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ENVIRONMENTAL SCAN

# ENERGY EFFICIENCY OCCUPATIONS

## San Diego and Imperial Region

JULY 2009

CENTERS OF EXCELLENCE
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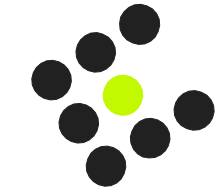

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**Mission**: The Centers of Excellence, in partnership with business and industry, deliver regional workforce research customized for community college decision making and resource development.

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



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## Contents

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**Based on a 2009 survey of San Diego and Imperial Region firms who employ Energy Efficiency workers, as many as 2,610 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 multiple research and industry partners, studied the energy efficiency sector in the San Diego and Imperial Region and across California. This report provides labor market intelligence for the San Diego and Imperial 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.

More than 150 employers responded to the survey, which yielded a comprehensive 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 is being fueled in part by the hundreds of millions of dollars coming to California and the San Diego Imperial Region from the American Recovery and Reinvestment Act of 2009.

Out of the eight occupations studied, compliance analysts are expected to grow the fastest (53 percent), adding 290 jobs in three years, while project managers for construction or design work are expected to add the most jobs, approximately 580 over the same three year period.

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

In the San Diego and Imperial Region, there are six programs that fully prepare students for energy efficiency occupations. In addition, there are three programs under development, mostly focused on energy auditing, home energy rating, and building retrofits. **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, and most have expressed an interest in expanding their offerings.

The findings from this study support the creation, adaptation and expansion of energy efficiency courses and programs at San Diego and Imperial 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.

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

The construction and operation of residential and commercial buildings in the U.S. accounts for 39 percent of our total energy use. This compares to the industrial sector at 33 percent and the transportation sector at 28 percent of total U.S. energy use.[1] Because buildings are such a significant consumer of energy and contributor to greenhouse gas emissions, they also need to be a focal point for any potential solutions.[2] As California's legislation and policy move in the 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 2008, the Centers of Excellence partnered with multiple utilities agencies including Southern California Edison, Southern California Gas Company, Pacific Gas and Electric (PG&E), and others. The COE also worked with several statewide and regional 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 feature in this study. The data released in this study is for the San Diego and Imperial Counties.

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.

[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.
[3]United States Green Building Council (USGBC); California Building Performance Contractors Association (CBPCA); Building Owners and Managers Association (BOMA); American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE); California Commissioning Collaborative Building Commissioning Association (BCA, Southwest Chapter); International Facility Management Association (IFMA); IBEW (Local 569); California Center for Sustainable Energy (CCSE); and the San Diego Workforce Partnership (SDWP).

Primary research was conducted with firms in the energy efficiency sector in the San Diego and Imperial Region.[4,5] Employers were surveyed from December 2008 through July 2009, resulting in 158 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.

[4]See definition of energy efficiency sector on page 9.

[5]The San Diego and Imperial Region includes San Diego and Imperial Counties.

## 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, [6] 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.[7]

***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.[8]

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.[9]

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

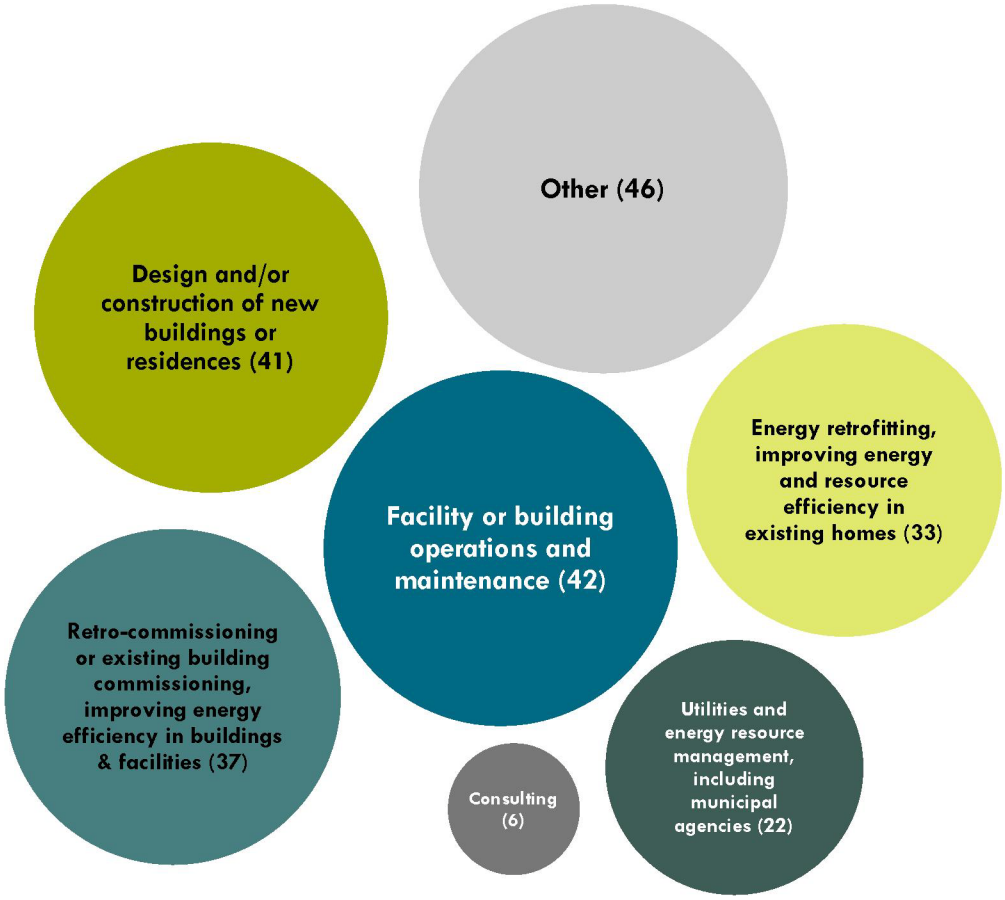
### Types of Employers, Number and Location of Firms in the Region

In the San Diego and Imperial Region, it is estimated that approximately 1,135 firms employ energy efficiency workers in one or more of the eight occupations studied. Of these, 158 responded to the survey. Sixty percent of employers identify themselves as involved directly with energy efficiency work, while forty percent said they were indirectly involved.[10]

**Eight Occupations Studied**

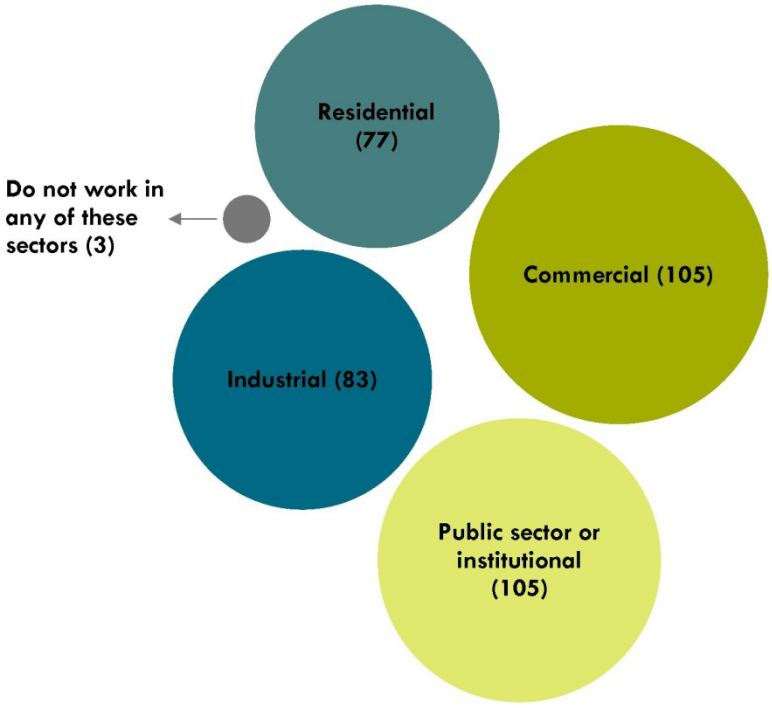
- Energy Auditor/Home Energy Rater
- Building Performance/Retrofitting Specialist
- Resource Conservation/Energy Efficiency Manager
- Compliance Analyst/Energy Regulation Specialist
- Construction/Design Project Manager
- HVAC Technicians/Installers
- Building Controls Systems Technicians
- Building 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 design and/or construction of new buildings than any other industry. (Note: Total exceeds 158 responses, since multiple responses were allowed.)

