains a summary of the information obtained.

- Current course, certificate, or program offerings in energy efficiency related topics.
- Number of current enrollments versus capacity for the course/program (where available).
- Future energy efficiency courses/programs being planned.
- Contact information for the lead person at the college.

Current College Programs, Certificates, or Courses Related to Energy Efficiency Occupations
Table 3 on the following page shows the colleges that offer courses, certificates, and degree programs related to the eight occupations studied. The legend indicates the meaning of the letters/symbols in the chart.

Table 3: Current College Programs, Certificates, or Courses

Types of Education/ Training Program	X = Course C = Certificate Program(s) D = Degree Program(s)

COLLEGE	ENERGY EFFICIENCY OCCUPATIONS							
	Energy Auditor or Home Energy Rater	Building Performance or Retro-fitting Specialist	Compliance Analyst or Energy Regulation Specialist	Project Manager for Construction or Design Work	HVAC Mechanic, Technician or Installer	Resource Conservation or Energy Efficiency Manager	Building Controls Systems Technician	Building Operator or Building Engineer
	Level of Preparation For and Programs Related to Each Occupation							
Citrus College				C-X	C-X		D-C-X	
East Los Angeles College	X		X			X		
El Camino College	See Appendix M	See Appendix M	See Appendix M		D-C-X			
Glendale Community College	See Appendix M							
LA Trade Technical College	C-X	C-X			D-C-X	X	X	C-X
Mt. San Antonio College					D-C-X		D-C-X	
Pierce	See Appendix M							

Note:
Additional training providers offer programs in these areas but were not included since this study focused on community college training programs. However, some examples of additional program offerings include those at the East San Gabriel Valley ROP Training Center, West Valley Occupational Center, and East LA Skills Center. Many of these are partnering with the colleges.

Community Support and Resources

There are excellent opportunities for regional colleges and the California Community Colleges Environmental Training Centers to partner with employers, industry associations, workforce partners and community organizations to meet the workforce needs of employers who hire energy efficiency workers. It will take well developed partnerships to prepare the thousands of skilled workers that will be needed based on the survey results. The chart below summarizes some of the existing and potential partnerships that can be leveraged in Los Angeles:

Organization	Type of Organization	Contribution to Partnership
*Southern California Edison www.sce.com/ www.sce.com/b-sb/design-services/socal-lighting/	Employer	Industry Standards, Job Descriptions, Access to Employees for Training, Training Centers
*Building Owners and Managers Association, Los Angeles, www.bomagla.org	Industry Association	Access to Employers, Industry Standards, Job Descriptions
*US Green Building Council, Los Angeles, www.usgbc-la.org	Industry Association	Access to Employers, Industry Standards, Job Descriptions, LEED Certification Training
* California Building Performance Contractors Association (CBPCA) www.cbpca.org	Industry Association	Access to Employers, Industry Standards, Job Descriptions, Building Performance Certifications and Training for HERS raters
* International Facility Management Association, www.ifmala.org/	Industry Association	Access to Employers, Industry Standards, Job Descriptions, Training and Industry Certifications
* American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), Southern California, www.ashrae.org/	Industry Association	Access to Employers, Industry Standards, Job Descriptions
* California Commissioning Collaborative (CCC), www.cacx.org	Industry Association	Access to Employers, Industry Standards, Job Descriptions
* Building Commissioning Association, Southwest Chapter (BCA), www.bcxa.org	Industry Association	Access to Employers, Industry Standards, Job Descriptions, Industry Certification for Certified Commissioning Professional
Alliance to Save Energy (green campus program)/ Green Campus ase.org/section/program/greencampus/ (Project Manager, Renee Lafrenz)	Non-profit organization	Partnering with community colleges to provide paid internships to students in energy efficiency.
*Green West Alliance – LACCD http://www.greenwestalliance.com/	Consortium led by community college and includes employers and community based organizations	Green Jobs Training (renewables, energy efficiency, green building, sustainability), On-the-Job-Training, Social, Support and Job Placement
*Southern California Gas Company www.socalgas.com	Employer	Industry Standards, Job Descriptions, Access to Employees for Training, Training Centers

Organization	Type of Organization	Contribution to Partnership
Los Angeles Department of Water and Power, www.ladwp.com/	Employer	Industry Standards, Job Descriptions, Access to Employees for Training, Training Centers
International Brotherhood of Electrical Workers, www.ibew.org/	Union	Access to labor union, training, resources, partners
California Labor Federation AFL-CIO, Workforce and Economic Development Program www.wed-works.org trainey@calaborfed.org	Statewide Labor Workforce and Economic Development Program	Access to Labor Unions, Training Facilities through Union Locals
Weatherization Training resources. This website links to training that California Department of Community Services and Development (CSD) requires for affiliates. http://www.buildingmedia.com/eblast/index.html	Workforce Development	Online courses, Training in weatherization
Los Angeles Workforce Investment Boards, www.lacity.org/wib/	Workforce Development	Access to Job Seekers, Training Funds, Employment Resources
* Environmental Training Centers California Community Colleges www.EnvTraining.org	Economic & Workforce Development	Technical Assistance, Curriculum Development, Training on energy auditing, regulatory compliance, and energy management/conservation.
*Los Angeles Workforce Development Leaders Community College Consortium (LOWDL), www.laocrc.com/	Consortium of community colleges in Los Angeles and Orange County focused on Workforce Training and Career Technical Education.	Education and Training (AA Degrees, Certificates, Basic Skills), college partnerships
Centers of Excellence (Los Angeles) California Community Colleges www.coeccc.net/energy	Economic & Workforce Development	Environmental Scanning, Partnership Development
California Association of Building Energy Consultants (CABEC) www.cabec.org	Industry Association	Association, certification (certified energy analyst)
Los Angeles Economic Development Corporation, LAEDC Green Jobs Taskforce, www.laedc.org/	Economic Development	Advisory group guiding workforce development for green jobs
NECA IBEW Advanced Lighting, http://yoursolarsolution.org/training.php	Industry Association and Statewide Labor Workforce	Access to training and curriculum
Clean Tech Los Angeles http://www.cleantechlosangeles.org/	University partnership including UCLA, USC and Cal Tech focused on clean technology and research	Cutting edge research and clean technology
LA Sustainable Jobs Collaborative, www.lattc.edu/dept/lattc/REDI/Utility.html	Community College	Resources, training, employer partnerships

Organization	Type of Organization	Contribution to Partnership
Green Hive www.thegreenhive.com	Community Based Organization	Access to resources, information and Integrated forum/marketplace
Sustainable Works, www.sustainableworks.org	Non-profit organization	Training in sustainability available for colleges/individuals
Regional Economic Development Institute (REDI), http://college.lattc.edu/redi/	Community College	REDI is a career and technical education applied research, training, and technical assistance center based at Los Angeles Trade-Technical College.
Institute for Sustainability at CSUN, www.csun.edu/sustainability	University	Resources/information
California's GREEN Workforce Coalition, www.greenworkforce.info	Workforce Investment Board (South Bay Wib)	Consortium of employers, CBOs, community colleges focusing on green workforce issues
California Lighting Technology Center (also see Southern Cal Edison) PIER program www.energy.ca.gov http://cltc.ucdavis.edu/ Los Angeles Contact: Dee Patel dee.patel@build-laccd.org	University/partnership	CALCTP has been developed cooperatively by investor owned utilities, the California Lighting Technology Center, the California Energy Commission, the California Community College system, IBEW-NECA, municipal utilities, and manufacturers of advanced, high efficiency lighting and lighting control systems. Partnership provides Training for faculty/access to curriculum in advanced lighting
California Energy Commission www.energy.ca.gov/	Energy policy and planning agency	Resources/information
Weatherization Training Resource	http://www.buildingmedia.com/eblast/index.html	Resources/training/certifications for weatherization

* Existing Partnership

Conclusion and Recommendations

Employers in the Los Angeles energy efficiency sector are projected to increase employment substantially over the next three years, creating thousands of jobs for the eight occupations studied. The survey results indicate that the majority of employers are having difficulty hiring qualified candidates in all eight energy efficiency occupations.

A recent survey revealed that seven of the nineteen community colleges in Los Angeles are offering or developing courses, certificates, or programs related to energy efficiency occupations. There is room for additional course offerings, as well as course and program development that will not just introduce students to energy efficiency concepts, but will fully prepare them for employment in these occupations.

Presently, only one college indicated offering coursework to prepare individuals as project managers for construction or design work. Two colleges offer courses related to "resource conservation" or "energy efficiency managers"; this could be expanded upon. Only one college indicated offering courses or a certificate preparing individuals as "building operators or engineers" while the same holds true for "compliance analyst" (although one college indicated this program is in development). Several colleges indicated plans to offer energy auditor programs but only one is presently doing this. Also, while employers indicated the strongest growth for building performance retrofitting specialist, as well as indicating this as one of the occupations they were having the greatest challenge with finding qualified individuals, only one college responded that it is currently offering a program in this area, with one college stating it is in the process of developing a program.

The summary of the courses and programs that colleges currently offer and/or plan to develop is a good start, but more work needs to be done. A complete analysis is needed of the community colleges' ability to respond to the projected need for thousands of skilled workers over the next few years. This will require a better understanding of the number of students that actually complete the current courses, certificates, and degree programs at Los Angeles colleges, and a system for capturing the number that are fully prepared for employment.

Colleges have the opportunity to work closer with the unions and industry associations to integrate certifications into courses and programs. Examples of these can be found in Appendix K. Some colleges are doing this and we tried to capture some of these in the comments in Appendix M.

Colleges should be aware of the programs driving the weatherization movement. For example, the Energy Assistance Program historically offered through the major utilities and administered by the California Department of Community Services and Development (CSD). The CSD also administers the Low Income Housing Energy Assistance Program (LiHEAP). The new ARRA funding will fuel the need for workers and more trained teachers. Presently, the CSD has a training facility in San Bernardino.

Local colleges have begun to anticipate employer needs for energy efficiency workers. Three colleges stated that although they are not offering courses at this time, there are programs being developed with plans to offer these programs in 2010.

