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Orange County Region

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CENTERS OF EXCELLENCE

Orange County 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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Based on a 2009 survey of Orange County firms who employ Energy Efficiency workers, as many as 3,130 new jobs will be added over the next three years in eight demand occupations.

Source: BW Research Partnership/Centers of Excellence

Executive Summary

The Centers of Excellence in collaboration with research and industry partners studied the energy efficiency sector in Orange County and across the State. This report focuses on the Orange County Region.

Major industry segments of the energy efficiency sector 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

A workforce survey was conducted with employers to better understand the projected demand for energy efficiency occupations and the workforce needs of employers.

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.

Over 137 Orange County employers responded to the survey, which yielded a rich set of data that is highlighted in this report. Eight energy efficiency occupations that are most relevant to community colleges were the focus of the employer survey.

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, which are being fueled in part by the hundreds of millions of dollars coming to California and the Orange County region from the American Recovery and Reinvestment Act of 2009.

Out of the eight occupations studied, energy auditors/home energy raters is expected to grow the largest adding 250 jobs in the next three years (65.7 percent growth rate) and project managers for construction or design work is expected to add the most jobs, approximately 990 in the next three years.

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 building performance/retrofitting specialists.

In Orange County, there are only three training programs that fully prepare students for energy efficiency occupations: a project management program, a HVAC mechanic technician program, and a building controls technician program. As a result, more training is needed. Fortunately several colleges have already begun to develop new programs that will help address the growing demand for energy efficiency services.

The findings from this study support the creation, adaptation and expansion of energy efficiency courses and programs at Orange County community colleges. These programs will provide meaningful employment opportunities for hundreds of students, support the expansion of energy efficiency firms, and help restore the health of the regional economy.

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 the colleges' programs. Appendix A contains information on how to use this environmental scan report.

Why study Energy Efficiency occupations? Workers who make new and existing homes and buildings more energy efficient performs 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] Since 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 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 partnered with multiple utilities agencies including Southern California Edison, Southern California Gas Company, Pacific Gas and Electric (PG&E), and

[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.

others. The COE also worked with several industry associations,[3] Lawrence Berkeley National Laboratory (LBNL), the California Community Colleges Environmental Training Centers (ETC), and BW Research Partnership to survey firms throughout the state who most likely have employees in eight energy efficiency occupations featured in this study. The data released in this study is for the Orange County region.

This 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 Orange County.[4] Employers were surveyed from December 2008 through May 2009, resulting in 137 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, a survey of community college programs related to energy efficiency occupations was conducted. 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); and California Association of Building Performance Contractors (CABPC).
[4]See definition of energy efficiency sector on page 8.

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 Orange County Area

In the Orange County Region, it is estimated that approximately 1,130 firms employ energy efficiency workers in one or more of the eight occupations studied. Of these, 137 responded to the survey. Fifty-five percent of employers identify themselves as involved directly with energy efficiency work, while forty-five percent said they were indirectly involved.[9]

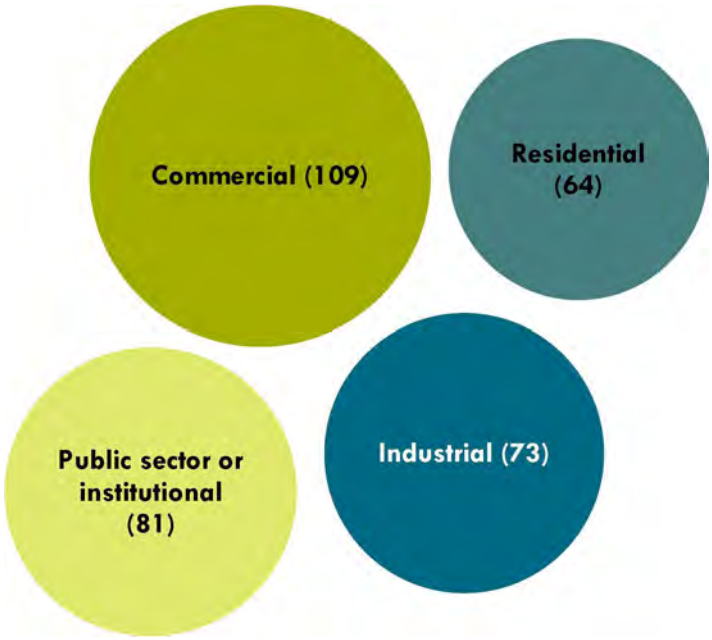
Eight Occupations Studied

- 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

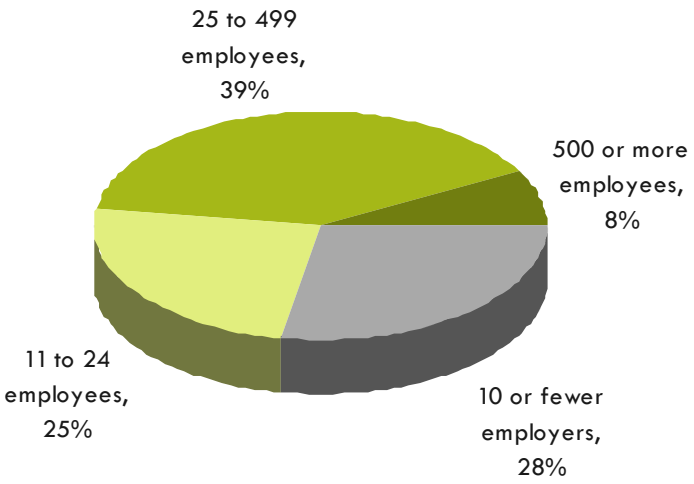
Employers were asked to identify their firm as part of one or more of the industries in the chart below. The chart shows that more firms are involved in the Retro-commissioning or existing building commissioning, improving energy efficiency in existing buildings and facilities area. (Note: Total exceeds 227 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 below shows that more firms provide services in the commercial sector than the other sectors. (Note: Total exceeds 137 responses, since multiple responses were allowed.)



The survey data reveals that most firms are relatively small — 53% employ fewer than 25 employees — with a significant portion (28%) employing 10 or fewer employees. More data on the size of firms is shown in the pie chart below.



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

Because more than 2000 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 hundreds of jobs in the Orange County Region. A summary of the Energy Efficiency related provisions in the Reinvestment Act can be found in Appendix D.

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 cost, 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 E.

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 F.

Regional Energy Efficiency Initiatives
The Orange County Workforce Investment Board with the Orange County Business Council and Clean Agency, developed a Green Initiatives Steering Tactics (GIST) plan and used it to apply for an energy training partnership grant offered through the Department of Labor, making them eligible to secure up to $5 million for its execution. The plan is an in-depth tailored

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

analysis and strategy document intended to serve as a guide for future green industry advancement activities.

For more information regarding local energy efficiency research institutions and programs, see Appendix G.

Significance of Energy Efficiency for the State and Regional Economy

The economy is experiencing a severe recession. Banks are failing, credit markets are frozen, home foreclosures are on the rise, and consumer purchasing power is in decline. California's unemployment rate stands at 11.9 percent as of July 2009.[11] Orange County's area unemployment rate was at 9.5 percent. Between June 2009 and July 2009, total nonfarm employment in Orange County decreased by 7,900 jobs to arrive at 1,416,500 jobs. Most economists predict that the recession will continue through 2010.

The energy efficiency sector has great potential to be a positive economic driver in California and Orange County 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 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 and newly appointed Special Advisor for Green Jobs, Enterprise and Innovation for the Obama Administration 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."[12]

Appendix H 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.

[11] California Employment Development Department, Labor Market Information Division, County Unemployment Rates
[12] 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 be found in the energy efficiency sector (as defined on page 9 of this report) and one that community colleges could address in their education offerings.[13] The eight occupations studied, as well as current and projected employment in the Orange County Region, are listed in Table 1 on the following page. Occupational profiles for the eight occupations can be found in Appendix I.

Qualifying the Employment Estimates

The combined occupational employment in the Orange County Region for the eight energy efficiency occupations studied, totals at least 2,520 jobs (count of known employment from the 137 survey respondents) and could be as high as 9,460 jobs. [14] 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 the Orange County Region (1,140 firms).

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, but are not limited to: 1) survey respondents may be more engaged in Energy Efficiency work than non-respondents, 2) we may have included some firms in our estimate of firms, who would not self-identify as a firm that hires energy efficiency workers, and/or we may have excluded some firms who would self-identify as a firm that hires energy efficiency workers, 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 **840 new jobs for the Orange County economy.**[15]

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 **3,130 new jobs for the Orange County economy.**

Employers expect the anticipated economic recovery to strengthen the demand for energy efficiency occupations, as **all eight occupations show employment growth expectations of 14 percent or higher over the next 3 years.**

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[13]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.

[14]Employment data from the 137 survey respondents is summarized in Appendix C.

[15]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 within the Orange County Region.