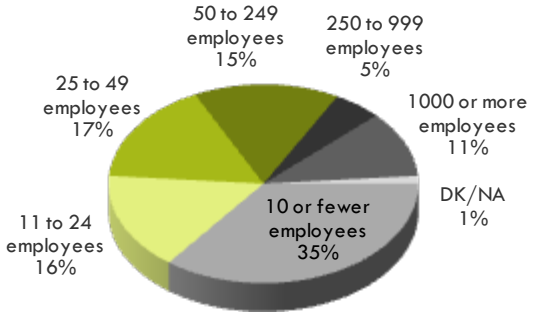



[10]See Appendix C for methodology on estimating number of firms.

Employers were also asked to identify the sectors within energy efficiency that they serve. Firms were allowed to pick all sectors that apply to their firm's services. The chart to the right shows that more firms provide services in the commercial and residential sector than in the industrial or public sector. (Note: Total exceeds 158 responses, since multiple responses were allowed.)




The survey data reveals that most of the firms are relatively small — 51% employ fewer than 25 employees — with a significant portion (35%) employing 10 or fewer employees. More data on the size of firms is shown in the pie chart below. Nearly all of the employers surveyed were located in San Diego County.




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

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

## Current Forces Driving Growth in Energy Efficiency

***Federal Legislation***

On February 17, 2009 President Obama signed into law the American Recovery and Reinvestment Act (ARRA) 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 San Diego and Imperial Region. Appendix E contains a summary of the Energy Efficiency related provisions in ARRA.

***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."[11] A summary of California's key legislative and policy initiatives related to Energy Efficiency can be found in Appendix F.

***Utility Energy Efficiency Programs***

Beginning in 2006, 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. The CPUC estimates that the amount of energy saved since 2006 eliminated the need to build three large power plants.[12] Sempra Energy's utilities (San Diego Gas & Electric (SDG&E) and Southern California Gas (SoCalGas)) have invested millions of dollars in energy efficiency incentives and programs. Since 1990, these programs have saved enough natural gas since to supply more than 800,000 homes and electricity to power nearly 600,000 homes for one year. The utilities' energy-efficiency programs also reduced peak electricity demand by more than 800 megawatts, the equivalent of nearly two large power plants.[13]

SDG&E and SoCalGas have achieved these savings by providing millions of dollars in incentives and rebates, including $60 million in 2009, to Southern California businesses that upgrade equipment and become more energy-efficient. In 2008, the utilities helped customers exchange more than four million standard light bulbs for efficient compact fluorescent light bulbs and weatherized 73,000 homes.[14]

***Regional Energy Efficiency Initiatives***

The California Center for Sustainable Energy (CCSE) is a nonprofit organization responsible for administering energy incentives for renewable energy production and energy efficiency projects

[11]Public Utilities Code Section 454.5(b)(9)(C)
[12]San Francisco Chronicle, "PG&E gets cash advance to pay backlog of energy-saving rebates", March14, 2009.
[13]SEMPRA, online at http://public.sempra.com/newsreleases/viewPR.cfm?PR_ID=2394&Co_Short_Nm=SE
[14]Ibid.

for consumers and businesses. The CCSE services include trainings, workshops, and technical assistance to builders and consumers to reduce energy usage. In addition to its energy advisory services, the CCSE provides financial incentives to nonprofit organizations to promote energy savings. The CCSE has also taken the lead on the City of San Diego and County of San Diego Energy Efficiency and Conservation Block Grant stimulus funds. These funds will be used for the following projects:

- $250,000 to enact a Climate Action Plan
- $3 million for a low-income home retrofit program with required audits, education and upgrades. The focus will be on low-income and those homeowners right above low-income criteria in "economically disadvantaged" neighborhoods
- $1.5 million for a home retrofit program (with no income requirements)
- $2.5 million for a city revolving loan fund for energy projects
- $2 million to retrofit city street lights
- $2 million for energy efficiency upgrades for Balboa Park[15]

In June, CleanTECH San Diego, in partnership with SDG&E and Mayor Sanders, launched program that offers qualified small businesses in the City of San Diego interest free financing for up to 10 years to fund energy efficiency improvements such as lighting retrofits, HVAC upgrades, water and heat pumps and food service equipment.

## 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.[16] San Diego area unemployment is 10.3 percent and Imperial County unemployment has skyrocketed to 27.5 percent.[17] 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 the San Diego and Imperial Region 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 statewide 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.

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

[15]City of San Diego, www.sandiego.gov
[16]California Employment Development Department, Labor Market Information Division, County Unemployment Rates, www.labormarketinfo.edd.ca.gov
[17]Ibid.

## 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.[18] The eight occupations studied, as well as current and projected employment in the San Diego and Imperial Region, are listed in Table 1 on the following page. Occupational profiles for the eight occupations can be found in Appendix J.

***Qualifying the Employment Estimates***

The combined occupational employment in the San Diego and Imperial Region for the eight energy efficiency occupations studied, totals at least 3,255 jobs (count of known employment from the 158 survey respondents) and could be as high as 11,780 jobs.[19] 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 San Diego and Imperial Region (1,135).

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 **650 new jobs for the San Diego and Imperial Region economy.**[20]

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 **2,610 new jobs for the San Diego and Imperial Region economy.**

Employers expect the anticipated economic recovery to strengthen the demand for energy efficiency occupations, as **all eight occupations show employment growth expectations of 17 percent or higher over the next 3 years.**

[18]Occupations were identified through executive interviews with industry leaders, Rich Della Valle, Statewide Director, Environmental Training Centers (ETC), community college faculty and deans, and the Energy Services occupational framework developed by ATEEC in 2008.

[19]Employment data from the 158 survey respondents is summarized in Appendix C.