These new courses at regional colleges will add students to the "pipeline" as soon as 2010, and will continue to do so over the next several years. And with technical assistance and support from the California Community College Environmental Training Centers, curriculum and program

development, as well as faculty training, can be accelerated. There are several programs college faculty can access that will help them get up to speed with the new skills required to help students get into this industry. For example, faculty should be aware of the aforementioned weatherization training administered by the CSD, the California Advanced Lighting Controls Training Program (CALCTP), and the Environmental Technology Centers. See the "Community Support and Resources" section.

Internships are important and organizations such as the alliance for energy are ready to assist. Many benchmark programs can provide models.[21] Local consortia can assist faculty and deans make connections to workforce partners, non-profits, trade associations, and curriculum (Green West Alliance and South Bay's Green Jobs Council. Website information for all of these organizations can be found in the "Community Support and Resources" Section.

Due to existing college program infrastructure in departments such as Construction, Environmental Controls Technology, and Environmental Technology, colleges may be well positioned to build a pipeline of skilled workers, create and expand industry partnerships and provide additional professional development opportunities for college faculty who will teach energy efficiency courses.

Recommendations

1. Build a pipeline of skilled workers.

- Create, adapt, or expand energy efficiency courses and programs at the community colleges to meet the projected demand for the eight occupations studied.
- Partner with local consortia focused on bringing together partners to address these workforce needs. Examples include Trade Tech's REDI, Sustainable Jobs Collaborative, The South Bay WIB's Green Jobs Taskforce and the LACCD's Green West Alliance. See the "Community Support and Resources" Section.
- Access available training and curriculum such as PIER's Advanced Lighting and the CSD weatherization training.
- Work with the EWD Environmental Training Centers and Advanced Transportation Technologies and Energy Centers to develop model curriculum, aligned with industry standards and certifications that can be shared regionally. Utilize survey results on critical skills required by employers as a starting point.
- Raise awareness of college and secondary school career counselors about energy efficiency occupations.
- Promote energy efficiency courses and programs to unemployed/underemployed returning students who have experience in construction trades, engineering or business.
- Work with College English Departments and/or EWD Workplace Learning Resource Centers to integrate Writing and Communication Skills into the curriculum.

[21] For more information, download the report "A California Success Story: Sheet Metal Apprenticeship's Contribution to Energy Efficiency," available on the COE website at www.coeccc.net/energy.

2. **Create and expand industry partnerships.**
   - Collaborate regionally on grants to fund program development, partnerships with industry and equipment needed to expand programs on energy efficiency.
   - Establish regional advisory boards to assist multiple, adjacent colleges, to identify in an on-going way, the employment skills and education requirements of employers.
   - Build off of the industry partnerships developed by the Centers of Excellence for this study, to expand outreach to employers and identify potential adjunct faculty.
   - Identify employers who want to partner with colleges to develop student internship programs; 71 percent of employers' surveyed indicated interest in developing such programs.
3. **Provide on-going professional development for college faculty.**
   - Faculty and Deans can access resources available to help faculty. Examples above such as PIER and weatherization "train the trainer" could be utilized.
   - Work with the Environmental Training Centers and Advanced Transportation Technologies and Energy Centers for technical assistance and training resources for faculty.
   - Identify employers who can develop faculty internship programs and/or assist colleges with equipment donations for program development.

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Appendix A: How to Utilize this Report

This report is designed to provide current industry data to:

- Define potential strategic opportunities relative to an industry's emerging trends and workforce needs;
- Influence and inform local college program planning and resource development;
- Promote a future-oriented and market responsive way of thinking among stakeholders; and,
- Assist faculty, Economic Development and CTE administrators, and Community and Contract Education programs in connecting with industry partners.

The information in this report has been validated by employers and also includes a listing of what programs are already being offered by colleges to address those workforce needs. In some instances, the labor market information and industry validation will suggest that colleges might not want to begin or add programs, thereby avoiding needless replication and low enrollments.

About the Centers of Excellence
The Centers of Excellence (COE), in partnership with business and industry, deliver regional workforce research customized for community college decision making and resource development. This information has proven valuable to colleges in beginning, revising, or updating economic development and Career Technical Education (CTE) programs, strengthening grant applications, assisting in the accreditation process, and in supporting strategic planning efforts.

The Centers of Excellence Initiative is funded in part by the Chancellor's Office, California Community Colleges, Economic and Workforce Development Program. The total grant amount (grant number 08-305-019 for $205,000) represents funding for multiple projects and written reports through the Center of Excellence. The Centers aspire to be the premier source of regional economic and workforce information and insight for California's community colleges.

More information about the Centers of Excellence is available at **www.coeccc.net**.

Important Disclaimer
All representations included in this report have been produced from primary research and/or 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; however, neither the Centers of Excellence, COE host District, nor California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon components or recommendations contained in this study.

Appendix B: Defining the Industries for Energy Efficiency Occupations Research

One of the central challenges in getting feedback from employers in emerging occupations is understanding and identifying where the employers are captured under current industry classifications that are largely unprepared for these emerging occupations. In looking at emerging energy efficiency occupations, this problem is particularly relevant. Although most of the secondary research examines the different job titles and occupations that are impacted by the new focus on energy efficiency, there is much less discussion about which industries employ these occupations.

For this study, the Centers of Excellence focused on the industries with the greatest concentration of energy efficiency occupational opportunities. The following three industries were selected using this criteria in our search for energy efficiency employers:

1. **Utilities and Energy Resource Management** includes employers in public & private Utilities & Agencies responsible for Consulting and Planning for Energy Conservation and Resource Management (NAICS definition: 221 - Utilities, 54135 – Environmental consulting, 924 Administration of Environmental Programs (Public Sector), 92613 Administration & Regulation of Electricity, Gas, and other Utilities (Public Sector) This would include those occupations that are engaged in assessment and planning for energy efficiency. This industry would largely account for those positions in the public sector as well as those consultants that are guiding energy efficiency planning.

2. **Design and or Construction of Buildings** (NAICS definition: 23 – Construction (Residential, Commercial or Industrial), 5413 – Architecture, Engineering and Design Services). This includes those occupations that are focused on building and designing more energy efficient homes, buildings and facilities. From a sector perspective we included employers who are focused on residential, commercial and industrial building development.

3. **Facility/Building Operations and Maintenance** (NAICS definition: 8113 Commercial & Industrial Equipment Repair and Maintenance, 53131 Real Estate Property Managers & Large Employers with Large Facilities) This includes those employers that hire individuals who can repair and maintain the new energy efficiency systems that are used in new and retrofitted buildings and facilities. This would include those individuals who are operating and maintaining new HVAC systems.

In many ways, the energy efficiency sector does not constitute an independent industry since the main activities, rather than being new efforts, often consist of a shift from standard practice to a more energy-efficient approach to design, building construction, and building operation (Goldman, 2008). At the same time, over the past 25 years, there have emerged new occupations, with new skill-sets that are not addressed within the traditional design, construction, and building operations professions and trades. Examples are energy auditing, resource conservation/energy efficiency manager, and building controls systems technician. (Goldman, LBNL, 2008; Centers of Excellence, 2009).

Appendix C: Study Methodology and Sample Data

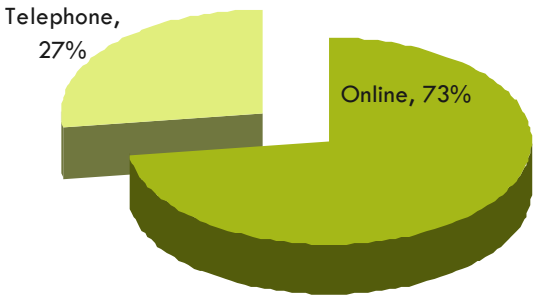
About the Survey

The Centers of Excellence in multiple regions, in partnership with BW Research, Inc., collected workforce data on energy efficiency occupations through an in-depth survey. The survey was conducted online and by telephone during the months of March, April, and May of 2009.

For Los Angeles, 73% of the survey responses were submitted online; 27% were conducted by telephone.

About the Respondents

One hundred eighty three (183) employers, representing a combined workforce of more than 20,000 Los Angeles Region based employees, responded to the survey. The respondent's industry, size of firm, and regional location were recorded where possible. Caution should be used in generalizing results to the entire population of employers to the degree that the sample may differ from the universe.



These respondents came from carefully selected industries targeted as containing energy efficiency firms or energy efficiency-related firms. Los Angeles Region employers in the following North American Industrial Classification sectors were asked to participate in the survey:

NAICS .....Title

221 .....Utilities

236 .....Construction of Buildings

238160.....Roofing Contractors

238210.....Electrical Contractors

238220.....Plumbing, Heating, and Air Conditioning Contractors

238310.....Building Finishing Contractors

238350.....Finish Carpentry Contractors

238990.....All Other Specialty Trade Contractors

531311.....Residential Property Managers

531312.....Nonresidential Property Managers

541310.....Architectural Services

NAICS .....Title

541320 ..... Landscape Architectural Services

541330 ..... Engineering Services

541340 ..... Drafting Services

541350 ..... Building Inspection Services

811310 ..... Commercial and Industrial Machinery and Equipment Repair and Maintenance

921 ..... Cities and Counties

924 ..... Administration of Environmental Programs

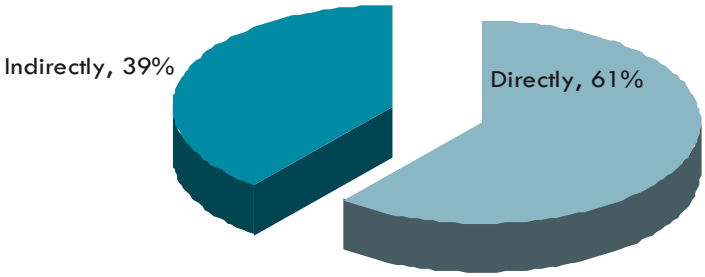
926130 ..... Regulation and Administration of Communications and Utilities

Employers were asked a series of questions to verify their firm met the study's energy efficiency definition:

> Energy efficiency work could include, but is not limited to: energy audits, assessments, installations, maintenance, operations, designing and/or building, and consulting.