Table 1: Estimated 2009 Employment and Projected Employment
(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 work is completed in a timely manner and within budget.	3,240	220	7%	990	30%
HVAC mechanics, technicians or installers install, repair and maintain heating, ventilation, air-conditioning and refrigeration systems.	2,080	50	3%	580	28%
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.	1,110	220	20%	540	48%
Building controls systems technician combine some of the traditional skill sets of building technicians with advanced skills in controls programming, networking, and systems integration.	960	90	9%	360	38%
Compliance analyst or energy regulation specialists evaluate if projects are meeting regulatory requirements and/or incentives and provide recommendations as needed to meet compliance.	640	50	9%	120	19%
Resource conservation or energy efficiency managers assess current energy and resource consumption and develop strategies to reduce usage.	540	80	15%	220	41%
Building operators or building engineers troubleshoot, install, replace, and repair building energy systems and controls to optimize energy efficiency.	520	30	6%	70	14%
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.	380	90	23%	250	66%
Total, All Occupations (totals may not add due to rounding)	**9,460**	**840**		**3,130**	

Other highlights include:

- The largest growth occupations **over the next 12 months** are project managers for construction or design work, and building performance or retrofitting specialists with as many as 220 new jobs projected for each.
- The largest growth occupations **over the next three years** continues to be project managers for construction or design work with as many as 990 new jobs projected, followed by HVAC mechanics, technicians or installers with as many as 580 new jobs projected, over the same period.
- The fastest growth rate **over 12 months** is projected for energy auditors or home energy raters (23%), followed by building performance or retrofitting specialists (20%).
- The fastest growth rate **over three years** is projected for energy auditors or home energy raters (66%), followed by building performance or retrofitting specialists (48%).

Occupational Skill and Knowledge Requirements

As previously mentioned, the energy efficiency sector is comprised of three industries — public/private utilities; building or facility operations and maintenance; and building design and construction. Because the building design and construction segment is comprised of multiple, smaller industries, it was divided into three sections: (a) design and/or construction of new buildings; (b) improving energy efficiency in homes (retrofitting existing homes); (c) improving energy efficiency in buildings (retro commissioning existing commercial buildings).

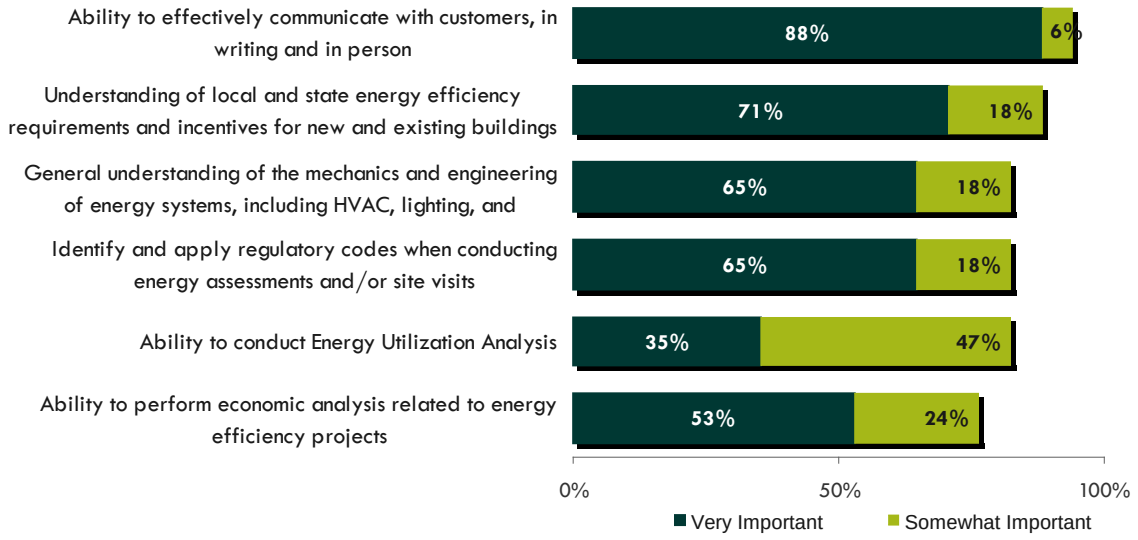
Dividing the building design and construction segment allowed the COE to collect data that is reflective of the energy efficiency workforce in Orange County. Employers participating in the survey provided data and information on energy efficiency in the five industries identified for this report. Figure 1 details the five industry components of the energy efficiency sector that employers were asked to provide information on.

Figure 1: Energy Efficiency Sector Industry Components

Utilities and Resource Management	•Includes occupations that are engaged in assessment and planning for energy efficiency.
Design and/or Construction of new buildings	•Includes occupations that are focused on building and desinging new energy efficient structures (residential and commercial focus; new structures only).
Improving energy efficiency in homes (Retrofitting homes)	•Includes occupations that are focused on building and designing energy efficiet homes (residential focus; existing buildings only).
Improving energy efficiency in buildings (Retro-commissioning)	•Includes occupations focused on building and designing energy efficient facilities (commercial focus; existing buildings only).
Facility or building operations and maintenance	•Includes occupations focused on repair and maintenance of new energy efficiency systems that are used in new and retroffited builidings and facilities.

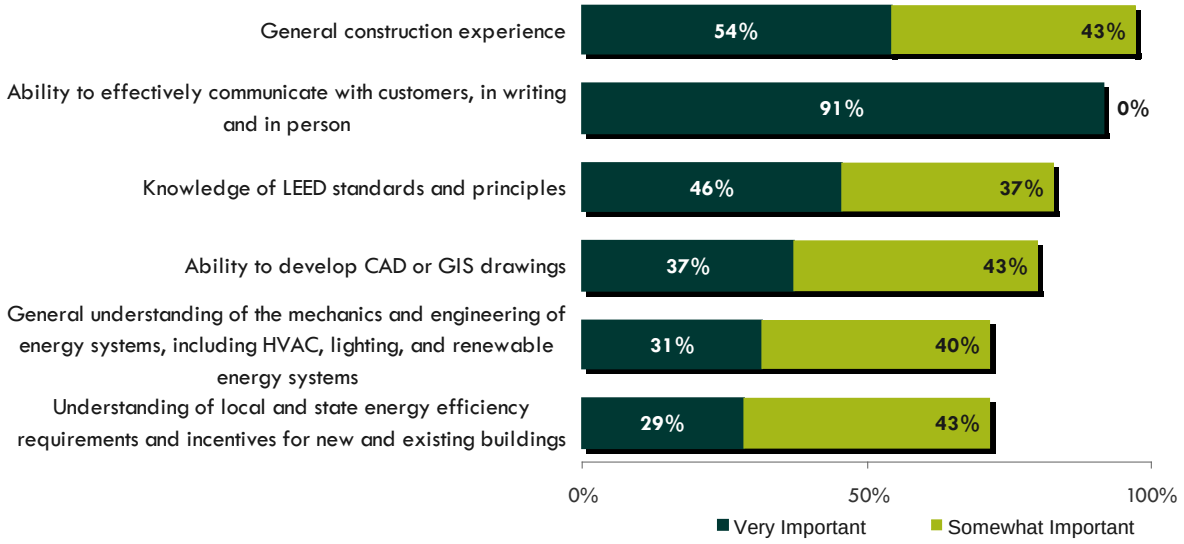
Once employers identified the industry segment that their firm is most closely aligned with, they were then asked about the skills and areas of knowledge important to them when hiring employees. The survey results for skills and knowledge requirements for the five industry segments are found in the following figures:

Figure 2: Utilities and Resource Management Segment



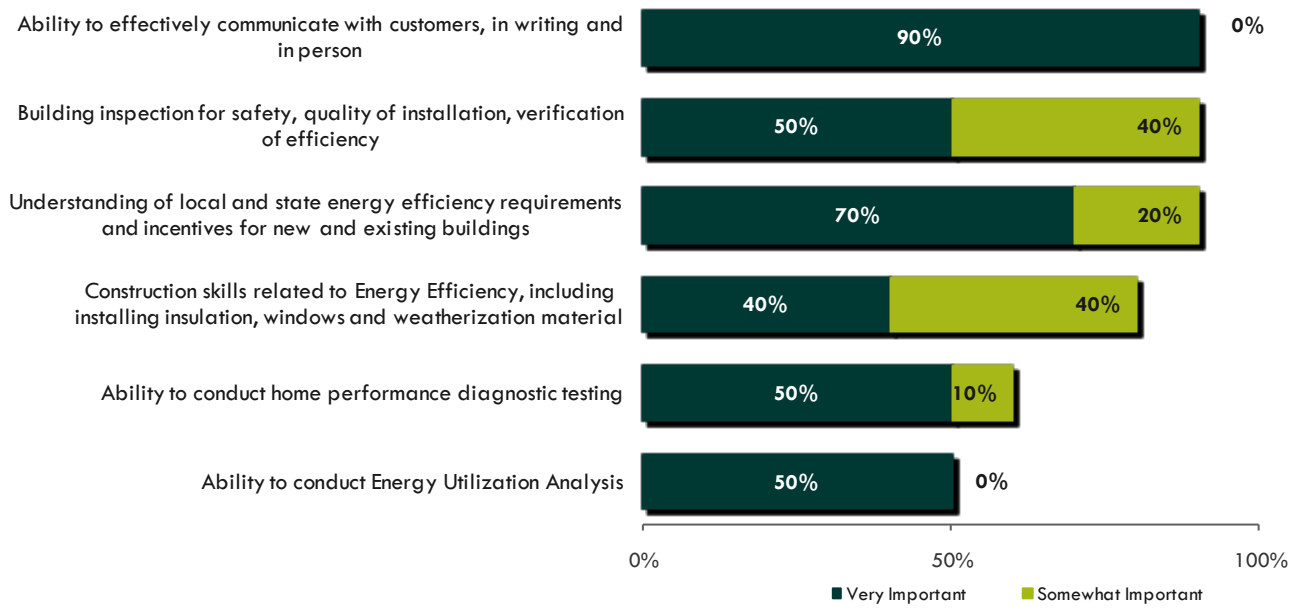
- Employers who work in utilities and resource management responded that the ability to communicate with customers, in writing and in person, is the most valued skill in an employee (88% very important).
- Employers indicated that an additional very important skill is having an understanding of local and state energy efficiency requirements and incentives for new and existing buildings (71%).

Figure 3: Design and/or Construction of New Buildings Segment



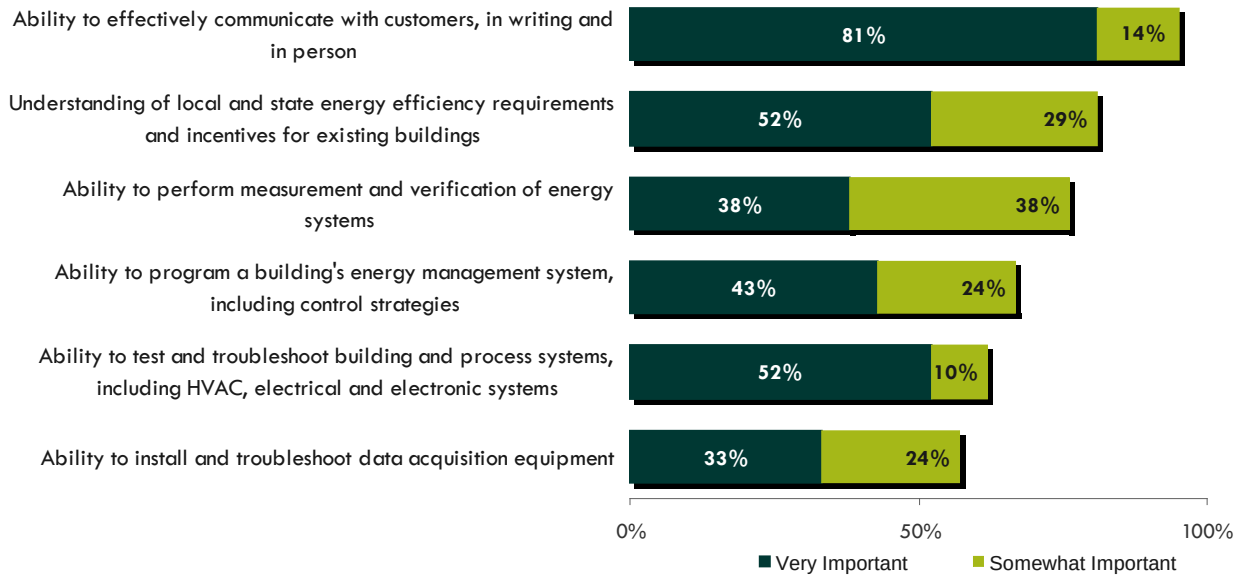
- Employers who work in Design and/or Construction of New Buildings responded that the ability to communicate with customers, in writing and in person, is the most valued skill in an employee (91% very important).
- Employers indicated that additional very important skills are: general construction experience (54%); knowledge of LEED standards and principles; and ability to develop CAD and GIS drawings (37%).

Figure 4: Improving Energy Efficiency in Homes Segment (Retrofitting Homes)



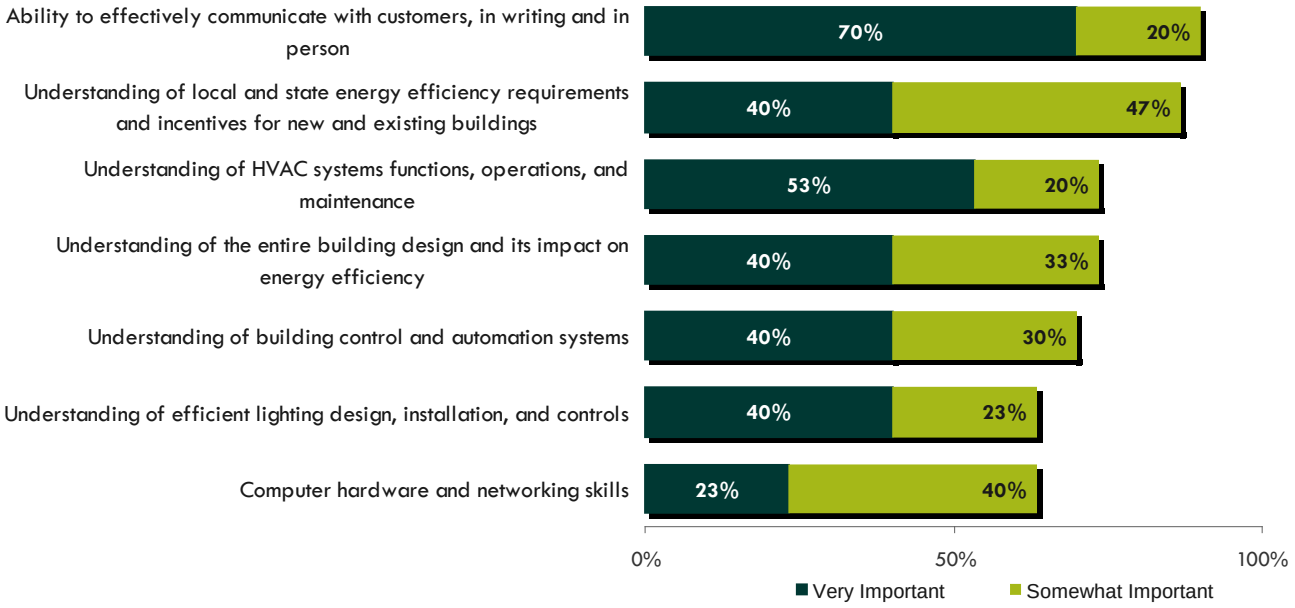
- Employers who work in Retrofitting Homes responded that the ability to communicate with customers, in writing and in person, is the most valued skill (90% very important).
- Employers indicated that an understanding of local and state energy efficiency requirements and incentives for new and existing buildings is also a very important skill (70%).

Figure 5: Improving Energy Efficiency in Existing Buildings Segment (Retro-Commissioning)



- Employers who work in Retro-Commissioning Buildings felt that the ability to communicate with customers, in writing and in person, is the most valued skill (81% very important).
- Employers indicated that additional very important skills are: understanding of local and state energy efficiency requirements and incentives for existing buildings (52%); and ability to test and troubleshoot building and process systems (52%).

Figure 6: Facility or Building Operations and Maintenance Segment



- Employers who work in Facility or Building Operations and Maintenance responded that the ability to communicate with customers, in writing and in person, is the most valued skill in an employee (70% very important).
- Employers indicated that an additional very important skill is an understanding of HVAC systems functions, operations, and maintenance (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 energy efficiency jobs 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.[16]

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

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

in the EESI. Significant growth is projected for Program Management Contractor Staff and Program Support Contractors in the range of 65% from 2007-2010.[17] 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 J contains an example of a Career and Education Pathway graphic for energy efficiency occupations. Also, Appendix K contains examples of Industry Certifications that if attained, can help workers advance into more skilled positions with higher pay.