[20]Employers were asked how many additional employees they expected to hire in 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 San Diego and Imperial 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 the project is completed in a timely manner and within budget. | 2,910 | 160 | 6% | 580 | 20% |
| **HVAC mechanics, technicians or installers** install, repair and maintain heating, ventilation, air-conditioning and refrigeration systems. | 1,790 | 60 | 3% | 440 | 25% |
| **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. | 1,550 | 50 | 3% | 310 | 20% |
| **Building operators or building engineers** troubleshoot, install, replace, and repair building energy systems and controls to optimize energy efficiency. | 1,510 | 60 | 4% | 260 | 17% |
| **Building controls systems technicians** combine some of the traditional skill sets of building technicians with advanced skills in controls programming, networking, and systems integration. | 1,410 | 100 | 7% | 340 | 24% |
| **Resource conservation or energy efficiency managers** assess current energy and resource consumption and develop strategies to reduce usage. | 1,160 | 70 | 6% | 240 | 21% |
| **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 energy profile. | 920 | 60 | 7% | 150 | 17% |
| **Compliance analyst or energy regulation specialists** evaluate if projects are meeting regulatory requirements and/or incentives. Provide recommendations to meet compliance. | 540 | 90 | 16% | 290 | 53% |
| **Total, All Occupations** (totals may not add due to rounding) | **11,780** | **650** | | **2,610** | |

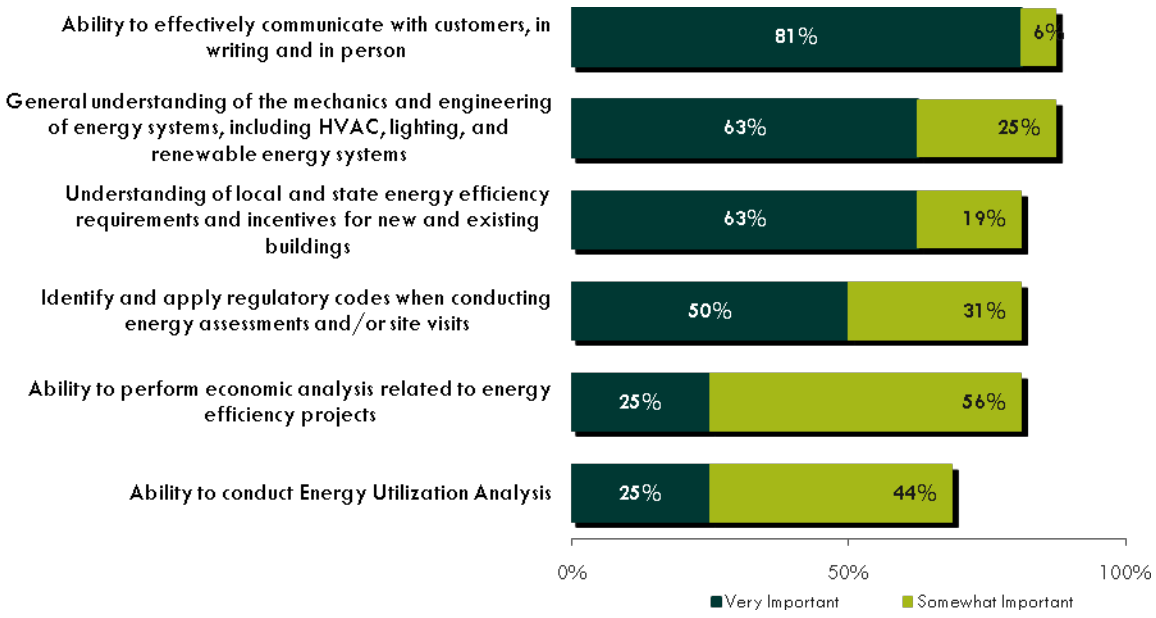
Other highlights include:

- The largest growth occupations **over the next 12 months** are project managers for construction or design work with as many as 160 new jobs projected, followed by building controls systems technicians, with as many as 100 new jobs projected over the same period.
- The largest growth occupations **over the next three years** are project managers for construction or design work with as many as 580 new jobs projected, followed by HVAC mechanics, technicians, or installers with as many as 440 new jobs projected.
- The fastest growth rate over 12 months is projected for compliance analysts or energy regulation specialists (16%), followed by building controls systems technicians and energy auditors or home energy raters (each at 7%).
- The fastest growth rate over three years is projected for compliance analysts or energy regulation specialists (53%), followed by HVAC mechanics, technicians, or installers (25%).

## Occupational Skill and Knowledge Requirements

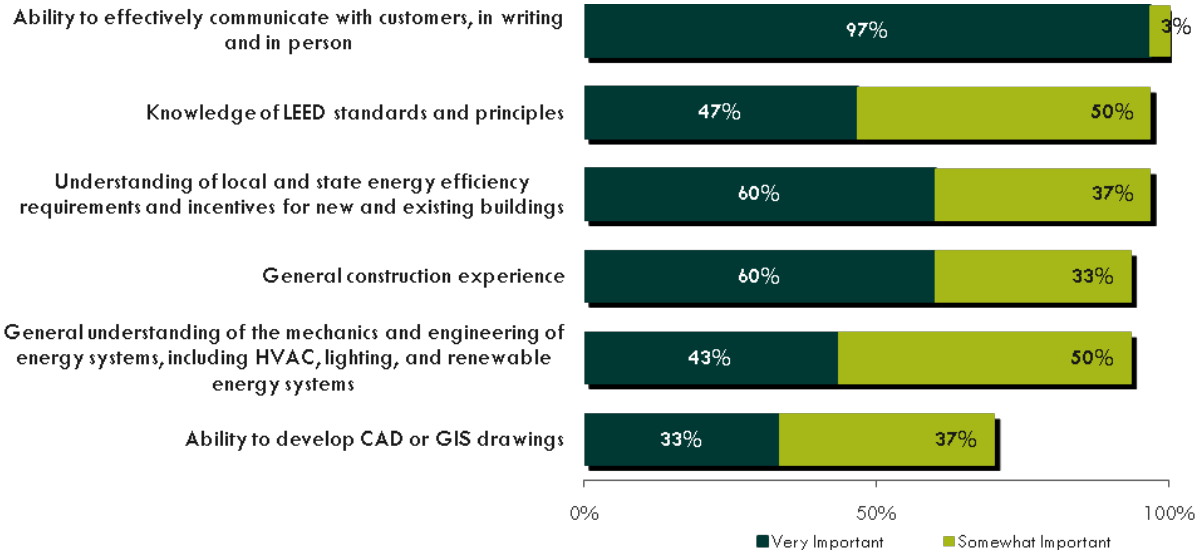
Employers were asked to identify the industry segment that their firm is most closely aligned with. They were then asked about the skills and areas of knowledge important to them when hiring employees. The survey results for the five industry segments are found in the figures below:

**Figure 1: Utilities and Resource Management**



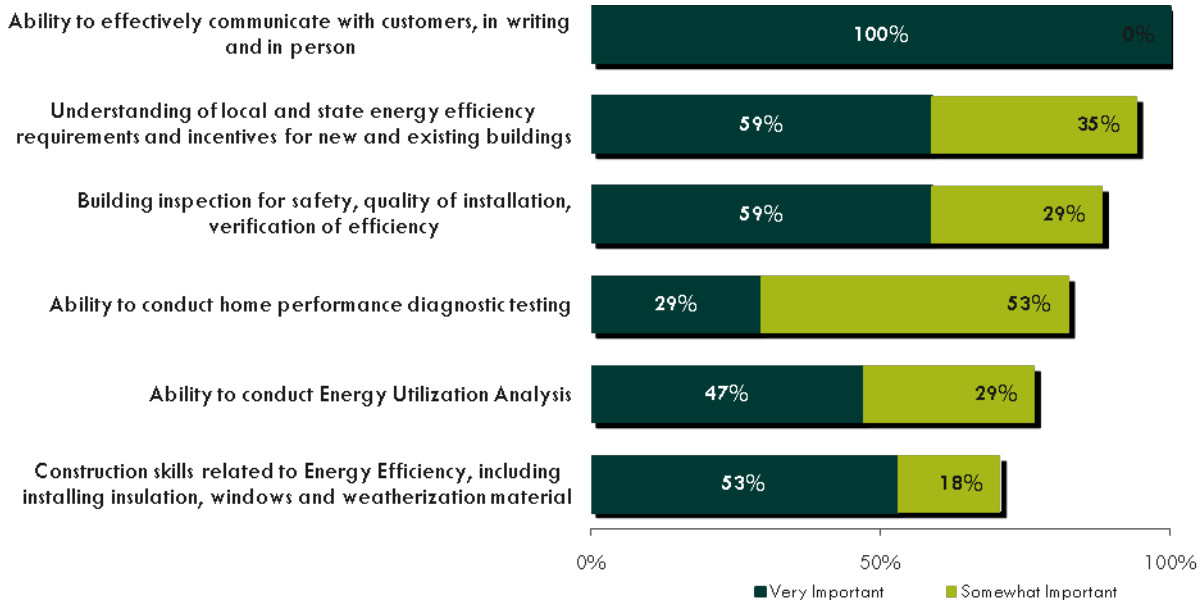

- Employers who work in utilities and resource management responded that the ability to communicate with customers, in writing and in person, is the most valued skill in an employee (81% very important).
- Employers indicated that additional very important skills are: general understanding of the mechanics and engineering of energy systems, including HVAC, lighting, and renewable energy systems (63%); understanding of local and state energy efficiency requirements and incentives for new and existing buildings (63%); and identify and apply regulatory codes when conducting energy assessments and/or site visits (50%).

**Figure 2: Design and/or Construction of New Buildings**



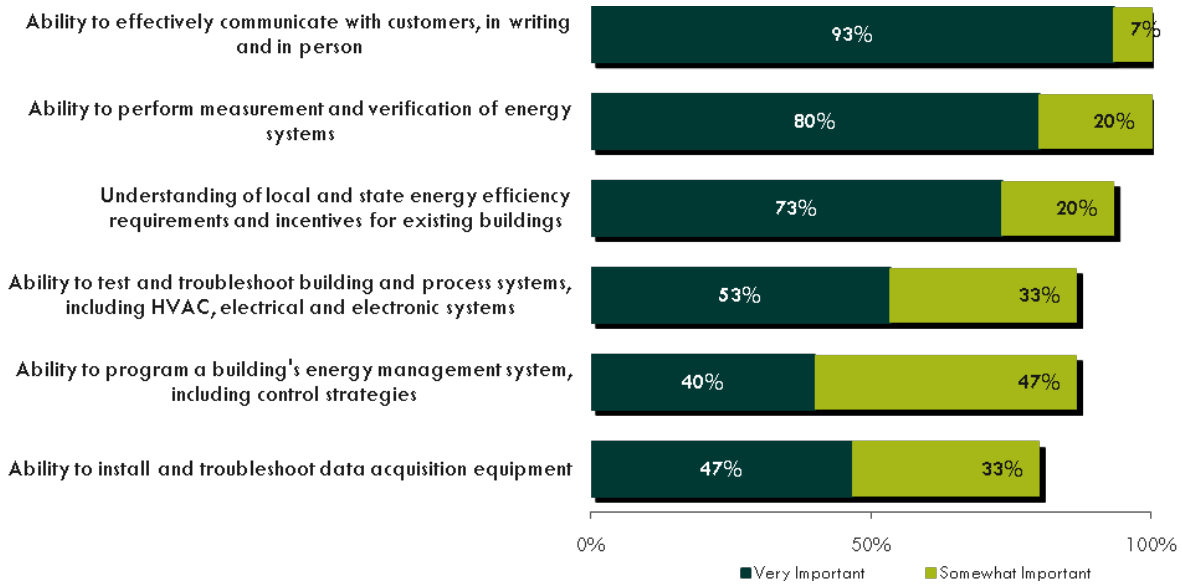

- Employers who work in Design and/or Construction of New Buildings responded that the ability to communicate with customers, in writing and in person, is the most valued skill in an employee (97% very important).
- Employers indicated that other very important skills are: understanding of local and state energy efficiency requirements and incentives for new and existing buildings (60%); general construction experience (60%); and knowledge of LEED standards and principles (47%).

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



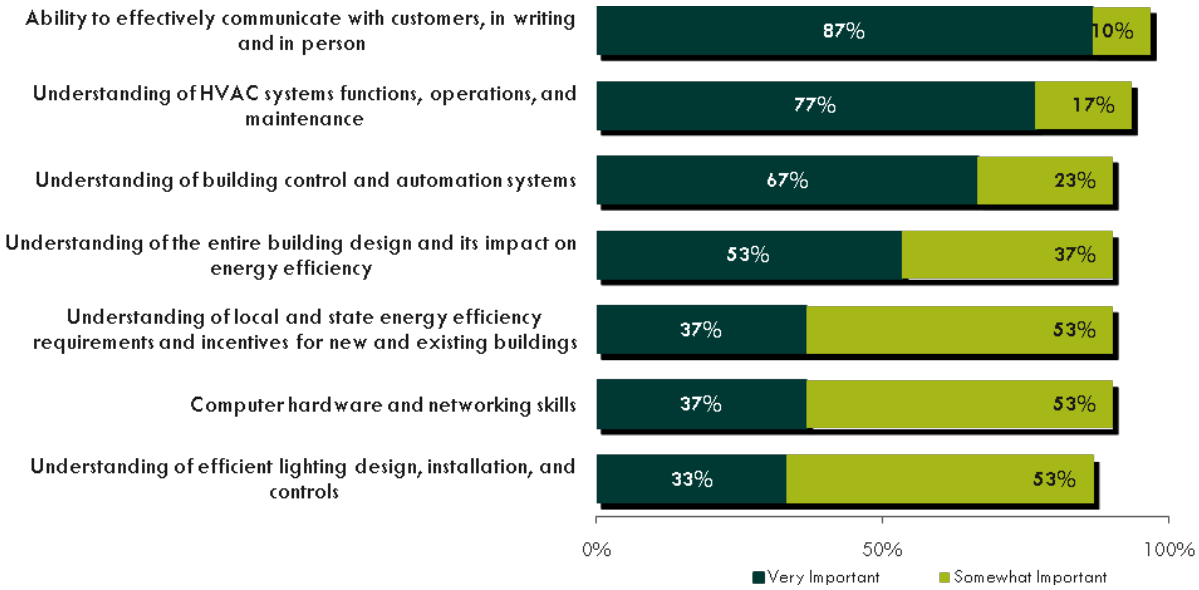

- Employers who work in Retrofitting Homes responded that the ability to communicate with customers, in writing and in person, is the most valued skill (100% very important).
- Employers indicated that understanding of local and state energy efficiency requirements and incentives for new and existing buildings and building inspection for safety, quality of installation and verification of efficiency are also very important skills (each 59%).

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




- Employers who work in Retro-Commissioning Buildings responded that the ability to communicate with customers, in writing and in person, is the most valued skill in an employee.
- Employers indicated that additional very important skills are: ability to perform measurement and verification of energy systems (80%); and understanding of local and state energy efficiency requirements and incentives for existing buildings (73%).

**Figure 5: Facility or Building Operations and Maintenance**




- Employers who work in Facility or Building Operations and Maintenance responded that the ability to communicate with customers, in writing and in person, is the most valued skill in an employee (87% very important).
- Employers indicated that additional very important skills are: understanding of HVAC systems functions, operations, and maintenance (77%) and understanding of building control and automation systems (67%).