Respondents were asked if their firm was involved in these kinds of energy efficiency efforts, either directly as a primary part of their business or indirectly in installing products or providing services that are energy efficient and reduce consumption.

61% percent of respondents identified their work as directly involved in energy efficiency, as a primary part of their business, while 39% responded that their firm was indirectly involved in energy efficiency work.



The following table details the current employment and growth expectations from the survey sample of employers.

Table 3: Sample 2008 Employment and Projected 12-month and 3-Year Growth for Each Occupation

Energy Efficiency Occupations	2009 Employment Estimate	12-month Projected Growth	Growth Rate	3-year Projected Growth	Growth Rate
Project managers for construction or design	919	51	6%	178	19%
Building operators or building engineers	323	1	0%	93	29%
HVAC mechanics, technicians or installers	317	32	10%	108	34%
Resource conservation or energy efficiency managers	197	15	8%	52	26%
Building performance or retrofitting specialists	144	33	23%	99	69%
Energy auditors or home energy raters	134	12	9%	52	39%
Building controls systems technician	123	4	3%	25	21%
Compliance analyst or energy regulation specialists	104	8	8%	24	23%
Total, All Occupations	**2,258**	**157**		**630**	

Study Methodology: Universe of Firms

To estimate the total number of energy efficiency firms in the Los Angeles Region, several industry databases were utilized.

- Using the NAICS codes already identified for the study as having the most relevance for energy efficiency work, business listings were acquired from InfoUSA.
- A database of businesses was also developed by the Centers of Excellence using more conventional research methods, including online searches and industry contacts.

- Additional groups of energy efficiency firms were identified through partnerships with industry associations (see below for list) who provided invaluable information about their organizations and members.
    - United States Green Building Council (USGBC) – Los Angeles Chapter
    - California Association of Building Performance Contractors (CABPC)
    - Building Owners and Managers Association (BOMA) – Los Angeles County
    - American Society of Heating, Refrigerating, and Air- Conditioning Engineers (ASHRAE), Southern California
    - California Commissioning Collaborative
    - Building Commissioning Association

These inputs were analyzed and adjusted for relevance to the energy efficiency field, duplication of records, and firms that may not be located in Los Angeles or no longer doing business. The total number for each database was then combined into the universe of firms estimate (2,904).

Study Methodology: Occupational Employment

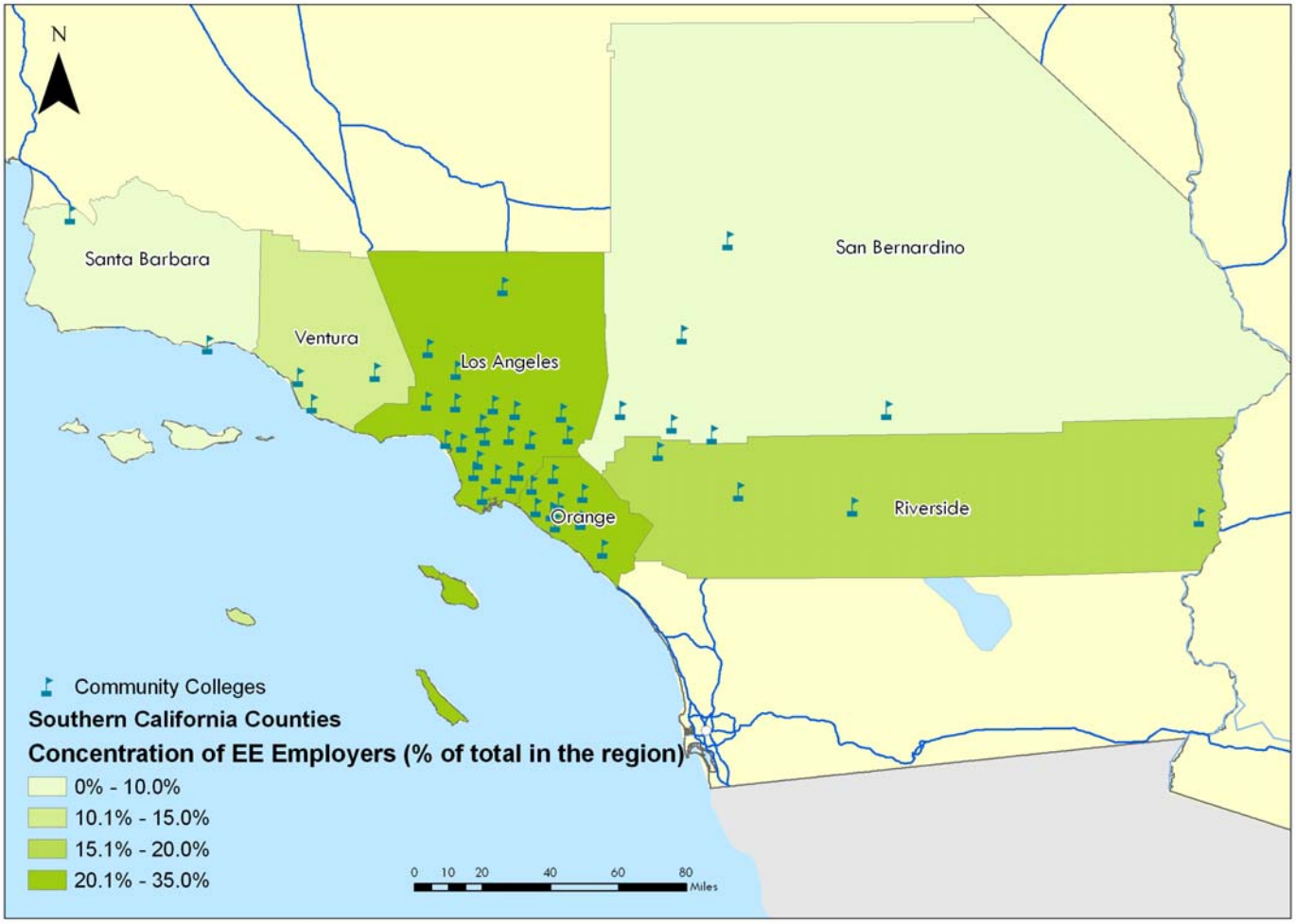
Eight energy efficiency occupations were identified as high-growth and aligned with community college education programs. The combined employment in the Los Angeles Area for the eight occupations totals at least 1600 jobs (known employment from survey respondents) and could be as high as 20,730 jobs. The latter figure is an extrapolated estimate of employment, based on survey responses and an estimate of the total number of energy efficiency-related firms in Los Angeles. Margin of error for the 183 survey respondents (out of the universe of 2904) is 7.01 percent.

To arrive at the estimates of occupational employment currently, in 12 months, and in three years, survey data for the sample was extrapolated to approximate the employment for the universe of firms.

- In the survey, respondents were asked how many individuals in each occupation were currently employed in permanent positions, full or part-time. This resulted in estimates for the distribution of employment across the sample, mean employment, and sample total employment.
- Respondents were then asked if their organization employs individuals in each of the 8 study occupations. These responses informed the percent of the sample firms employing each occupation.
- Employers were asked how many more or less of each occupation they expect to have at their location in 12 months and in three years. These responses resulted in occupational growth rates for both periods of time.

Using the percent of firms employing each occupation, mean employment from the sample, and the universe of firms estimate (see previous page), the current employment was estimated for each occupation. A similar method was used to calculate the approximate growth in the next 12 months and in three years. The current employment estimate was combined with the percent of firms employing each occupation, the occupational growth rate(s), and the universe of firms estimate to produce the projected employment total(s).

Appendix D: Concentration of Energy Efficiency Employers in Southern California



Location of Survey Respondents	*Percent of Sample*
Los Angeles	32%
Orange	24%
Riverside	16%
Ventura	11%
Santa Barbara	9%
San Bernardino	8%
Total	100%

Note: This map utilizes sample information only and does not represent the concentration of the universe of employers. 590 total survey respondents are shown here for the Southern California counties.

Appendix E: Energy Efficiency Investments for U.S. in American Recovery and Reinvestment Act of 2009 (ARRA)

Energy Efficiency Provision	Amount in ARRA
Weatherize homes of up to 1 million low-income residents (1), (4)	$5 billion
Converting Federal Buildings to High-Performance Green Buildings	$4.5 billion
Energy Efficiency and Conservation Block Grants to States	$3.2 billion
State Energy Program (2)	$3.1 billion
Tax credits for retrofitting existing homes (30% credit with a cap of $1,500)	$4.3 billion
Veterans Medical Facilities (non-recurring maintenance including energy projects)	$1 billion
Public Housing Capital Fund (for improvement of energy efficiency and other capital and management activities)	$4 billion
Energy and Green Retrofit investments in Elderly, Disabled and Section 8 Assisted Housing	$250 million
Electricity delivery and energy reliability activities to modernize the electric grid (Smart Grid Technology) (3)	$4.5 billion, including $100 million provided for worker training activities.
Qualified Energy Conservation Bonds (QECBs)[22]	$2.4 billion
Totals	**$32.35 billion**

Sources: news.cnet.com; San Francisco Chronicle, February 12, 2009, "Energy and Efficiency intact in stimulus bill" by Martin LaMonica; greenforall.org; Center for American Progress.

Notes

1. Household eligibility is increased from 150 to 200 percent of the federal poverty income level and the per home maximum allowance is increased from $ 2,500 to $ 6,500. Low-income families will save an average of $350 annually in reduced energy costs.
2. Only to states that update their residential building codes, commercial building codes, create plans for enforcing building codes, and update regulations on utility energy efficiency programs.
3. To include demand response equipment, enhance security and reliability of the energy infrastructure, energy storage research, development, demonstration and deployment, and facilitate recovery from disruptions to the energy supply,
4. Green Jobs Act: $500 million for training programs to build the green workforce is being funded by the Act.