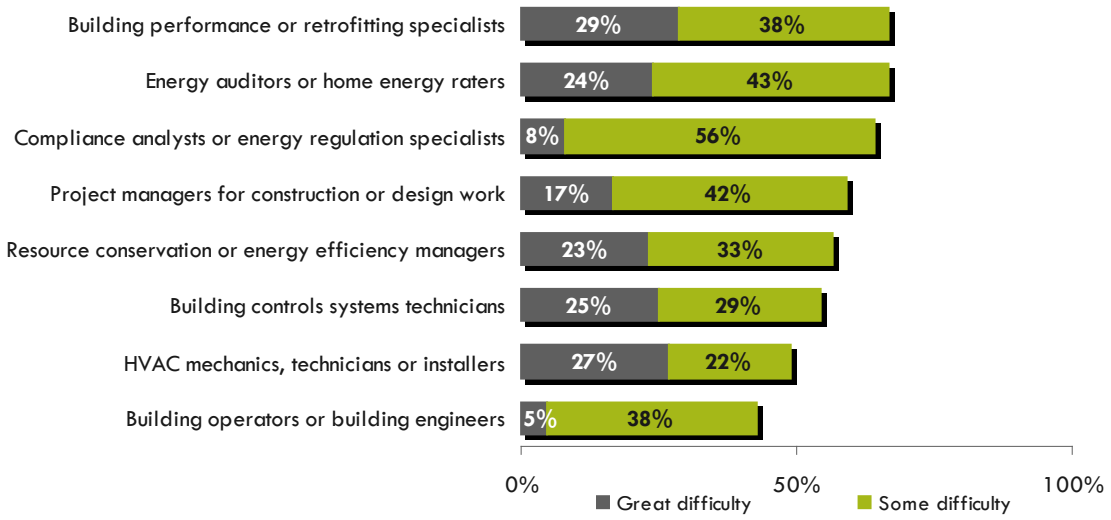
Employer Needs and Challenges

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.[18]

Hiring Difficulties

The majority of employers responding to the survey indicated great or some 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. In particular:

Figure 7: Difficulty in Hiring for Each Occupation

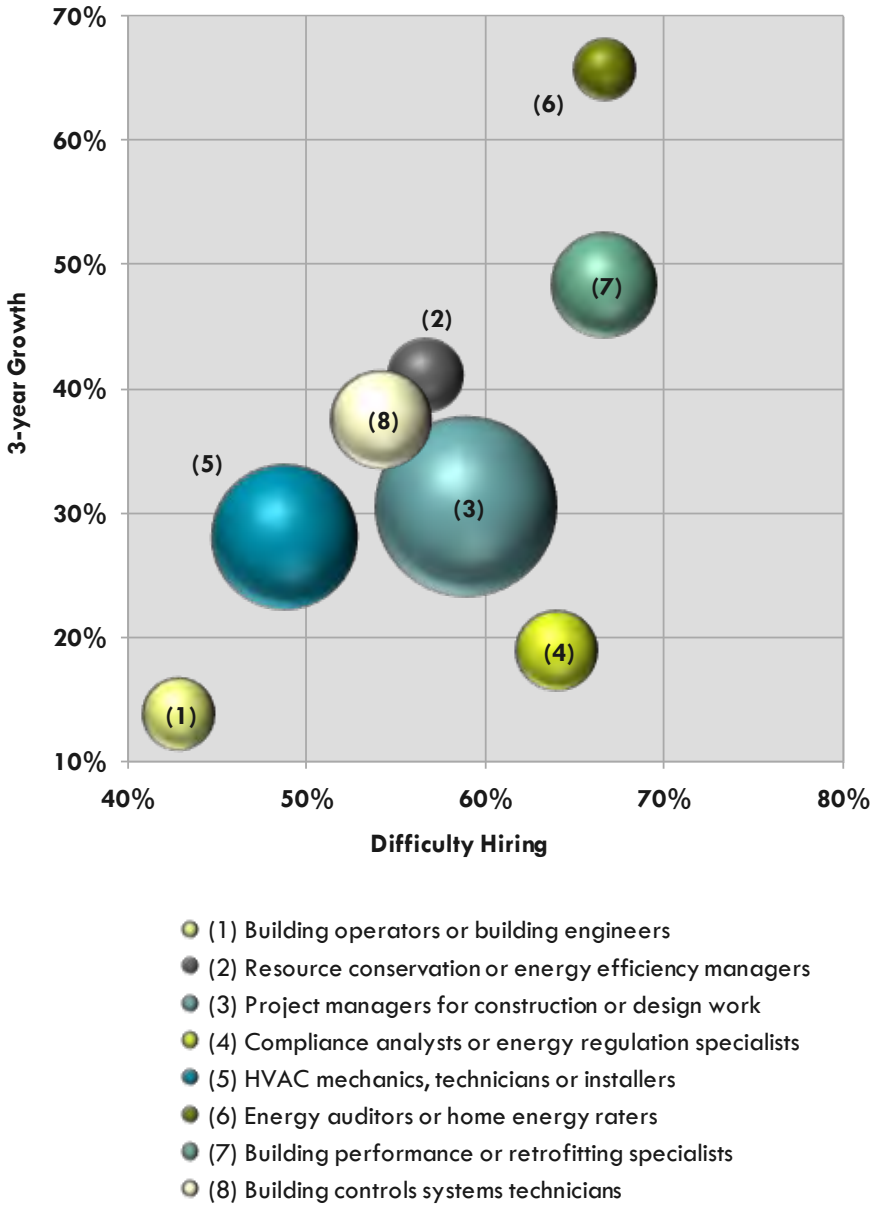


- 2 out of 3 employers experience difficulty finding Building performance or retrofitting specialist and energy auditors or home energy raters.
- More than one-fourth of employers experience great difficulty finding qualified building performance or retrofitting specialists, HVAC mechanics, technicians or installers, and building controls systems technicians.

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

In the bubble chart (next page), 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 8: Difficulty in Hiring and Expected Growth for Each Occupation



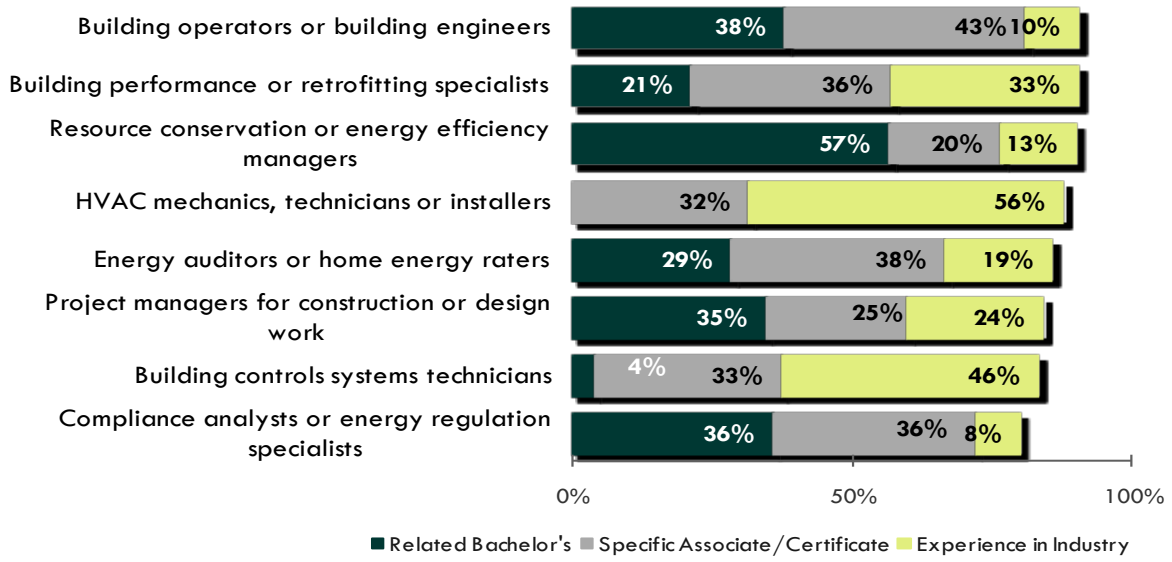
- Project managers for construction or design work, the largest occupation, is expected to experience moderate job growth over the next three years and have a high level of reported difficulty in finding qualified applicants.
- Building performance or retrofitting specialists, moderate in size, are expected to grow fast and have a high level of reported difficulty in finding qualified applicants.
- Energy auditors are relatively small in size, but have a high level of reported difficulty in finding qualified applicants and high level of projected job growth over the next three years.

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.

- 43% of surveyed employers prefer building operators or building engineers have an associate degree or program certificate specific to the position.
- The majority of employers (57%) prefer resource conservation or energy efficiency managers to have a bachelor's degree in a related field, but not necessarily specific to the position.
- The majority of surveyed employers surveyed prefer hands on experience in the industry for HVAC mechanics, technicians or installers (56%).