## 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 support programs. 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.[21]

Lawrence Berkeley National Lab (LBNL) is currently conducting a needs assessment of the energy efficiency services workforce in the U.S. and in eleven states, including California. One component of the research is estimating the size of the energy efficiency services industry (EESI) nationally and in the selected states. Early results indicate that there are over 5,500 jobs in California for Program Administrator Staff, Program Management Contractor Staff and Program Support Contractors. These positions represent the professional and management jobs in the EESI. Significant growth is projected for Program Management Contractor Staff and Program Support Contractors in the range of 65% from 2007-2010.[22] Technical workers who begin in the occupations studied for this report could pursue career advancement opportunities into these management and professional jobs with additional education and experience.

Appendix K contains an example of a Career and Education Pathway graphic for energy efficiency occupations. Appendix L also contains some examples of Industry Certifications that if attained, can help workers advance into more skilled positions with higher pay.

[21] Adapted from "Green Collar Jobs," Green For All, www.greenforall.org
[22] "Energy Efficiency Services Industry: Commercial/Industrial Workforce Requirements," C. Goldman et al, 2009.

## Employer Needs and Challenges

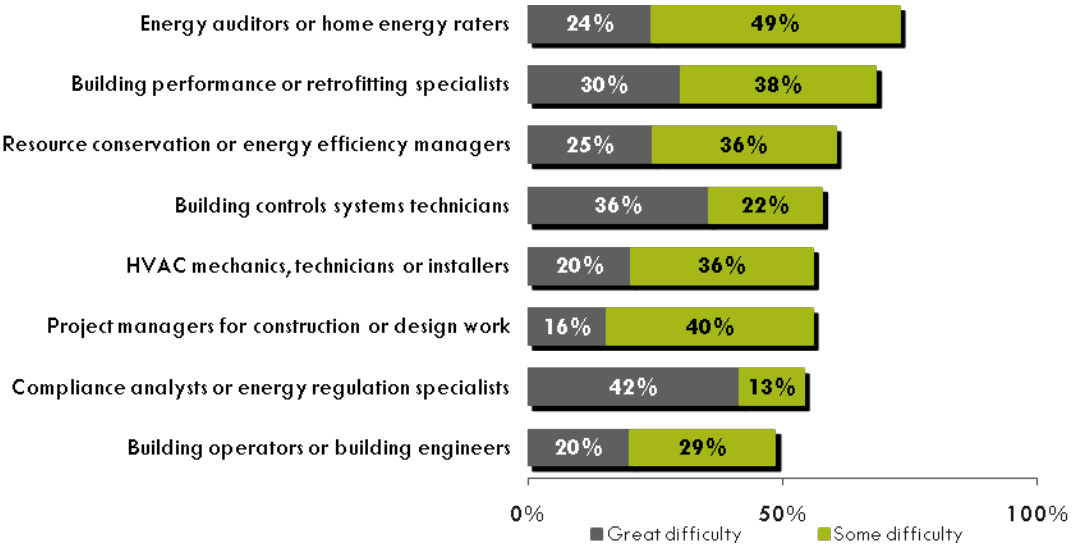
Utilities and energy efficiency service providers report a serious problem in attracting trained and experienced professional and technician personnel with expertise to perform energy efficiency work. The shortage of available and experienced personnel may be a bottleneck constraining the ability of Energy Efficiency program administrators, service providers and facility owners to effectively ramp up their energy efficiency activities and efforts to meet growing demand.[23]

***Hiring Difficulties***

Nearly 60 percent of employers responding to the survey indicated difficulty in hiring for all eight occupations as shown in Figure 6. The level of difficulty finding qualified applicants for these occupations only strengthens the overall demand for energy efficiency workers.

- Three out of four employers have difficulty finding energy auditors or home energy raters.
- Forty-two percent of employers indicated they experience great difficulty finding qualified building controls systems technicians.

**Figure 6: Difficulty in Hiring for Each Occupation**

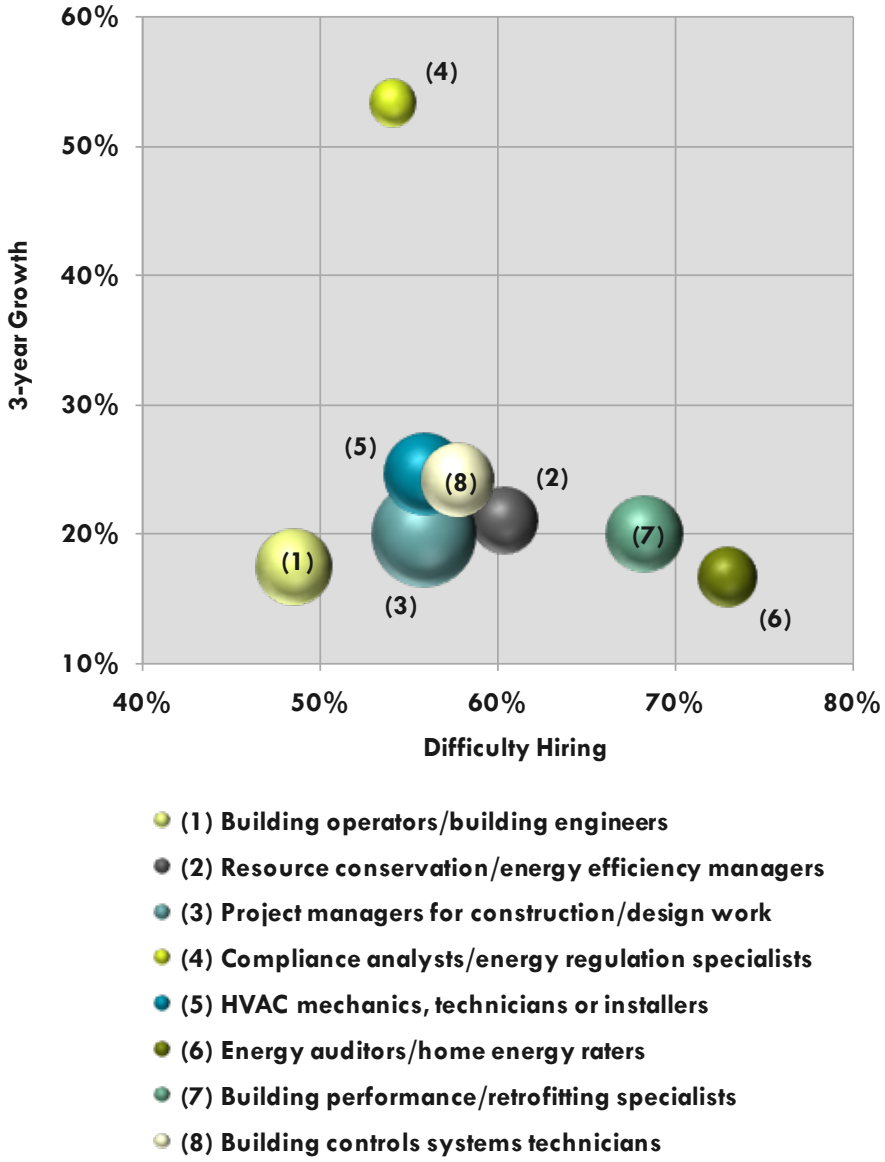



In the bubble chart (next page), the relationship between difficulty in hiring and expected growth for each of the eight occupations is revealed. The area of each bubble represents the size of current employment for each occupation.