[22] Build American Bonds (BABs) are another option. ARRA created these bonds to stimulate the economy by assisting state and local governments in financing capital projects at lower borrowing costs. This debt instrument can be used for clean energy and energy efficiency projects (www.energycenter.org).

Appendix F: California's Key Legislative and Policy Initiatives on Energy Efficiency

AB 32: Assembly Bill 32 (AB32): The California Global Warming Solutions Act of 2006 mandates that California must reduce its green house emissions to 1990 levels by 2020. The bill sets a goal of approximately an 11% reduction from current emissions levels and nearly a 30% reduction from projected business-as-usual levels in 2020.

The California Air Resources Board's (CARB) Draft Scoping Plan for AB 32: Implementation states that "California will need to greatly expand on energy efficiency efforts to meet our greenhouse gas emission reduction goals." CARB's Draft Scoping Plan identifies energy efficiency as the second largest component of the State's overall emissions reduction program. (source: CPUC Energy Efficiency Strategic Plan)

Energy Efficiency and California Block Grants (AB 2176): In 2008, AB 2176 was amended to require the California Energy Commission (CEC) to administer funds allocated to the state from the federal Energy Independence and Security Act of 2007 (Energy Act) for energy efficiency projects. The bill stipulates that 60% of Energy Act funds be used to provide grants to cities and counties with relatively small populations, and the remaining 40% to be used to provide grants to entities eligible under the federal act.

The Warren-Alquist State Energy Resources Conservation and Development Act (AB 2309): This 2008 law requires the California Public Utilities Commission (CPUC) to authorize the investor-owned utilities (IOUs) to provide energy efficiency audits for owner-occupied residential buildings built before January 1, 2006 upon owner request and make recommendations to the owner on cost-effective energy saving measures.

Energy Efficiency and Water Programs (AB 2404): This law, enacted in 2008, requires the CPUC to report to the Legislature the outcome of a pilot project that was established by the CPUC to determine whether water conservation projects are cost-effective means to saving energy, and make recommendations as to whether the utilities could achieve cost-effective energy efficiency improvements via water conservation projects.

California Public Utilities Commission Long Term Energy Efficiency Strategic Plan,(2008): Sets forth a roadmap for energy efficiency in California through the year 2020 and beyond. At the heart of the Plan are four bold strategies for achieving the aggressive goals outlined in the document. These goals are outlined below:

California's Big Bold Energy Efficiency Strategies:

- All new residential construction in California will be zero net energy by 2020.
- All new commercial construction in California will be zero net energy by 2030.
- Heating, Ventilation and Air Conditioning (HVAC) will be transformed to ensure that its energy performance is optimal for California's climate.
- All eligible low-income customers will be given the opportunity to participate in the low income energy efficiency (LIEE) program by 2020.

Energy Action Plan II (2005): Established "loading order" for energy use in state, making energy efficiency the top priority energy resource.

State Building Codes- Title 24: California's Title 24 Building Energy Efficiency Standards regulates building sector policies (new and existing) in the areas of lighting and HVAC systems in commercial, government and residential buildings, as well as appliances used within those buildings. Title 24 which is updated every 3 years will continue to have a major impact on the growth of energy efficiency occupations, as the standards continue to become stricter and require higher levels of energy efficiency in the future.

California has adopted the first statewide green building code which will promote green building practices and energy efficient technologies. The provisions of the California Building Code will apply to every building in California. The new standards become guidelines starting July 2009 and a grace period will render the new code optional until 2010 so that industry and enforcement agencies have time to prepare for the new building standards.

Governor's Green Building Executive Order S-20-04: (2004) Directed state agencies to make state-owned facilities 20% more energy efficient by 2015.

Appendix G: Utilities Energy Efficiency Programs

Below is a sampling of energy efficiency incentive programs and rebates offered by the utilities companies. Many more can be found on their website.

Pacific Gas and Electric (PG&E)

Program	What it Provides	Website for Information
Residential Lighting Residential HVAC Residential Appliance 1-2-3 Cashback	Incentives and information for lighting equipment, cooling systems, and rebates for energy-efficient appliances.	http://www.pge.com/myhome/ http://www.pge.com/myhome/saveenergymoney/rebates/index.shtml
Commercial/Industrial Incentives & Rebates Real Time Metering Load Management C/I Efficiency Services	Efficiency program for commercial and industrial customers	http://www.pge.com/mybusiness/ http://www.pge.com/mybusiness/energysavingsrebates/
Pacific Energy Center (San Francisco) Energy Training Center (Stockton)	Education center that provides technical information, design tools, and advice for energy efficiency.	http://www.pge.com/mybusiness/edusafety/training/pec http://www.pge.com/mybusiness/edusafety/training/stockton
Demand Response Programs	A variety of programs for small and larger business customers.	http://www.pge.com/mybusiness/energysavingsrebates/demandresponse/
Incentives by Industry	Details on efficiency incentives for specific industries.	http://www.pge.com/mybusiness/energysavingsrebates/incentivesbyindustry/
Agricultural and Food Processing	Incentive programs and services for agricultural customers.	http://www.pge.com/mybusiness/energysavingsrebates/incentivesbyindustry/agriculture/

Southern California Edison (SCE) Energy Efficiency Programs

Program	What it Provides	Website for Information
Express Efficiency	Generous cash rebates for business customers toward the purchase and installation of qualified equipment that improves their facility's energy efficiency.	http://www.sce.com/ExpressEfficiency/express-efficiency
Non-Residential Energy Audit Program	Free assistance for small to medium business customers to assess their energy usage and energy cost, and available cash incentives.	http://www.sce.com/b-rs/small-medium/audit/non-residential-audit.htm
Direct Install Program	Free energy efficient products for small businesses, and includes free installation and long-term energy savings with no underlying costs.	http://www.sce.com/b-rs/small-medium/direct-install/direct-install.htm
Heating, Ventilation, and Air Conditioning	Pre-qualifies contractors who can improve the reliability and efficiency of customer A/C investment by providing maintenance services that will lengthen the life of their equipment and prevent the cost of unplanned downtime.	http://www.sce.com/b-rs/commercial/air-conditioning-quality.htm
Retro-Commissioning	Save commercial customers 5-20% on their energy bills. Experienced engineers work closely with customers and their staff to find cost-effective ways to optimize their building's performance, lower electricity bills and improve occupant comfort.	http://www.sce.com/b-rs/small-medium/

Program	What it Provides	Website for Information
Savings By Design	Information and analysis tailored to the needs of customer projects to help them design the most efficient building possible. Helps offset the costs of energy-efficient buildings. Reward designers who meet ambitious energy efficiency targets.	http://www.sce.com/b-rs/bb/savings-by-design.htm
Community Partnerships	Dynamism and a keen awareness of energy efficiency best practices (i.e., enhancing the design, implementation and evaluation of energy saving technologies). Also execute substantive and vital business and community projects that save energy, money and the environment.	http://www.sce.com/business/energy-solutions/energy-efficiency-partnerships.htm
Energy Efficient Evaporative Cooling Rebate	$600 for an energy efficient evaporative cooling system.	http://www.sce.com/residential/rebates-savings/heating-cooling/evaporative-cooling.htm
ENERGY STAR® Qualified Room Air Conditioner Rebate	$50 back on an ENERGY STAR® qualified room air conditioner! This rebate is part of the Home Energy Efficiency Rebate Program (HEER).	http://www.sce.com/residential/rebates-savings/heating-cooling/energy-star-air-conditioners.htm

Southern California Gas Energy Efficiency Programs

Program	What it Provides	Website for Information
Home Energy Efficiency Survey	An Energy Efficiency Survey to help customers identify where they can reduce energy consumption and lower their energy bills.	http://www.socalgas.com/residential/energysurvey/index.html
Residential Rebates	Rebates for making energy efficient home improvements or upgrading to qualified, high-efficiency appliances.	http://www.socalgas.com/rebates/residential/
Multifamily Rebates	Owners and property managers of apartments and mobile home parks can implement a range of energy efficiency improvements to lower bills and increase comfort.	http://www.socalgas.com/rebates/multifamily/
Home Energy & Water Efficiency Kit Request	Customers can save energy by signing up for a no cost energy kit.	http://www.socalgas.com/residential/EE_kit_promo/index.html
Conservation Tips	Energy and money saving tips for one's home.	http://www.socalgas.com/residential/conservation/index.html
Energy Efficiency Contractor Programs	Energy-saving programs offered by energy efficiency contractors.	http://www.socalgas.com/energyefficiency/contractors_all.html
Home Energy Upgrade Financing	$2,500 to $20,000 to purchase and install energy-efficient upgrades.	http://www.socalgas.com/rebates/residential/financingtaxcredits.html
Savings By Design	Provides energy analysis and financial incentives of up to $150,000 for commercial customers and $500,000 for industrial customers considering a new process line, new facility, or new equipment.	http://www.socalgas.com/business/sbd/index.html
Business Rebates	Multiple rebate and incentive opportunities for businesses can be found here.	http://www.socalgas.com/business/efficiency/
Energy Resource Center	Resource center which offer certification and training programs.	http://www.socalgas.com/business/resourceCenter/ercHome.html