Figure 9: Education and Experience preferences for each of the eight occupations

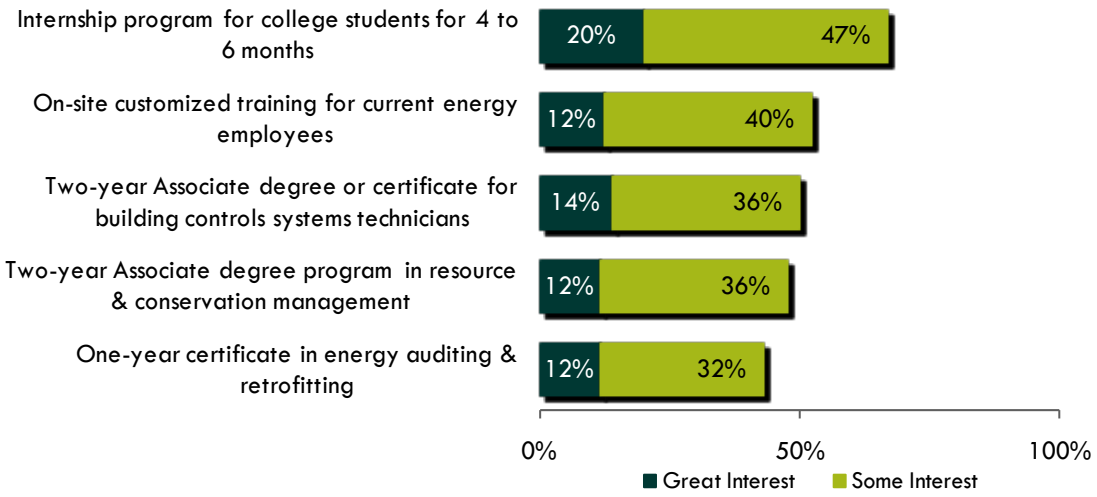


Workforce Development Opportunities

Employers expressed great interest in education and training programs that can be developed by community colleges. The employer responses are summarized in Figure 10.

- Two-thirds of employers expressed great or some interest in an internship program for community college students.
- 1 out of 2 employers were interested in a two-year Associate program for resource and conservation management (50%).
- Fifty-two percent of employers were interested in on-site customized training for their current energy employees.

Figure 10: 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 Orange County, 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 in Orange County 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.[19] 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. To further identify college programs, an online survey was disseminated to colleges.

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)
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

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

Orange County College Programs Related to Energy Efficiency Occupations
Three of the 9 colleges located in the Orange County region identified themselves as offering energy efficiency programs, certificates, or courses. Each college was asked to provide the following information:

- Current course, certificate, or program offerings in energy efficiency related topics.
- Future energy efficiency courses/programs being planned.
- Contact information for the lead person at the college.

Appendix L contains a summary of the information obtained, including information about courses being developed.

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

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

Table 3: Current College Programs, Certificates, or Courses

COLLEGE	ENERGY EFFICIENCY OCCUPATIONS							
	Energy Auditor or Home Energy Rater	Building Performance or Retrofitting 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							
Cypress					X, C, D		X	
Orange Coast				X	X, C, D		C	
Santiago Canyon				C				

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 table on the following page summarizes the existing and potential partnerships that can be leveraged.

Organization	Service Area (Type of Organization)	Contribution to Partnership
American Society of Heating, Refrigerating & Air Conditioning Engineers (ASHRAE) www.oeashrae.org	Orange Empire Chapter (Industry Association)	Access to Employers, Industry Standards, Job Descriptions
Building Commissioning Association, (BCA)* www.bcxa.org/southwest/	Southwest Chapter (Industry Association)	Access to Employers, Industry Standards, Job Descriptions, Industry Certification for Certified Commissioning Professional
Building Owners & Managers Association (BOMA) www.bomaoc.org	Orange County Chapter (Industry Association)	Access to Employers, Industry Standards, Job Descriptions
California Building Performance Contractors Association (CBPC A)* www.cbpca.org	Statewide & Southern California Chapter (Industry Association)	Access to Employers, Industry Standards, Job Descriptions, Building Performance Certifications and Training for HERS raters
California Commissioning Collaborative (CCC)* www.cacx.org	Statewide (Industry Association)	Access to Employers, Industry Standards, Job Descriptions
California Labor Federation AFL-CIO, Workforce and Economic Development Program www.wed-works.org	Statewide (Labor, Workforce & Economic Development Program)	Access to Labor Unions, Training Facilities through Union Locals
Environmental Training Centers, California Community Colleges* www.EnvTraining.org	Statewide (Economic & Workforce Development Program)	Technical Assistance, Curriculum Development, Training on energy auditing, regulatory compliance, and energy management/conservation.
International Facility Management Association (IFMA) www.ifmaoc.org	Orange County Chapter (Industry Association)	Access to Employers, Industry Standards, Job Descriptions, Training and Industry Certifications
Pacific Gas & Electric (PG&E)* www.pge.com	Statewide (Employer)	Industry Standards, Job Descriptions, Access to Employees for Training, Training Centers (San Francisco, Stockton)
UC Davis, Energy Efficiency Center http://eec.ucdavis.edu/	Statewide (Research & Development, Education Institution)	Access to internships, fellowships and job postings and forums, workshops, guest lectures, and events
US Green Building Council (USGBC) www.usgbc-oc.org	Orange County Chapter (Industry Association)	Access to Employers, Industry Standards, Job Descriptions, LEED Certification Training
Workforce Investment Boards (SETA, Golden Sierra, Yolo, Northern Central) www.cwib.ca.gov	Orange County (Workforce Development)	Access to Job Seekers, Training Funds, Employment Resources

* Existing Partnership

Conclusion and Recommendations

Employers in the energy efficiency sector are projected to increase employment substantially over the next three years in the Orange County region and across the state. The survey results indicate that the majority of employers are having some to great difficulty hiring qualified candidates in all eight energy efficiency occupations studied.

This study also reveals that there are only three training programs that fully prepare students for these in-demand jobs. In Orange County, Santiago Canyon College offers a program to prepare Project Managers. Coast College and Cypress College each offer a program to prepare HVAC Mechanic, Technician or Installers, and Building Controls Systems Technicians.

According to the survey results, employers indicated that they experience the most difficulty in hiring for three occupations: (1) Energy Auditors or Home Energy Raters, (2) Building Performance or Retrofitting Specialists, and (3) Compliance Analysts or Energy Regulation Specialists. Of these, the first two occupations are expected to experience the fastest growth rate in the next 3 years at 66% (250 jobs) and 48% (540 jobs) respectively. As such, these two occupations should be the top priority when considering where to allocate limited resources.

The good news is that colleges are beginning to anticipate employer needs for energy efficiency workers. Of the nine Orange County colleges surveyed, one is already planning a new course to address the need for Energy Auditors or Home Energy Raters. As this conversation continues, many other colleges will reflect on their offerings and consider program alignment to meet these occupational demands.

Orange County Community Colleges are well positioned to build a pipeline of skilled workers, create and expand industry partnerships, and meet regional workforce needs. The Centers of Excellence recommend the following action steps to promote the development of a skilled energy efficiency workforce.

Recommendations

1. Refine the list of Orange County Community College courses and programs for Energy Efficiency Occupations.

- Working through the regional consortium, confirm and clarify the program offerings for each Orange County Community College related to these eight occupations to ensure program duplication does not occur.
- Many colleges indicated that they were beginning program development for energy efficiency course; it would be productive to gain insight on the timing and feasibility of these programs.

2. Create and expand industry partnerships.

- 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.
- Establish regional advisory boards to assist multiple, adjacent colleges, to identify in an on-going way, the employment skills and education requirements of employers.

- Collaborate regionally on grants to fund program development, partnerships with industry and equipment needed to expand programs on energy efficiency.

3. Build a pipeline of skilled workers.

- Create, adapt, or expand energy efficiency courses and programs at Orange County Community colleges to meet the projected demand for the eight occupations studied.
- Work with the Environmental Training 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.

4. Develop employer preference training methods:

- Expand internship opportunities for community college students to include energy efficiency occupations; 2/3 of employers surveyed indicated interest in developing such programs.
- Develop contract education offerings for these occupations by leveraging the statewide contract education program. Half of employers were interested in on-site customized training for their current employees.

5. Further develop communication skills curriculum:

- Ensure that communication skills are a component of existing and new program development. Approximately 70-90% of employers in all five industry segments indicated that the most valued skill as an employee is the ability to communicate with customers, in writing and in person.

6. Provide on-going professional development for college faculty.

- Work with the Environmental Training 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 08-305-020 for $205,000) represents funding for multiple projects and written reports through the Northern California 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 Industries for Energy Efficiency Research

One of the central challenges in getting feedback from employers in emerging occupations is understanding where the employers exist 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 these 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.

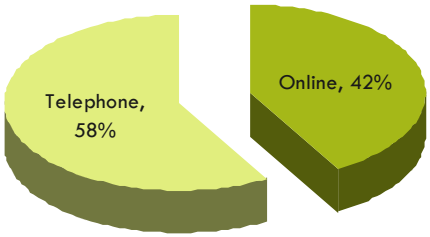
3. **Facility/Building Operations and Maintenance** (NAICS definition: 8113 Commercial & Industrial Equipment Repair and Maintenance, 53131 Real Estate Property Managers & Large Employers with Large Facilities) This includes those employers that hire individuals who can repair and maintain the new energy 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 the Orange County Region, 42percent of the survey responses were submitted online; 58 percent were conducted by telephone.