- Compliance analysts, moderate in size, are expected to grow the fastest over the next three years and have the highest reported level of great difficulty in finding qualified applicants at 42%.
- Building performance or retrofitting specialists, the third largest occupation, are expected to experience significant job growth over the next three years and have a high level of reported difficulty in finding qualified applicants.
- Project managers for construction or design work, the largest occupation, is expected to experience moderate job growth and report a relatively high level of difficulty in finding qualified applicants.

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

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

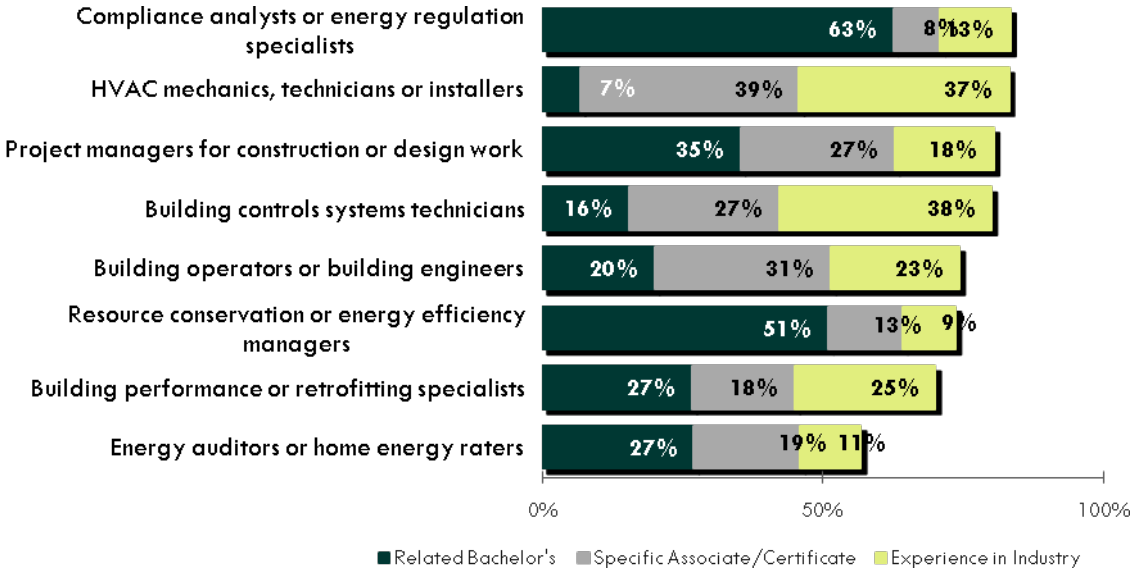



***Education and Experience Preferences***

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

- Employers were most comfortable with community college training for HVAC technicians, building operators or building engineers, and building controls systems technicians.
- Employers were more evenly split on project managers for construction and design work. The responses indicated that, in general, a bachelor's degree or an associate degree/certificate specific to the position would be satisfactory.
- Employers generally preferred a bachelor's degree for compliance analysts and resource conservation or energy efficiency managers.

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

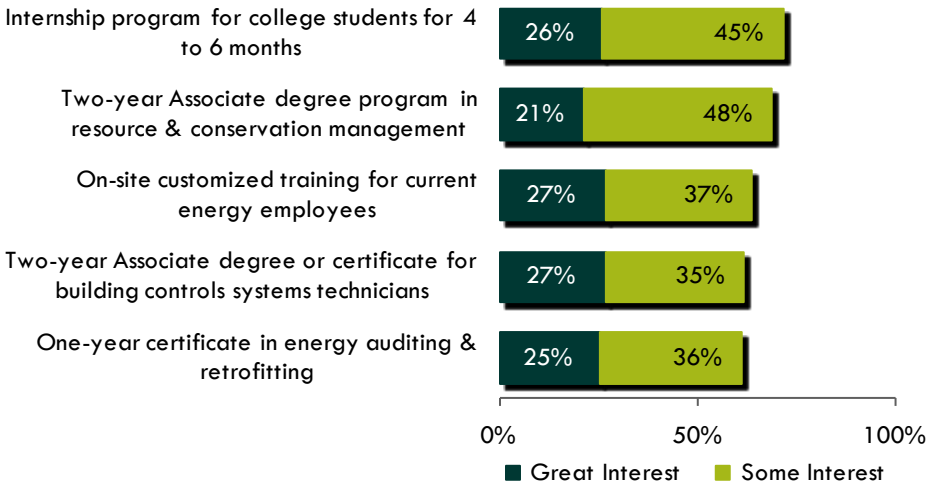



***Workforce Development Opportunities***

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

- 71% employers expressed great or some interest in an internship program for community college students.
- Two out of three employers were interested in a two-year Associate program for resource and conservation management.
- More than 60% of employers expressed great or some interest in on-site customized training for current energy employees.
- Three-fifths of employers surveyed expressed interest in a two-year Associate degree or certificate program for building controls systems technicians.
- Greater than 50% of employers surveyed expressed some or great interest in a one-year certificate in energy auditing and retrofitting.

**Figure 9: Employer Interest in Community College Programs**



## College Response and Issues

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

***College Program Selection Criteria***

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

The task of identifying energy efficiency-related programs offered at the region's community colleges was not easy, since potential courses, certificates and degrees are buried within a host of programs with differing titles. The initial search involved a review of the California Community College Chancellor's Office Inventory of Approved Programs.[24] The nine programs shown below are the most likely candidates related to the eight occupations studied, based on the Taxonomy of Programs (TOP) and their related codes.

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

| Top Code | Inventory of Approved Programs |
|---|---|
| 301.00 | Environmental Science (Natural science, biology, geology) and mostly transfer degree oriented |
| 302.00 | Environmental Studies (Social science based, or biological/earth science based) |
| 303.00 | Environmental Technology (Hazardous materials control, environmental compliance, pollution control technology) |
| 945.00 | Industrial Systems Technology and Maintenance (Facilities Maintenance Technology/Management) |
| 946.00 | Environmental Controls Technology (HVAC/Commercial HVAC) |
| 946.10 | Energy Systems Technology (Energy Management/ Energy Technology) |
| 952.00 | Construction Crafts Technology |
| 957.00 | Civil and Construction Management Technology |
| 957.20 | Construction Inspection |

To further identify college programs, an online survey was disseminated to colleges through the San Diego and Imperial Regional Consortium of Occupational Deans. Follow up phone interviews were also conducted.

[24]CCCCO Inventory of Approved Programs, https://misweb.cccco.edu/webproginv/prod/invmenu.htm

***San Diego and Imperial Region Courses and Programs Related to Energy Efficiency Occupations***
Seven of the nine colleges located in the region were identified 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.
- Number of current enrollments versus capacity for the course/program.
- Future energy efficiency courses/programs being planned.
- Contact information for the lead person at the college.