Department of Water and Power (DWP) Energy Efficiency Programs

Program	What it Provides	Website for Information
Residential Guide to Energy and Water Efficiency	A guide to help customers identify where they can reduce energy consumption.	http://www.ladwp.com/ladwp/cms/ladwp004487.jsp
Business Guide to Energy and Water Efficiency	A guide for businesses that are interested in saving dollars.	http://www.ladwp.com/ladwp/cms/ladwp000580.jsp
Buyer's Guide to Efficient Appliances	A guide to help consumers save you money and help our environment.	http://www.ladwp.com/ladwp/cms/ladwp002264.jsp
Consumer Rebate Program (CRP)	Rebates for refrigerators, pool pumps, dual pane windows, air conditioners, and clothes washers.	http://www.ladwp.com/ladwp/cms/ladwp000478.jsp
Green Power Program	Enables customers to support renewable energy by paying a small premium on their bill.	http://www.ladwp.com/ladwp/cms/ladwp001924.jsp
Solar Incentive Program	Offers incentives for customers that purchase and install their own solar power systems	http://www.ladwp.com/ladwp/cms/ladwp009749.jsp http://www.ladwp.com/ladwp/cms/ladwp000787.jsp
Energy Conservation Tips	Offers ways to keep cool and use energy efficiently.	http://www.ladwp.com/ladwp/cms/ladwp008434.jsp
Home Energy Saver Tool	Tool available online.	http://www.ladwp.com/ladwp/cms/ladwp000605.jsp
Commercial Lighting Efficiency Offer (CLEO)	Offers rebates for energy efficiency lighting.	http://www.ladwp.com/ladwp/cms/ladwp000572.jsp
Chiller Efficiency Program	Offers rebates for purchasing energy efficient chillers.	http://www.ladwp.com/ladwp/cms/ladwp001108.jsp
Commercial Solar Power Incentive	Offers incentives for customers that purchase and install their own solar power systems.	http://www.ladwp.com/ladwp/cms/ladwp004196.jsp
New Construction Incentive Program	Offers incentives for owners and developers wishing to build new energy-efficient buildings.	http://www.ladwp.com/ladwp/cms/ladwp008821.jsp
Non-Residential Custom Performance Program (CPP)	Offers incentives for the installation of energy saving measures, equipment or systems that exceed Title 24 or minimum industry standards. Incentives are based on estimation software that determines the energy savings for each project..	http://www.ladwp.com/ladwp/cms/ladwp008836.jsp

Appendix H: Los Angeles Energy Efficiency Research Institutions

Clean Tech Los Angeles

The City of Los Angeles recently established a working partnership to promote Los Angeles as the global capital of clean/green technology. The plan includes a large area along the Los Angeles River that will be redeveloped to be the "Clean Tech Corridor". Three universities are involved as well as NASA's Jet Propulsion Laboratory (JPL), the Department of Water and Power (DWP) and the Community Redevelopment Agency (CRA). Each of the three research universities has recently been awarded an Energy Frontier Research Center by the Department of Energy.

Caltech University – JPL and Caltech will apply their extensive expertise in climate change science, remote sensing, environmental engineering and systems design to assist the city and the DWP in developing, maturing and deploying innovative technologies to improve energy efficiency, increase the use of renewable energy sources, conserve water and reduce greenhouse gas emissions.

University of California at Los Angeles (UCLA) – The Institute of the Environment's mission is to generate knowledge and provide solutions for regional and global environmental problems and to educate the next generation of professional leadership committed to the health of our planet. It employs innovative, cross-disciplinary approaches to address critical environmental challenges - including those related to climate change, water quality, air pollution, biodiversity, and sustainability.

University of Southern California (USC) Energy Institute – The Energy Institute's mission at USC is to become the premier center for cross-disciplinary research that generates both short and long-range fuel and energy solutions.

Plans are also underway for the three universities to partner on an "Energy Innovation Hub" proposal. The Universities are working on additional projects in wind and energy efficiency. More information on Clean Tech Los Angeles can be found at www.cleantechlosangeles.org.

Appendix I: Key Findings from "Energy Efficiency, Innovation and Job Creation in California," October 2008

A summary of the key findings of a recent study conducted by the Center for Energy, Resources and Economic Sustainability (CERES) at UC Berkeley is below. The 2008 study illustrates why investing in energy efficiency has already paid big economic and job creation dividends and has the potential to pay even larger dividends in the future.

California's Job Creation through Energy Efficiency: The Past

- Energy efficiency measures have, enabled California households to redirect their expenditures toward other goods and services, creating about 1.5 million (full-time equivalent) jobs with a total payroll of $45 billion, driven by well-documented household energy savings of $56 billion from 1972-2006.
- As a result of energy efficiency, California reduced its energy import dependence and directed a greater percentage of its consumption to in-state, employment-intensive goods and services, whose supply chains also largely reside within the state, creating a "multiplier" effect of job generation.
- The same efficiency measures resulted in slower (but still positive) growth in energy supply chains, including oil, gas, and electric power. For every new job foregone in these sectors, however, more than 50 new jobs have been created across the state's diverse economy. (Note: This comparison is for net combined job creation, meaning we count both cumulative effects of both job creation and job losses.)

California's Job Creation through Energy Efficiency: The Future

- By including the potential for innovation, we find that the proposed package of policies in the California Air Resources Board (CARB) Draft Scoping Plan achieves 100 percent of the GHG emissions reduction targets as mandated by AB 32, while increasing the Gross State Product (GSP) by about $76 billion, increasing real household incomes by up to $48 billion and creating as many as 403,000 new efficiency and climate action driven jobs.
- The economic benefits of energy efficiency innovation have a compounding effect. The first 1.4 percent of annual efficiency gain produced about 181,000 additional jobs, while an additional one percent yielded 222,000 more. It is reasonable to assume that the marginal efficiency gains will be more costly, but they have more intensive economic growth benefits. (Note: Job creation in the second case is larger because we assume energy efficiency applies to electricity use by all sectors, while the 1.4 percent efficiency improvement in the baseline applies only to household electricity demand.)
- Existing energy efficiency programs and proposed state climate policies will continue the structural shift in California's economy from carbon intensive industries to more job intensive industries. While job growth continues to be positive in the carbon fuel supply chain, it is less than it would be without implementation of these policies.
- A lower carbon future for California is a more prosperous and sustainable future.

Appendix J: Occupational Profiles

Occupation: HVAC Mechanics, Technicians or Installers

HVAC mechanics, technicians or installers install, repair and maintain heating, ventilation, air conditioning and refrigeration systems.The following list describes in more detail some of the tasks that may be required of HVAC mechanics, technicians or installers:[23]

- Technicians must be able to maintain, diagnose, and correct problems with heating, air conditioning, and refrigeration systems.
- Some technicians may sell service contracts to their clients to provide for regular maintenance of the heating and cooling systems.
- Technicians follow blueprints or other specifications to install oil, gas, electric, solid-fuel, and multiple-fuel heating systems and air conditioning systems.
- When air conditioning and refrigeration technicians service equipment, the refrigerants used are carefully conserved, recovered, and recycled as the release of these refrigerants can be harmful to the environment.

Occupational Outlook: Concern for the environment has prompted the development of new energy-saving heating and air conditioning systems. An emphasis on better energy management should lead to the replacement of older systems and the installation of newer more efficient systems in existing homes and buildings. Installation of new air conditioning and heating systems in existing buildings also continues during construction slumps, as individuals and businesses adopt more energy-efficient equipment to cut utility bills. HVAC technicians are expected to experience significant growth in the immediate future.

- In Los Angeles, employment in this occupation is projected to increase ten percent over the next 12 months (310 new jobs).
- Over the next three years, employment is projected to increase 34 percent or by 1,020 jobs.
- In addition to increased demand for HVAC technicians, 53 percent of employers surveyed experience difficulty finding qualified applicants for these positions.

Career Pathways: Because of the increasing sophistication of heating, air conditioning, and refrigeration systems, employers may prefer to hire those who have completed technical school training or a formal apprenticeship.

Lateral occupation: In addition to installation, some sheet metal workers specialize in testing, balancing, adjusting, and servicing existing air conditioning and ventilation systems to make sure they are functioning properly and to improve their energy efficiency. Properly installed duct systems as a key component to heating, ventilation, and air conditioning (HVAC) systems; sometimes duct installers are called HVAC technicians. A growing activity for **sheet metal workers** is building commissioning, which is a complete mechanical inspection of a building's HVAC, water, and lighting systems.[24]

[23] Occupational Outlook Handbook, 2008-2009, "Heating, Air-Conditioning, and Refrigeration Mechanics and Installers," www.bls.gov/oco
[24]Occupational Outlook Handbook, 2008-2009, "Sheet Metal Workers," www.bls.gov/oco

Advancement usually takes the form of higher wages. Some technicians may advance to positions as supervisor or service manager. Others may move into sales and marketing or become building superintendents, cost estimators, or system test and balance specialists.

- Approximately four in ten employers surveyed prefer hands on experience in the industry for HVAC mechanics, technicians or installers (42%), while 39% preferred a related certificate or associate degree.
- When asked what skills are most important, Los Angeles employers working in Facility or Building Operations and Maintenance indicated they value the ability to communicate with customers, in writing and in person (94 percent), and understanding of HVAC systems functions, operations, and maintenance (57 percent stated "Very Important").

Occupational Wages: In Los Angeles, the annual wages (based on survey responses) for HVAC technicians are:

	Entry Level Median Annual Wage	Experienced Level Median Annual Wage
HVAC Technicians	$40,000	$59,160

Entry level is loosely defined as new hires up to one-year experience on-the-job, while experienced level is more typically defined as those workers with more than three years experience on-the-job.

Occupation: Project Managers for Construction or Design Work

Project Managers for Construction or Design Work are responsible for communicating with project partners and ensuring that the project is completed in a timely manner and within budget. The following list describes in more detail some of the tasks that may be required of Project Managers for Construction or Design Work:[25]

- Construction managers plan, direct, and coordinate a wide variety of construction projects.
- They are often called project managers, constructors, construction superintendents, project engineers, construction supervisors or general contractors.
- Project managers for Construction or Design Work determine the best way to get materials to the building site and the most cost-effective plan and schedule for completing the project.
- They oversee the delivery and use of materials, tools, and equipment; worker productivity and safety, and the quality of construction.
- They are also responsible for obtaining all necessary permits and licenses and may direct or monitor compliance with building and safety codes, other regulations and requirements set by the project's insurers.

Occupational Outlook: Concern for the environment has prompted the development of new energy-saving heating and air conditioning systems. An emphasis on better energy management should lead to the replacement of older systems and the installation of newer more efficient systems in existing homes and buildings. Installation of new air conditioning and

[25]Occupational Outlook Handbook, 2008-2009, "Construction Managers," www.bls.gov/oco

heating systems in existing buildings also continues during construction slumps, as individuals and businesses adopt more energy-efficient equipment to cut utility bills.