About the Respondents

One hundred and thirty seven (137) employers, representing a combined workforce of more than 2,527 Orange County 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. Orange County 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

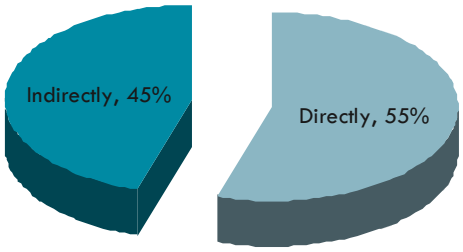
924..... Administration of Environmental Programs

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, operation, 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.



Fifty-five percent of respondents identified their work as directly involved in energy efficiency, as a primary part of their business, while forty-five percent 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 2009 Employment and Projected Employment
(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
HVAC mechanics, technicians or installers	1,147	30	3%	321	28%
Project managers for construction or design	517	35	7%	157	30%
Building operators or building engineers	359	23	6%	50	14%
Building performance or retrofitting specialists	204	40	20%	98	48%
Building controls systems technician	138	13	9%	52	38%
Resource conservation or energy efficiency managers	61	9	15%	25	41%
Compliance analyst or energy regulation specialists	58	5	9%	11	19%
Energy auditors or home energy raters	44	10	23%	29	66%
Total, All Occupations	**2,527**	**165**		**743**	

Study Methodology: Universe of Firms

To estimate the total number of energy efficiency firms in the Orange County Region, the following inputs were considered.

- 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) that provided invaluable information about their organizations and members.
    - California Association of Building Performance Contractors (CABPC)
    - 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 the Orange County Region or are no longer doing business. The total number for each database was then combined into the universe of firms estimate (1,130).

Study Methodology: Occupational Employment

Eight energy efficiency occupations were identified as high-growth and aligned with community college education programs. The combined employment in Orange County for the eight occupations totals at least 2,527 jobs (known employment from survey respondents) and could be as high as 9,460 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 the Orange County Region. Margin of error for the 137 survey respondents (out of the universe of 1,130) is ± 7.86 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 above), 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: Energy Efficiency Investments in 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)[20]	$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.

[20] 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 E: California's Key Legislative and Policy Initiatives

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 F: Examples of Energy Efficiency Programs Provided by Local Utilities

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
Standard Performance Contract	Financial incentives for businesses to offset the capital cost of installing new high efficiency equipment or systems.	http://www.sce.com/b-rs/large-business/spc/standard-performance-contracts.htm
Agricultural Energy Efficiency Program	Energy-efficient solutions for small and large farms, ranches, and dairies.	http://www.sce.com/b-rs/agriculture/agriculture.htm
California New Homes Program	Financial incentives to homebuilders who construct homes that exceed California's energy efficiency standards for new residential construction (Title 24).	http://www.sce.com/b-rs/bb/cali-new-homes/california-new-homes-program.htm
Direct Install Program	Free energy efficient products for small businesses, including free installation and long-term 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
Industrial Energy Efficiency Programs	Combines industrial energy expertise with incentives to help industrial customers save energy, money and the environment.	http://www.sce.com/b-rs/industrial/ieep.htm
Innovative Designs for Energy Efficiency Activities Program	Focus is on different marketing or delivery methods, different market segments, and/or different technologies from those offered in the SCE portfolio.	http://www.sce.com/AboutSCE/Regulatory/eefilings/IDEEAProgram/default.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/
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

Program	What it Provides	Website for Information
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
Demand Response Contracts	Demand response resources from a third party contractor.	http://www.sce.com/b-rs/demand-response-programs/demand-response-contracts.htm
Permanent Load Shifting (PLS)	Assist business customers with resources to acquire PLS enabling technologies to reduce their energy bills by shifting load from peak time periods when rates are higher to mid- and off-peak periods when rates are lower.	http://www.sce.com/pls/permanent-load-shifting.htm
Agriculture Pumping – Interruptible Program	Customers earn a year-round monthly bill credit when they agree to temporarily interrupt electric service to their equipment during a power emergency.	http://www.sce.com/b-rs/agriculture/agricultural-pumping-interruptible.htm
Auto Demand Response	Enables customers with Energy Management Systems to participate without manual intervention.	http://www.sce.com/b-rs/large-business/auto-demand-response.htm
Base Interruptible Program	An interruptible rate designed for customers and aggregators (participants) whose monthly Maximum Demand or aggregated monthly Maximum Demand reaches or exceeds 200 kW and who commit to curtail at least 15% of their Maximum Demand, which shall not be less than 100 kW per period of Interruption.	http://www.sce.com/tou
TOU-BIP Event Status	Notifies customers that an interruption event is underway via the Remote Terminal Unit and the dedicated telephone.	http://www.sce.com/b-rs/large-business/event-status/tou-bip-event-status.htm
Capacity Bidding Program	Internet-based program that offers financial incentives to customers agreeing to reduce their energy use when SCE forecasts and calls a critical "event".	http://www.sce.com/cbp
Critical Peak Pricing	Rate discounts to customers for shifting or reducing electricity use during critical peak events in the summer season.	http://www.sce.com/b-rs/large-business/cpp/critical-peak-pricing.htm
Demand Bidding Program (DBP)	Internet-based bidding program that offers qualified participants (who have at least one service account with a demand of 200 kilowatts or greater) the opportunity to receive bill credits for voluntarily reducing load when a DBP event is called.	http://www.sce.com/dbp
Optional Binding Mandatory Curtailment Program	Exempts customers from rotating outages in exchange for partial power reductions from their entire circuit over a longer period.	http://www.sce.com/b-rs/large-business/optional-binding-mandatory-curtailment.htm

Program	What it Provides	Website for Information
Summer Discount Plan	SCE installs a cycling device on customer's central air conditioner. In exchange, customers receive a credit on their summer season electric bills for permitting SCE to periodically turn off, or "cycle", their air conditioner(s).	http://www.sce.com/summerdiscount
Self Generation Incentive Program (SGIP)	Business customers with a demand of 30 kilowatts or more can receive a cash incentive from 60 cents to $4.50 per watt for installing qualifying electricity generating equipment under SGIP.	http://www.sce.com/customergeneration/customer-generation.htm
Technical Assistance & Technology Incentives	Free demand response site assessments to eligible commercial and industrial customers and offers financial incentives for installing eligible demand response equipment that reduce electricity usage during periods of peak demand.	http://www.sce.com/b-rs/large-business/technical-assistance-technology-incentives.htm
Agricultural Technology Application Center (Tulare, CA)	Education center that provides energy solutions for an industry that is becoming more high-tech and complex every day.	http://www.sce.com/b-sb/energy-centers/
Customer Technology Application Center (Irwindale, CA)	Education center that provides information about energy management and efficiency. It provides solutions tailored to business needs.	http://www.sce.com/b-sb/energy-centers/
Multifamily Energy Efficiency Rebate Program	Property owners and managers incentives on a broad list of energy efficiency improvements in lighting, HVAC, insulation and window categories. These improvements are to be used to retrofit existing multifamily properties of two or more units.	http://www.sce.com/residential/rebates-savings/multifamily/multifamily-energy-efficiency.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
Whole House Fan Rebate	$50 back on a Whole House Fan. This rebate is part of the HEER.	http://www.sce.com/residential/rebates-savings/heating-cooling/whole-house-fan.htm
Pool Pump & Motor Rebate	$200 back for a Two-speed pool pump or Variable-speed pool pump purchased and installed from January 1, 2009 through December 31, 2009. This rebate is part of the HEER.	http://www.sce.com/residential/rebates-savings/pool/pool-pump-motor.htm
ENERGY STAR® Qualified Refrigerator Rebate	$50 back on an ENERGY STAR® qualified refrigerator. This rebate is part of the HEER.	http://www.sce.com/residential/rebates-savings/appliance/energy-star-fridge.htm

Program	What it Provides	Website for Information
Energy efficient Electric Water Heater Rebate	$30 back for purchasing an energy efficient electric water heater. This rebate is part of the HEER.	http://www.sce.com/residential/rebates-savings/appliance/electric-water-heater.htm
Refrigerator and Freezer Recycling Program	$50 for old, working refrigerator or freezer.	http://www.sce.com/residential/rebates-savings/appliance/fridge-freezer-recycling.htm
A/C Quality	Saves money on cooling bills and improves comfort by ensuring that central A/C systems are efficient and reliable.	http://www.sce.com/residential/rebates-savings/heating-cooling/air-conditioner-quality.htm
Energy Star® Lighting	From time to time, SCE works with manufacturers and retailers to make possible special discount prices on specific ENERGY STAR® qualified lighting products. You might see the SCE logo on packages at your favorite stores.	http://www.sce.com/residential/rebates-savings/lighting/energy-star-lighting.htm
SCE Operation Light Exchange	Allows residential customers to exchange halogen torchiere floor lamps and incandescent floor/table/desk lamps/night lights for new Energy Star labeled lamps.	www.scelampexchange.com
Solar Incentives	Rebates on fixed and tracking photovoltaic (solar energy) systems, as part of the California Solar Initiative.	http://www.sce.com/residential/rebates-savings/csi/