Table 3 shows the colleges that offer courses, certificates and degree programs related to the eight occupations studied. In addition, each college assigned a level of preparation that the course gives students, related to the skills needed to begin work in the occupation. Appendix L contains a summary of the information obtained. The legend below indicates the meaning of the letters/symbols in the chart.

| | |
|---|---|
| **Level of Preparation** | **I = Introduces to Occupation**<br>**P = Fully Prepares for Occupation** |
| **Types of Education/Training Program** | **X = Course**<br>**C = Certificate Program(s)**<br>**D = Degree Program(s)**<br>**UD = Under Development** |

**Table 3: Current College Programs, Certificates, or Courses**

| COLLEGE | ENERGY EFFICIENCY OCCUPATIONS | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Energy Auditor or Home Energy Rater | Building Performance or Retro-fitting Specialist | Compliance Analyst or Energy Regulation Specialist | Project Manager, 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 | | | | | | | |
| Cuyamaca College | P - UD | | | | | | | |
| Imperial Valley College | | | | I - X | P - D | | I - X | I - X |
| Palomar College | P - C | I - C | | | | | | |
| San Diego City College | | P - UD | | I - C | P - D | | P - X | |
| San Diego Continuing Education | | P - C | | | | | | |
| San Diego Mesa College | | | | I - D | | | | I - D |
| Southwestern College | P - UD | | | P - D | | | | |

## 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.ashrae.org | San Diego Chapter (Industry Association) | Access to Employers, Industry Standards, Job Descriptions |
| Building Commissioning Association, (BCA)* www.bcxa.org | Southwest Chapter (Industry Association) | Access to Employers, Industry Standards, Job Descriptions, Industry Certification for Certified Commissioning Professional |
| California Building Performance Contractors Association (CBPCA)* www.cbpca.org | Statewide (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. |
| San Diego Gas and Electric www.sdge.com | Regional (Public Utility) | Tech assistance, access to employers, industry standards, job descriptions, regulatory compliance |
| US Green Building Council (USGBC)* www.usgbc-ncc.org | Northern California Chapter (Industry Association) | Access to Employers, Industry Standards, Job Descriptions, LEED Certification Training |
| Workforce Investment Boards (Imperial Valley WIB, San Diego Workforce Partnership) www.cwib.ca.gov, www.sandiegoatwork.org | Northern California (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 San Diego and Imperial Region and across the state. The survey results indicate that the majority of employers are having difficulty hiring qualified candidates in all eight energy efficiency occupations studied.

This study also reveals that there are only four training programs that fully prepare students for these in-demand jobs. In the San Diego and Imperial Region, several colleges are launching new programs in the fall that prepare students for careers in building performance/retrofitting and energy auditing.

According to the survey results, employers indicated that they were most comfortable with community college training for three occupations: (1) HVAC Technicians, (2) Building Operators or Building Engineers, and (3) Building Controls Systems Technicians. Because all of the occupations are experiencing substantial growth and employers have reported difficulty in hiring for each, the educational preferences are especially important when considering where to allocate limited resources.

The good news is that colleges have already begun to anticipate employer needs for energy efficiency workers. Three of the nine colleges surveyed are already planning new courses or programs that will prepare students for these in-demand occupations. These new certificate programs will add students to the "pipeline" as soon as the fall 2010, and will continue to do so over the next year and beyond.

Community colleges in the San Diego and Imperial Region 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. Develop Contextualized Communication Skills Curricula for Energy Efficiency**

- Address shortages by developing curricula that is in line with skill shortages as identified by industry, particularly for communication skills and other workplace skills.
- Collaborate with the Workplace Learning Resource Centers to fill employer needs for 21st Century Skills.

**2. Focus on Employer Preferences**

- Develop and expand contract education opportunities, and leverage the Economic and Workforce Development Program's inventory of contract education providers, CEDCAL (www.cccewd.net).
- Work with the Environmental Training Centers and Advanced Transportation Technology and Energy Centers to develop model curriculum, aligned with industry standards and certifications that can be shared regionally. Utilize survey results on critical skills required by employers as a starting point.

- Since all eight occupations show significant growth potential, colleges should focus on those occupations where employers prefer Associate degrees: HVAC technicians, building operators or building engineers, and building controls systems technicians.

**3. Build a pipeline of skilled workers**

- Develop and expand energy efficiency courses and programs at San Diego and Imperial Region community colleges to meet the projected demand for the eight occupations studied.
- Work with the Environmental Training Centers and Miramar College's Advanced Transportation Technology and Energy Centers to develop model curriculum focused on auditing, weatherization, and renewable energy as core courses.
- Raise awareness of college and secondary school career counselors about energy efficiency occupations by leveraging existing community based organizations interested in energy efficiency.
- Promote energy efficiency courses and programs to unemployed/underemployed returning students who have experience in construction trades, engineering or business.

**4. Create and expand industry partnerships**

- Create advisory committee for energy efficiency occupational training through the Regional Consortium of Occupational Deans for Region 10.
- Collaborate regionally on grants to fund program development, partnerships with industry and equipment needed to expand programs on energy efficiency.
- Leverage existing regional advisory boards to assist multiple, adjacent colleges, to develop, the employment skills and education requirements of employers.
- Expand the industry partnerships developed by the Centers of Excellence for this study, to facilitate outreach to employers and identify potential adjunct faculty, especially the California Center for Sustainable Energy, the San Diego Workforce Partnership, the San Diego Chapter of the United States Green Building Council, and the San Diego Regional Sustainability Partnership.
- Identify employers who want to partner with colleges to develop student internship programs. Seventy-one percent employers surveyed indicated interest in developing such programs.

**5. Provide on-going professional development for college faculty**

- Work with the Environmental Training Centers and Advanced Transportation Technology and Energy Center at Miramar College 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 08-305-023 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 auditors, 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, May, and June of 2009.

For the San Diego and Imperial Region, 83.5 percent of the survey responses were submitted online; 16.5 percent were conducted by telephone.

***About the Respondents***

One hundred and fifty-eight (158) employers, representing a combined workforce of more than 65,000 San Diego and Imperial Region based employees, responded to the survey. The respondent's industry, size of firm, and regional location were recorded where possible. Caution should be used in generalizing results to the entire population of employers to the degree that the sample may differ from the universe.

These respondents came from carefully selected industries targeted as containing energy efficiency firms or energy efficiency-related firms. San Diego and Imperial Region employers in these 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 |
| 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.

Sixty percent of respondents identified their work as directly involved in energy efficiency, as a primary part of their business, while 40 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 | 757 | 24 | 3% | 186 | 25% |
| Project managers for construction or design | 735 | 41 | 6% | 146 | 20% |
| Building performance or retrofitting specialists | 547 | 18 | 3% | 109 | 20% |
| Resource conservation or energy efficiency managers | 420 | 26 | 6% | 88 | 21% |
| Energy auditors or home energy raters | 352 | 23 | 7% | 58 | 17% |
| Building controls systems technician | 223 | 16 | 7% | 54 | 24% |
| Building operators or building engineers | 183 | 7 | 4% | 32 | 17% |
| Compliance analyst or energy regulation specialists | 37 | 6 | 16% | 20 | 53% |
| **Total, All Occupations** | **3,255** | **162** | | **692** | |

***Study Methodology: Universe of Firms***
To estimate the total number of energy efficiency firms in the 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.

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 San Diego and Imperial Region or are no longer doing business. The total number for each database was then combined into the universe of firms estimate (1,135).

***Study Methodology: Occupational Employment***
Eight energy efficiency occupations were identified as high-growth and aligned with community college education programs. The combined employment in the San Diego and Imperial Region for the eight occupations totals at least 3,225 jobs (known employment from survey respondents) and could be as high as 11,780 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 San Diego and Imperial Region. Margin of error for the 158 survey respondents (out of the universe of 1,135) is ± 7.24 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.