Sophisticated technology and the proliferation of laws setting standards for buildings and construction materials, worker safety, energy efficiency, environmental protection, and the potential for adverse litigation have further complicated the construction process. Advances in building materials and construction methods, the need to repair or replace infrastructure nationwide, and the growing number of multipurpose buildings and energy efficient structures will further add to the demand for more construction managers.

Project Managers for Construction or Design Work are expected to experience significant growth in the immediate future.

- In Los Angeles, employment in this occupation is projected to increase six percent over the next 12 months (280 new jobs).
- Over the next three years, employment is projected to increase 19 percent or by 970 jobs.
- In addition to increased demand for Project Managers, 60 percent of employers surveyed experience difficulty finding qualified applicants for these positions.

Career Pathways: Traditionally, people advanced to construction management positions after having substantial experience as construction craft workers (carpenters, masons, plumbers, or electricians) or after having worked as construction supervisors or as owners of independent specialty contracting firms. However, as construction processes become increasingly complex, employers are placing more importance on specialized education after high school.[26]

- 38 percent of employers preferred Project Managers with a related Bachelor's degree, while 15 percent indicated technicians would benefit from a specific Associate degree or program certificate and 19 percent would consider experience in the industry adequate.
- Employers who work in design and/or construction of new buildings responded that the ability to communicate with customers, in writing and in person, and general construction experience are the most valued skills in an employee, with 100% of those surveyed identifying the skills as very or somewhat important.

Occupational Wages: In Los Angeles, the annual wages (based on survey responses) for Project Managers for Construction or Design Work are:

	Entry Level Median Annual Wage	Experienced Level Median Annual Wage
Project Managers for Construction or Design Work	$50,000	$75,000

Entry level is loosely defined as new hires up to one-year experience on-the-job, while experienced level is more typically defined as those workers with more than three years experience on-the-job.

[26]Occupational Outlook Handbook, 2008-2009, "Construction Managers," www.bls.gov/oco

Occupation: Building Performance or Retrofitting Specialist

Building performance or retrofitting specialist are contractors who improve the energy efficiency of homes or buildings by installing insulation, windows, lighting and other energy efficient products. The following list describes in more detail some of the tasks that may be required of building performance or retrofitting specialist: These workers may also be called weatherization specialists, insulation workers, or other trade specific titles.[27]

- Install energy efficient products for residential or building retrofits, including windows, doors, insulation, lighting and other weatherization materials in compliance with retrofitting standards.
- Replace gas appliances, furnaces, water heaters, air conditioning units, and air filtration systems with more energy efficient upgrades.
- Replace or seal air ducts where air leakage occurs.
- Use tools for cutting insulating materials, welding to join sheet metal or secure clamps, and compressors to blow or spray insulation.

Occupational Outlook: Demand for building performance and retrofitting specialists will be spurred by the continuing need for energy efficient homes and buildings, both of which will generate work in existing structures and new construction. Building performance or retrofitting specialists are expected to experience significant growth in the immediate future.

- In Los Angeles, employment in this occupation is projected to increase 23 percent over the next 12 months (620 new jobs).
- Over the next three years, employment is projected to increase 69 percent or by 1,870 jobs.
- In addition to increased demand for building performance or retrofitting specialists, 69 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 30 percent of employers responding "great" difficulty.

Career Pathways: For most entry-level specialists working in residential applications, learning is mostly done on-the-job but for commercial and industrial settings a formal apprenticeship program or additional training or education is generally required.[28]

- 17 percent of employers surveyed preferred building performance or retrofitting specialists with a related Bachelor's degree, while employers were split evenly, 31 percent, indicating specialists would benefit from a specific Associate degree or program certificate, as well as this same percentage considering experience in the industry adequate.
- Employers who work in energy retrofitting responded that the ability to communicate with customers, in writing and in person, as well as understanding of local and state energy efficiency requirements and incentives are the most valued skills in an employee, with 100% of those surveyed identifying these two skills as important.

[27]Occupational Outlook Handbook, 2008-2009, "Insulators," www.bls.gov/oco
[28]Occupational Outlook Handbook, 2008-2009, "Insulators," www.bls.gov/oco

Occupational Wages: In Los Angeles, the annual wages (based on survey responses) for Building Performance or Retrofitting Specialists are:

	Entry Level Median Annual Wage	Experienced Level Median Annual Wage
Building Performance or Retrofitting Specialists	$40,000	$60,000

Entry level is loosely defined as new hires up to one-year experience on-the-job, while experienced level is more typically defined as those workers with more than three years experience on-the-job.

Occupation: Energy Auditors or Home Energy Raters

Energy auditors or home energy raters are responsible for collecting, analyzing, and validating energy usage in the field and preparing reports on a building or home's total energy profile. The following list describes in more detail some of the tasks that may be required of energy auditors or home energy raters.

- Conduct energy audits, which may include testing heating, ventilation, air conditioning, water heating systems, doors, windows, lighting and insulation for efficiency.
- Use current technology such as infrared cameras, blower door testing equipment, balometers, and other diagnostic instruments to gather energy efficient data and compute energy use analysis and overall building performance.
- May install minor energy saving measures and educate customers about how to reduce energy use through lifestyle changes, building retrofits, and utility programs.

Occupational Outlook: Demand for energy auditors or home energy raters will be spurred by the continuing need for energy efficient buildings and residential and commercial cost-saving measures. Energy auditors or home energy raters are expected to experience significant growth in the immediate future.

- In Los Angeles, employment in this occupation is projected to increase 9 percent over the next 12 months (120 new jobs).
- Over the next three years, employment is projected to increase 39 percent or by 520 jobs.
- In addition to increased demand for energy auditors or home energy raters, 64 percent of employers surveyed experience difficulty finding qualified applicants for these positions.

Career Pathways: Energy auditors or home energy raters may advance into the occupation in a variety of ways. Home energy raters may have experience in retrofitting or weatherization occupations, building inspection or as an HVAC technician. Energy auditors may have more technical education or professional experience.

- 16 percent of employers surveyed preferred energy auditors or home energy raters with a related Bachelor's degree, while 35 percent indicated specialists would benefit from a specific Associate degree or program certificate and 23 percent would consider experience in the industry adequate.

- When asked what skills are most important, employers working in Improving Energy Efficiency in Existing Buildings (Retro-Commissioning) indicated they value the ability to communicate with customers, in writing and in person (94 percent), ability to perform measurement and verification of energy systems (89 percent), and ability to test and troubleshoot building and process systems, including HVAC, electrical and electronic systems.

Occupational Wages: In Los Angeles, the annual wages (based on survey responses) for Energy Auditors or Home Energy Raters are:

	Entry Level Median Annual Wage	Experienced Level Median Annual Wage
Energy Auditors or Home Energy Raters	$41,600	$59,770

Entry level is loosely defined as new hires up to one-year experience on-the-job, while experienced level is more typically defined as those workers with more than three years experience on-the-job.

Occupation: Resource Conservation or Energy Efficiency Managers

Resource conservation or energy efficiency managers assess current energy and resource consumption and develop strategies to reduce usage. The following list describes in more detail some of the tasks that may be required of resource conservation or energy efficiency managers.

- Develop, plan and analyze energy efficiency measures and programs for public or private organizations to reduce energy consumption.
- Manage energy efficiency projects and policies for an organization or commercial, residential, and governmental clients.
- Perform market analysis and research and consult on demand side energy programs.
- May conduct energy simulation modeling and technology feasibility studies for an organization or commercial, residential, and governmental clients.

Occupational Outlook: Demand for resource conservation or energy efficiency managers will be impacted by the influx of legislation and regulation specific to energy use and energy efficiency. Resource conservation or energy efficiency managers are expected to experience growth in the immediate future.

- In Los Angeles, employment in this occupation is projected to increase eight percent over the next 12 months (140 new jobs).
- Over the next three years, employment is projected to increase 26 percent or by 480 jobs.
- In addition to increased demand for resource conservation or energy efficiency managers, 61 percent of employers surveyed experience difficulty finding qualified applicants for these positions.

Career Pathways: Resource conservation or energy efficiency managers may begin their careers as energy auditors or home energy raters and move into a management position with a combination of work experience and additional education.

- 44 percent of employers surveyed preferred resource conservation or energy managers with a related Bachelor's degree, while 29 percent indicated specialists would benefit from a specific Associate degree or program certificate and 8 percent would consider experience in the industry adequate.
- When asked what skills are most important, employers working in Utilities and Resource Management indicated they value the ability to communicate with customers, in writing and in person (91 percent), ability to perform economic analysis related to energy efficiency projects (76 percent), and a general understanding of the mechanics and engineering of energy systems (72 percent).

Occupational Wages: In Los Angeles, the annual wages (based on survey responses) for resource conservation or energy efficiency managers are:

	Entry Level Median Annual Wage	Experienced Level Median Annual Wage
Resource Conservation or Energy Efficiency Managers	$55,000	$72,800

Entry level is loosely defined as new hires up to one-year experience on-the-job, while experienced level is more typically defined as those workers with more than three years experience on-the-job.

Occupation: Building Controls Systems Technicians

Building controls systems technicians combine some of the traditional skill sets of building technicians with advanced skills in controls programming, networking, and systems integration. The following list describes in more detail some of the tasks that may be required of building controls systems technicians.

- Diagnoses, repairs and optimizes complex electronic building controls systems, requiring extensive knowledge of a variety of electronic and/or digital controls systems.
- Ability to test and write modifications in multiple languages of systems software.
- Ability to read and interpret detailed drawings, sequence of operations, specifications, operating manuals and other written materials
- Works closely with other skilled trades and building engineer to trouble-shoot and resolve problems with HVAC and Building Systems.

Occupational Outlook: Demand for building controls systems technicians is increasing due to advancing technology in building systems and the need for qualified workers to monitor, repair and maintain these systems to ensure a safe and comfortable building environment. While growth over the next 12 months is relatively flat, Building controls systems technicians are expected to experience significant growth over the three year period.