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 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/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

Program	What it Provides	Website for Information
Advanced Home Program	A residential new construction program that encourages builders to develop single family and multi-family homes that incorporate sustainable design and higher energy-efficiency standards through education, design assistance and financial incentives.	http://www.socalgas.com/construction/ahp/index.html
Savings By Design	Provides energy analysis and financial incentives of up to $150,000 for commercial and $500,000 for industrial customers considering a new process line, new facility, or new equipment.	http://www.socalgas.com/business/sbd/index.html
Energy Efficiency Programs for Commercial/Industrial Large Business Customers	Incentives up to $2,000,000 per premise per year on qualifying energy-efficient equipment retrofits, process redesigns (or a combination of both) for projects that can save more than 200,000 therms per year.	http://www.socalgas.com/business/efficiency/largeBusinessCustomers.html
Express Efficiency Rebates	Cash rebates up to $200,000 per customer per year to offset the cost of new, energy-efficient equipment.	http://www.socalgas.com/business/rebates/er_express_rebates.html
Business Energy Efficiency Programs	Incentives of up to $2,000,000 per premise per year for eligible core or non-core customers on qualifying new energy-efficient equipment, process improvements, or a combination of both.	http://www.socalgas.com/business/efficiency/beep/index.html
Commercial/Industrial Incentives	Incentives for new energy-efficient equipment, refurbishing of selected applications or modification of gas related processes.	http://www.socalgas.com/business/rebates/ic_home.html
Industrial End User Program	Offered at no charge, helps industrial customers work through technical issues to identify and quantify cost savings from complex energy-efficiency projects.	http://www.socalgas.com/business/efficiency/industrialEndUser.html
Commercial Food Service Rebates	Rebates for equipment replacement, which offset the initial purchase cost, plus energy savings and lower operating costs.	http://www.socalgas.com/business/rebates/parr.html
Vendor Participation Program	Allows suppliers and installers of insulation, steam traps, boilers and other qualifying measures to apply for energy efficiency rebates on behalf of their customers.	http://www.socalgas.com/business/vendorParticipationProgram/
Self Generation	Financial incentives to help business customers offset the cost of installing systems to generate their own electricity.	http://www.socalgas.com/business/selfGen/index.html
Gas Engines	Funding to replace or rebuild existing gas engine and pump.	http://www.socalgas.com/business/rebates/gasEngines.html
Energy Resource Center	Resource center which offer certification and training programs.	http://www.socalgas.com/business/resourceCenter/ercHome.html

Program	What it Provides	Website for Information
Food Service Equipment Center	Equipment center where someone can "test drive" more than 150 pieces of equipment from more than 60 different manufacturers.	http://www.socalgas.com/business/foodService/
Energy Challenger Survey	Survey that helps businesses find out how they can save energy and money.	http://www.socalgas.com/business/energysurvey/index.html
On-Bill Financing	Working in conjunction with The Gas Company's energy efficiency programs, On-Bill Financing offers qualified business customers 0%, unsecured financing from $5,000 to $250,000 per meter for taxpayer-funded institutional customers (e.g. cities, counties, etc.) and $5,000 to $100,000 per meter for non-institutional customers to facilitate the purchase and installation of qualifying natural gas energy efficiency measures.	http://www.socalgas.com/business/rebates/onBillFinancing.html
Equipment & Technology	For information on natural gas equipment & technologies.	http://www.socalgas.com/business/usefulInnovations/tsHome.html

Appendix G: Energy Efficiency Research Institutions and Programs

University of California, Irvine
Pacific Rim Consortium on Energy, Combustion, and the Environment (PARCON): Located at the UCI Engineering Laboratory Facility, this consortium encourages communication and the exchange of technologies and tools available to address the energy challenges in the world with immediate focus on those relevant to the region.
(www.parcon.uci.edu)

Advanced Energy and Power Program (APEP): Located at the UCI Engineering Laboratory Facility, this program is involved in research with three main areas; the National Fuel Cell Research Center, the UCI Combustion Laboratory, and research in Information Technology.
(www.apep.uci.edu)

California State University, Fullerton
Offers a Green Building Certificate focusing on the emerging trend of developing sustainable communities through green design and by defining more effective ways to use viable resources. Offered through the university extended education program.
(www.csufextension.org/classes/certificate/CertDetail.aspx?GN=3409&GV=1)

Chapman University
Environmental Science and Policy Program: An interdisciplinary degree that encourages students to explore in a systematic way the complex interactions among atmospheric, hydrologic, geological, and biological systems and human activities.
(www.chapman.edu/CS/EnvSci/default.asp)

Appendix H: "Energy Efficiency, Innovation and Job Creation in California"

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 I: 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:[21]

- 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 Orange County, employment in this occupation is projected to increase 2.6 percent over the next 12 months (50 new jobs).
- Over the next three years, employment is projected to increase 28 percent or by 580 jobs.
- In addition to increased demand for HVAC technicians, 22 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 27 percent of employers responding "great" difficulty.

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**

[21] Occupational Outlook Handbook, 2008-2009, "Heating, Air-Conditioning, and Refrigeration Mechanics and Installers," www.bls.gov/oco

workers is building commissioning, which is a complete mechanical inspection of a building's HVAC, water, and lighting systems.[22]

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.

- 56 percent of employers surveyed preferred HVAC technicians with experience in the industry, while 32 percent indicated preference for a specific Associate degree or program certificate.
- When asked what skills are most important, Orange County employers working in Facility or Building Operations and Maintenance indicated they value the ability to communicate with customers, in writing and in person (70 percent), and understanding of HVAC systems functions, operations, and maintenance (53 percent).

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

	Entry Level Median Annual Wage	Experienced Level Median Annual Wage
HVAC Technicians	$37,440	$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: 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:[23]

- 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.

[22]Occupational Outlook Handbook, 2008-2009, "Sheet Metal Workers," www.bls.gov/oco
[23]Occupational Outlook Handbook, 2008-2009, "Construction Managers," www.bls.gov/oco

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.

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 the Orange County Region, employment in this occupation is projected to increase 6.7 percent over the next 12 months (220 new jobs).
- Over the next three years, employment is projected to increase 30.4 percent or by 990 jobs.
- In addition to increased demand for Project Managers, 42 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 17 percent of employers responding "great" difficulty.

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.[24]

- 35 percent of employers surveyed preferred Project Managers with a related Bachelor's degree, while 25 percent indicated preference for a specific Associate degree or program certificate, and 24 percent preferred industry experience.
- When asked what skills are most important, Orange County employers working in Design and/or Construction of New Buildings indicated they value the ability to communicate with customers, in writing and in person (91 percent), general construction experience (54 percent), and knowledge of LEED standards and principles (46 percent).

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

Occupational Wages: In Orange County, 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	$52,000	$80,000

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 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.[25]

- 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 specialist are expected to experience significant growth in the immediate future.

- In Orange County, employment in this occupation is projected to increase 19.7 percent over the next 12 months (220 new jobs).
- Over the next three years, employment is projected to increase 48.3 percent or by 540 jobs.
- In addition to increased demand for building performance or retrofitting specialists, 38 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 29 percent of employers responding “great” difficulty.

[25]Occupational Outlook Handbook, 2008-2009, “Insulators,” www.bls.gov/oco

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.[26]

- 36 percent of employers surveyed preferred building performance or retrofitting specialists with a specific Associate degree or program certificate, while 21 percent indicated specialists would benefit from a related Bachelor's degree and 33 percent would consider experience in the industry adequate.
- When asked what skills are most important, Orange County employers working in Improving Energy Efficiency in Homes (Retrofitting Homes) indicated they value the ability to communicate with customers, in writing and in person (90 percent), building inspection for safety, quality of installation, verification of efficiency (50 percent), ability to conduct home performance diagnostic testing (50 percent), and Ability to conduct home performance diagnostic testing (50 percent).

Occupational Wages: In Orange County, 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	$46,800	$64,480

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.

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

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 Orange County, employment in this occupation is projected to increase 23 percent over the next 12 months (90 new jobs).
- Over the next three years, employment is projected to increase 65.7 percent or by 250 jobs.
- In addition to increased demand for energy auditors or home energy raters, 43 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 24 percent of employers responding "great" difficulty.

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.