- In Los Angeles, employment in this occupation is projected to increase 3 percent over the next 12 months (60 new jobs).

- Over the next three years, employment is projected to increase 21 percent or by 410 jobs.
- In addition to increased demand for technicians, 54 percent of employers surveyed experience difficulty finding qualified applicants for these positions.

Career Pathways: Building controls systems technicians may transition into this occupation from related jobs, such as HVAC technician or junior building operator/engineer. With experience and additional education, building controls systems technicians may advance to gain greater responsibility for larger and more complex facilities.

- 13 percent of employers surveyed preferred building controls systems technicians with a related Bachelor's degree, while 44 percent indicated specialists would benefit from a specific Associate degree or program certificate and 30 percent would consider experience in the industry adequate.
- When asked what skills are most important, Los Angeles employers working in Facility or Building Operations and Maintenance indicated they value the ability to communicate with customers, in writing and in person (94 percent), and understanding of HVAC systems functions, operations, and maintenance (57 percent stated "Very Important").

Occupational Wages: In Los Angeles, the annual wages (based on survey responses) for building controls systems technicians are:

	Entry Level Median Annual Wage	Experienced Level Median Annual Wage
Building Controls Systems Technicians	$41,600	$70,000

Entry level is loosely defined as new hires up to one-year experience on-the-job, while experienced level is more typically defined as those workers with more than three years experience on-the-job.

Occupation: Building Operators or Building Engineers

Building operators or building engineers troubleshoot, install, replace, and repair building energy systems and controls to optimize energy efficiency. The following list describes in more detail some of the tasks that may be required of building operators or building engineers.

- Perform and/or direct the performance of all maintenance of HVAC and energy systems to ensure the highest level of efficiency without disruption to the building.
- Monitor operation of electrical and mechanical equipment supporting the facility and the facility's critical operations.
- Perform routine preventive maintenance on building HVAC and energy systems.
- Knowledge of overall building systems, including equipment monitoring, building automated management systems, as well as having a thorough understanding of HVAC and electrical systems.
- Prepare and maintain maintenance logs and records.

Occupational Outlook: Demand for building operators or building engineers is increasing due to advancing technology in building systems and the need for qualified workers to monitor, repair and maintain these systems to ensure a safe and comfortable building or facility environment. Building operators or building engineers are expected to experience growth over the three year period.

- In Los Angeles, employment in this occupation is flat over the next 12 months (10 new jobs).
- Over the next three years, employment is projected to increase 29 percent or by 940 jobs.
- In addition to increased demand for technicians, 66 percent of employers surveyed experience difficulty finding qualified applicants for these positions.

Career Pathways: Building operators or building engineers may advance into this occupation with experience as a facility manager or commercial HVAC technician, with additional education and experience.

- 34 percent of employers surveyed preferred building operators or building engineers to have a related Bachelor's degree, while 29 percent indicated operators would benefit from a specific Associate degree or program certificate and 16 percent would consider experience in the industry adequate.
- When asked what skills are most important, Los Angeles employers working in Facility or Building Operations and Maintenance indicated they value the ability to communicate with customers, in writing and in person (94 percent), and understanding of HVAC systems functions, operations, and maintenance (57 percent stated "Very Important").

Occupational Wages: In the Los Angeles, the annual wages (based on survey responses) for building operators or building engineers are:

	Entry Level Median Annual Wage	Experienced Level Median Annual Wage
Building Operators or Building Engineers	$52,000	$66,320

Entry level is loosely defined as new hires up to one-year experience on-the-job, while experienced level is more typically defined as those workers with more than three years experience on-the-job.

Occupation: Compliance analysts or energy regulation specialists

Compliance analysts or energy regulation specialists evaluate if projects are meeting regulatory requirements and/or incentives and provide recommendations as needed to meet compliance. The following list describes in more detail some of the tasks that may be required of compliance analysts or energy regulation specialists.

- Performs energy efficiency compliance assessments, documents compliance status and makes recommendations on corrective action to achieve compliance.
- Develops plans and procedures necessary to achieve compliance with energy and energy efficiency legislation; federal, state and local building codes; and regulations from CEC, CPUC or other regulatory bodies relevant to energy markets.
- Develops audit plans and audit surveillance checklists.

Occupational Outlook: Demand for compliance analysts or energy regulation specialists will be impacted by the influx of legislation and regulations specific to energy use and energy efficiency. Compliance analysts or energy regulation specialists are expected to experience significant growth in the immediate future.

- In Los Angeles, employment in this occupation is projected to increase eight percent over the next 12 months (140 new jobs).
- Over the next three years, employment is projected to increase 23 percent or by 370 jobs.
- In addition to increased demand, Close to 3 out of 4 employers experience difficulty finding compliance analysts or energy regulation specialists.

Career Pathways: Compliance analysts or energy regulation specialists may transition into this occupation from a number of positions, including energy efficiency manager, energy procurement manager, energy analyst, or energy auditor.

- 35 percent of employers surveyed preferred compliance analysts or energy regulation specialists to have a related Bachelor's degree, while 30 percent indicated analysts would benefit from a specific Associate degree or program certificate and 9 percent would consider experience in the industry adequate.
- Employers who work in utilities and resource management responded that the ability to communicate with customers, in writing and in person, is the most valued skill in an employee, with 91percent of those surveyed identifying communication skills as very or somewhat important. Additional skills valued as important include the ability to perform economic analysis related to energy efficiency projects (76 percent), and general understanding of the mechanics and engineering of energy systems (72 percent).

Occupational Wages: In Los Angeles, the annual wages (based on survey responses) for compliance analysts or energy regulation specialists are:

	Entry Level Median Annual Wage	Experienced Level Median Annual Wage
Compliance analysts or Energy regulation specialists	$42,880	$55,280

Entry level is loosely defined as new hires up to one-year experience on-the-job, while experienced level is more typically defined as those workers with more than three years experience on-the-job.

Appendix K: Examples of Industry Certifications in the Energy Efficiency Sector

Workers who attain industry certifications will have greater opportunities for career advancement. Community colleges can play a role in preparing students for these industry certifications as part of course and program development.

Energy Auditor/Home Energy Rater
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 Title 24 Building Energy Efficiency Standards and can proficiently perform calculations. These two certifications are the Certified Energy Plans Examiner (CEPE) and the Certified Energy Analyst (CEA). A summary of these certifications can be found at: http://www.cabec.org

Additional organizations that certify home energy raters include California Certified Energy Rating and Testing Services (CalCERTS), the California Building Performance Contractors Association (CBPCA), and the California Home Energy Efficiency Rating System (CHEERS).

Building or Facility Operations and Maintenance
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

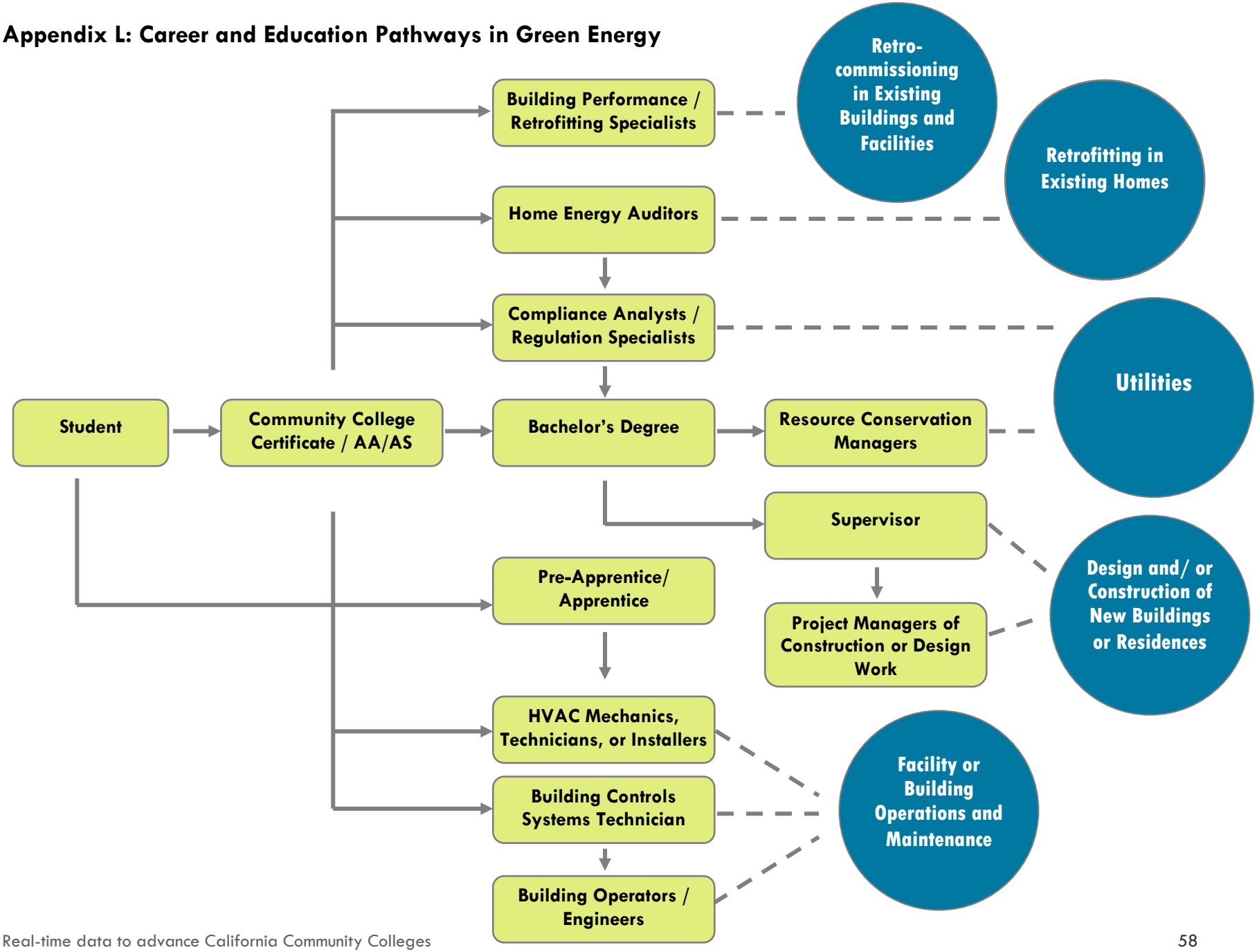
The International Facility Management Association (IFMA) has two certifications: Facility Management Professional (FMP) and Certified Facility Manager (CFM). A summary of the certifications offered by the IFMA can be found at: http://www.ifma.org/learning/fm_credentials/index.cfm

Heating Ventilation & Air Conditioning Technicians
North American Technician Excellence – NATE: NATE, North American Technician Excellence Inc., is an independent, third-party certification body for HVAC/R technicians. NATE-approved testing organizations throughout the U.S. and Canada offer NATE tests. Candidates can earn installation and/or service certification in five specialty areas: air-conditioning, air distribution, heat pumps, gas heating & oil heating. http://www.natex.org/index.asp

The National Environmental Balancing Bureau (NEBB): The National Environmental Balancing Bureau (NEBB) is the premier international certification for firms that perform testing adjusting and balancing of heating ventilating and air conditioning systems in addition to building system commissioning, sound and vibration measurement, retro-commissioning, fume hood testing, and clean room performing certification. http://www.nebb.org/

See also the Heating Ventilation and Air Conditioning Occupations environmental scan for the Los Angeles Region at: www.coeccc.net.

Appendix L: Career and Education Pathways in Green Energy



Appendix M: Los Angeles College Programs Related to Energy Efficiency Occupations

Seven colleges out of the 19 located in the Los Angeles Area were identified as either offering or planning programs or courses using the selection criteria (see page 23). A survey was conducted spring 2009, as well as follow-up calls to obtain information included in the table below.

Current College Programs in Energy Efficiency, Enrollments/Capacity, Future Offerings and College Contacts

College	Current Program(s)	Enrollments/ Capacity	Future Program(s)	Contact
Citrus College	Courses and Certificate in HVAC Mechanics, Technicians, or Installers. Title: Energy Management and Controls. (Industry Certified: HERS, Sempra Energy, EPA, SIEU). Union Apprenticeship. Degree, Course and Certificate in Building Controls Systems Technician.		The Energy Systems Technology program is in the final stages of approval. 1) Building Controls System Technician. Title: Building Systems Design Technology (Certificate). 2) Developing Building Operator or Building Engineer. Title: Building Systems Maintenance & Operations Technology (Certificate). 19- 30 units. Planned for Spring 2010. (Not Industry Certified)	Kim Holland, Director , Workforce Development kholland@citruscollege.edu 626-914-8701
East Los Angeles College	Course in Energy Systems Design: ARC 152 - Design of Energy-Using Systems for Housing. This course provides a student with a basic understanding of how to calculate loads and choose appropriate equipment for space heating and cooling, lighting, plumbing and other residential services. Students will also understand how to select the appropriate materials for building envelopes and how to minimize energy use for space heating, cooling, ventilation and lighting.	Enrollment 20 (Spring semester 2009)/30 Capacity	New energy efficiency courses are being developed. One such course is: ARC 150 - Sustainability Fieldtrips. Course, credit, 1 unit is planned to be offered in 2010. Partnering with high schools and other disciplines to introduce students to the concept of energy-efficient building design and other opportunities for employment in the sustainability arena.	Douglas S. Stenhouse, AIA-E Adjunct Professor, dsssts@quixnet.net 310-897-0479 Renee D. Martinez martinrd@elac.edu 323-265-8973 D. Michael Hamner AIA, Chair hamnerm@elac.edu 626-672-2724
Glendale Community College	None of the above are currently offered		New efficiency programs are being developed. Title: Energy Audit Technician. Course, credit, 4-12 units will be offered. Planned for 2010. Non-union apprenticeship. Partnering with high schools	Scott Rubke, Division Chair, srubke@glendale.edu 818-240-1000 ext. 5541
Pierce College			Looking to start a possible course in energy auditor or home energy rater. In the process of developing an AA degree in energy efficiency. Partnering with Employers and West Valley Occ. Center	Judith Trester, Director, EWD trestejd@piercecollege.edu 818-710-2549

College	Current Program(s)	Enrollments/ Capacity	Future Program(s)	Contact
El Camino College	Associate Degree and Certificate in Heating Ventilation Air Conditioning and Refrigeration (HVAC)	Enrollment 26 (per curriculum of record)	Investigating Energy Auditor or Home Energy Rater. Title: Energy Auditor. Developing Building Performance or Retrofitting Specialist. Title: Construction Technician. Course, credit, 1-3 units. Planned for Spring 2012 Developing Compliance Analyst or Energy Regulation Specialists. Title: Energy Auditor. Course, credit, 1-3 units. Planned for Spring 2012 New HVAC Mechanics, Technicians, or Installers classes in Fall 2009. Title: HVAC Technician. AS or AA, credit, 10-30 units Developing Resource Conservation or EE Manager course to credit, 4-12 units. Title: Energy Auditor. Planned for Spring 2012 Developing Building Controls Systems Technician. Credit, 1-3 units. Title: HVAC Technician. Planned for Fall 2010 Developing: 1) Energy Efficient Environmental Systems. 2) Solar Thermal & Photovoltaic Developing ENV1 and Survey of Green Technologies. Planned for Spring 2010	Steve Cocca, Professor Technology scocca@elcamino.edu 310-660-3593 ext. 3617 Vic Cafarcia, Instructor
Mt San Antonio College	• Degree and Certificate in HVAC Mechanics, Technicians, or Installers. (Industry Certified: PAHRA) • Degree and Certificate in Building Controls Systems Technician. Title: Building Automation Technician	775 Full Time Equivalent Students (FTES) three years 2005-2008. Retention: approximately 88%	An approved degree and certificate in Building Automation. Will offer AA or AS, credit and 19-30 units. Planned for Fall 2010. Partnering with Los Altos High School	Lanny Richardson Air Conditioning and Refrigeration. Lrichardson@mtsac.edu (909) 594-5611 ext. 4639 Darrow Soares Acting Associate Dean, Career and Technical Education dsoares@mtsac.edu 909-594-5611 ext. 4637

College	Current Program(s)	Enrollments/ Capacity	Future Program(s)	Contact
LA Trade Technical College	**Degree & Certificate Programs** **Weatherization and Energy Efficiency Certificate Program** • Includes Courses in Building Performance or Retrofitting Specialist. (Industry Certified: Sempra Energy, EPA, SIEU). Partnering with high schools and local community based agencies through YouthBuild • Includes Courses in Energy Auditor or Home Energy Rater. (Industry Certified: HERS (pending), Sempra Energy, EPA, SIEU). Partnering with high schools and local community based agencies through YouthBuild **Refrigeration & Air Conditioning Mechanic Certificate, AA/AS Degrees** • Courses in HVAC Mechanics, Technicians, or Installers. Title: Energy Management and Controls. (Industry Certified: Sempra Energy, EPA, SIEU). Union Apprenticeship • Includes course in Energy Efficiency Manager Title: Thermal Energy Storage and Heat Recovery, and Refrigeration Systems Energy Efficiency **Certificate in Operation Maintenance Engineer** • Course and Certificate in Building Operator or Building Engineer. Title: Operations Maintenance Engineer. Union Apprenticeship • Includes Courses in Resource Conservation or Energy Efficiency Manager. Title: Energy Management **Courses** Course in Building Controls Systems Technician. Title: Advanced Lighting Controls, Energy Management Controls. (Industry Certified: Sempra Energy, EPA, SIEU)	35 - 50 35 - 50 45 34 35 35 35 to 50	Updating Energy Auditor or Home Energy Rater. Title: Residential Energy Auditor, Commercial Energy Auditor. 4- 12 units will be offered. Planned for Spring 2010 Updating Building Performance or Retrofitting Specialist. Title: Weatherization: Commercial. 1- 3 units will be offered. Planned for Spring 2010 Updating Compliance Analyst or Energy Regulation Specialists. Title: HERS Rater Course. 1- 3 units will be offered. Planned for Spring 2010 Updating Project Manager for Construction or Design work. 1- 3 units will be offered. Planned for Spring 2010 Updating Building Controls Systems Technician. 1- 3 units will be offered. Planned for Spring 2010 LAUSD and AUSD partnerships for weatherization and energy auditing; IUOE Local 501 for Stationary	William Elarton, Chairman Construction, Design & Mfg. Los Angeles Trade Technical College 400 West Washington Blvd. Los Angeles, California 90015 (213) 763-3701 (213) 763-5394 Fax

College	Current Program(s)	Enrollments/ Capacity	Future Program(s)	Contact
ESGVROP/ TC*	Course in Building Performance or Retrofitting Specialist. (Industry Certified). Non-union apprenticeship. Partnering with high schools Course in Compliance Analyst or Energy Regulation Specialists Course and Certificate in HVAC Mechanics, Technicians, or Installers. (Industry Certified). Non-union apprenticeship. Partnering with high schools Course and Certificate in Building Inspection Course and Certificate in Building Operator or Building Engineer		Updating Building Performance or Retrofitting Specialist Course to Certificate, credit and 1-3 units duration. Title: Electronics Home Technology Integration. Planned for Fall 2009. Updating HVAC Mechanics, Technicians, or Installers course and certificate to 1-3 units duration. Title: HVAC Technology. Planned for Fall 2009. Developing Building Controls Systems Technician course. Title: Electronics, Mobile Technology or HTI. Certificate in 1-3 units duration will be offered and planned for Fall 2009. (Industry Certified). Non-union apprenticeship. Partnering with high schools	C. Lil Walker, Lead Data Research, cwalker@esgvrop.org 626-472-5106

* East San Gabriel Valley Regional Occupational Program (ESGVROP) – While this is not a community college, this program was included as an example of additional training providers offering courses in energy efficiency related occupations.