- 38 percent of employers surveyed preferred energy auditors or home energy raters with a specific Associate degree or program, while 29 percent indicated preference for a related Bachelor's degree and 19 percent would consider experience in the industry adequate.
- When asked what skills are most important, Orange County 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 (81 percent), understanding of local and state energy efficiency requirements and incentives for existing buildings (52 percent), and the ability to test and troubleshoot building and process systems, including HVAC, electrical and electronic systems (52 percent)

Occupational Wages: In Orange County, 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	$45,000	$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: 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 significant growth in the immediate future.

- In Orange County, employment in this occupation is projected to increase 14.9 percent over the next 12 months (80 new jobs).
- Over the next three years, employment is projected to increase 41 percent or by 220 jobs.
- In addition to increased demand for resource conservation or energy efficiency managers, 33 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 23 percent of employers responding "great" difficulty.

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.

- 57 percent of employers surveyed preferred resource conservation or energy managers with a related Bachelor's degree, while 20 percent indicated preference for a specific Associate degree or program certificate, and 13 percent would consider experience in the industry adequate.
- Two-thirds of employers expressed great or some interest in an internship program for community college students.
- One out of two employers were interested in on-site customized training for their current energy employees (52 percent) and a two-year Associate degree or certificate program for building controls systems technicians (50 percent).
- When asked what skills are most important, Orange County employers working in Utilities and Resource Management indicated they value the ability to communicate with customers, in writing and in person (88 percent), and an understanding of local and state energy efficiency requirements and incentives for new and existing buildings (71 percent).

Occupational Wages: In Orange County, 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	$52,000	$80,000

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 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. Building controls systems technicians are expected to experience significant growth in the immediate future.

- In the Orange County Region, employment in this occupation is projected to increase 9.4 percent over the next 12 months (90 new jobs).
- Over the next three years, employment is projected to increase 37.5 percent or by 360 jobs.
- In addition to increased demand for technicians, 29 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 25 percent of employers responding “great” difficulty.

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.

- 33 percent of employers surveyed preferred building controls systems technicians with a specific Associate degree or certificate, while only 4 percent indicated technicians would benefit from a related Bachelor’s degree and 46 percent would consider experience in the industry adequate.

- When asked what skills are most important, Orange County employers working in Facility or Building Operations and Maintenance indicated they value the ability to communicate with customers, in writing and in person (70 percent), and understanding of HVAC systems functions, operations, and maintenance (53 percent).

Occupational Wages: In Orange County, 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	$45,000	$73,900

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 significant growth in the immediate future.

- In Orange County, employment in this occupation is projected to increase 6.5 percent over the next 12 months (30 new jobs).
- Over the next three years, employment is projected to increase 13.8 percent or by 70 jobs.
- In addition to increased demand for technicians, 38 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 5 percent of employers responding "great" difficulty.

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.

- 43 percent of employers surveyed preferred building operators or building engineers with a specific Associate degree or certificate, while 38 percent indicated preference for a related Bachelor's degree and 10 percent would consider experience in the industry adequate.
- When asked what skills are most important, Orange County employers working in Facility or Building Operations and Maintenance indicated they value the ability to communicate with customers, in writing and in person (70 percent), and an understanding of HVAC systems functions, operations, and maintenance (53 percent).

Occupational Wages: In the Orange County, 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	$56,160	$74,000

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: 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 regulation specific to energy use and energy efficiency. Compliance analysts or energy regulation specialists are expected to experience significant growth in the immediate future.

- In Orange County, employment in this occupation is projected to increase 8.6 percent over the next 12 months (50 new jobs).
- Over the next three years, employment is projected to increase 18.9 percent or by 120 jobs.

- In addition to increased demand for technicians, 56 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 8 percent of employers responding "great" difficulty.

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.

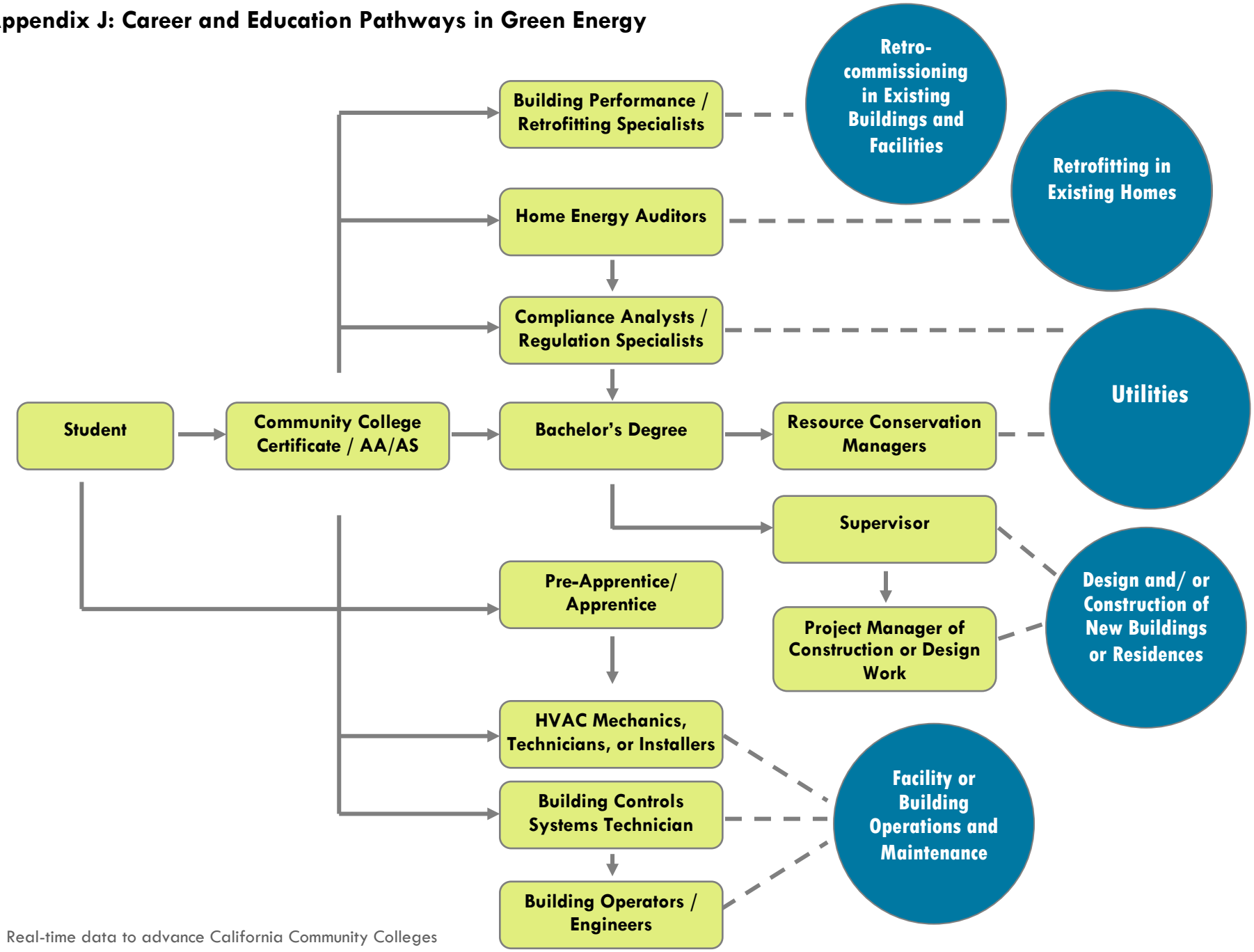
- 36 percent of employers surveyed preferred compliance analysts or energy regulation specialists to have a related Bachelor's degree, 36 percent indicated preference for a specific Associate degree or program certificate, and 8 percent would consider experience in the industry adequate.
- When asked what skills are most important, Orange County employers working in Utilities and Resource Management indicated they value the ability to communicate with customers, in writing and in person (88 percent), and an understanding of local and state energy efficiency requirements and incentives for new and existing buildings (71 percent).

Occupational Wages: In Orange county, 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	$60,000	$80,000

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.

Appendix J: Career and Education Pathways in Green Energy



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

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/

Appendix L: Orange County College Programs Related to Energy Efficiency Occupations

Six of the eight colleges in Orange County offer or plan to offer programs or courses related to the eight energy efficiency occupations identified in this report. The following table provides details about the current and proposed programs.

Current College Programs in Energy Efficiency, Future Offerings and College Contacts

	Energy Auditor or Home Energy Rater	Bldg. Performance or Retrofitting Specialist	Compliance Analyst or Energy Regulation Specialist	Construction or Design Project Manager	HVAC Mechanic, Tech., or Installer	Resource Conservation or Energy Efficiency Manager	Bldg. Controls Systems Technician	Bldg. Operator or Engineer
Cypress					Degree, Certificate & Course		Course	
Irvine Valley					Developing a not-for-credit course			
NOCCCD-SCE				Customized Training				
Orange Coast	Developing course			Course	Degree, Certificate, Course & Customized Training	Developing course	Certificate	
Santiago Canyon				Certificate				