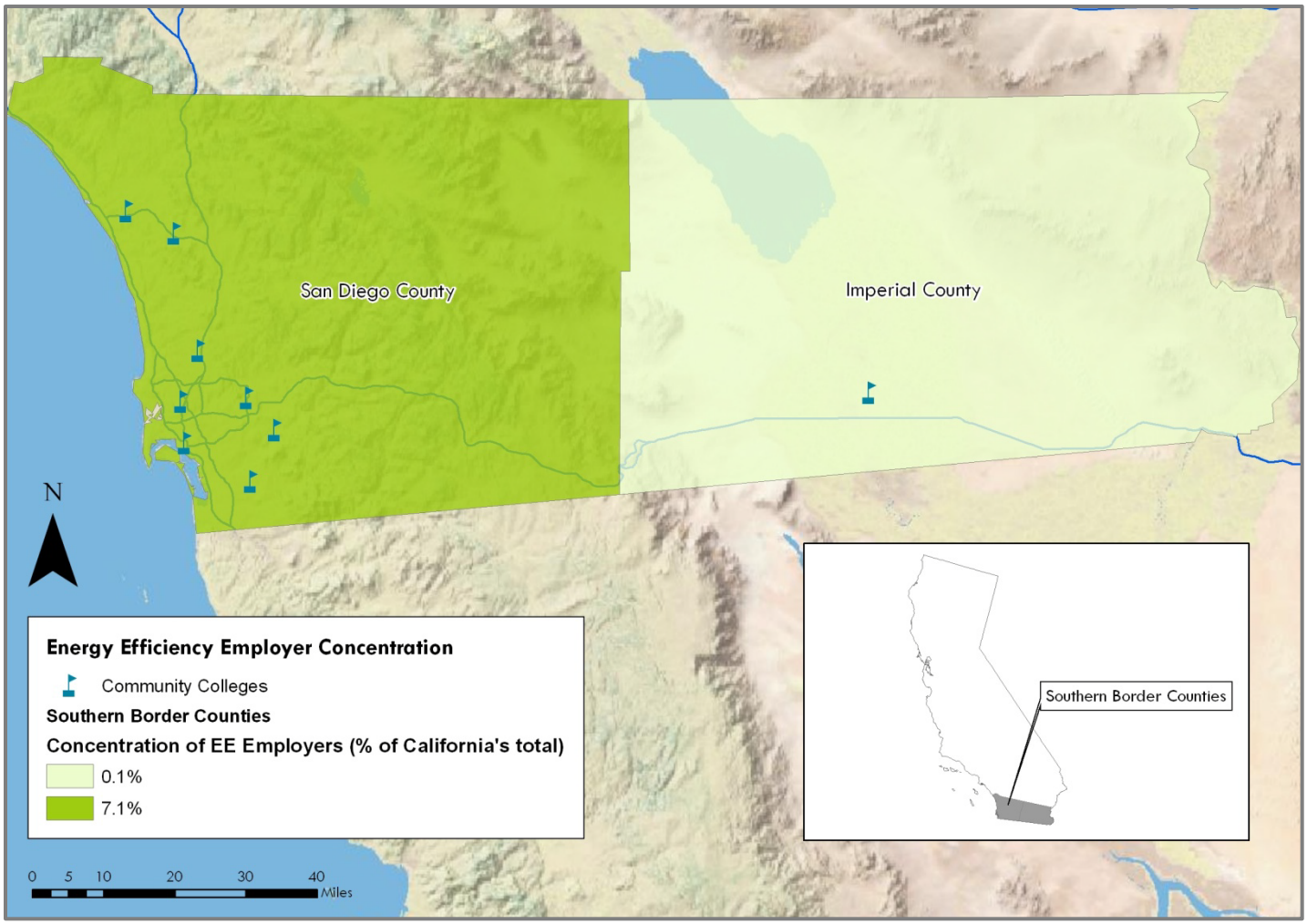
- In the survey, respondents were asked how many individuals in each occupation were currently employed in permanent positions, full or part-time. This resulted in estimates for the distribution of employment across the sample, mean employment, and sample total employment.
- Respondents were then asked 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: Concentration of Energy Efficiency Employers

| *Location of Survey Respondents* | *Percent of Sample* |
|---|---|
| Imperial County | 1.3% |
| San Diego County | 98.7% |
| Total | 100% |

**Concentration of Energy Efficiency Employers in the San Diego and Imperial Region**



## Appendix E: 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)[25] | $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.

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

## Appendix F: California's Key Legislative and Policy Initiatives

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

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

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

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

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

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

California's Big Bold Energy Efficiency Strategies:

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

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

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

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

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

# Appendix G: Energy Efficiency Programs Provided by Local Utilities

## 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 |
| 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 |

| Program | What it Provides | Website for Information |
|---|---|---|
| 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 |
| 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 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:[26]

- 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 the San Diego and Imperial Region, employment in this occupation is projected to increase 3.2 percent over the next 12 months (60 new jobs).
- Over the next three years, employment is projected to increase 24.6 percent or by 440 jobs.
- In addition to increased demand for HVAC technicians, 56 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 20 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 workers** is building commissioning, which is a complete mechanical inspection of a building's HVAC, water, and lighting systems.[27]

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

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

- 37 percent of employers surveyed preferred HVAC technicians with experience in the industry, while 39 percent indicated preference for a specific Associate degree or program certificate, and 6.7 percent preferred a Bachelor degree.
- When asked what skills are most important, San Diego and Imperial Region employers working in Facility or Building Operations and Maintenance indicated they value the ability to communicate with customers, in writing and in person (97 percent), understanding of HVAC systems functions, operations, and maintenance (94 percent), understanding of building control and automation systems (90 percent), and understanding of efficient lighting and design, installation, and controls (90 percent).

**Occupational Wages**: In the San Diego and Imperial Region, the annual wages (based on survey responses) for HVAC technicians are:

| | Entry Level Median Annual Wage | Experienced Level Median Annual Wage |
|---|---|---|
| HVAC Technicians | $38,272 | $60,160 |

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

### Occupation: Project Managers for Construction or Design Work

Project Managers for Construction or Design Work are responsible for communicating with project partners and ensuring that the project is completed in a timely manner and within budget. The following list describes in more detail some of the tasks that may be required of Project Managers for Construction or Design Work:[28]

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

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

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

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 San Diego and Imperial Region, employment in this occupation is projected to increase 5.6 percent over the next 12 months (160 new jobs).
- Over the next three years, employment is projected to increase 19.9 percent or by 580 jobs.
- In addition to increased demand for Project Managers, 56 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 16 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.[29]

- 35 percent of employers surveyed preferred Project Managers with a related Bachelor's degree, while 28 percent indicated preference for a specific Associate degree or program certificate, and 18 percent preferred industry experience.
- When asked what skills are most important, San Diego and Imperial Region employers working in Design and/or Construction of New Buildings indicated they value the ability to communicate with customers, in writing and in person (100 percent), knowledge of LEED principles (97 percent), understanding of local and state energy efficiency requirements and incentives for new and existing buildings (97 percent), general construction experience (93 percent), and general understanding of the mechanics and engineering of energy systems, including HVAC, lighting, and renewable energy systems (93 percent).

**Occupational Wages**: In the San Diego and Imperial Region, the annual wages (based on survey responses) for Project Managers for Construction or Design Work are:

| | Entry Level Median Annual Wage | Experienced Level Median Annual Wage |
|---|---|---|
| Project Managers for Construction or Design Work | $50,000 | $75,716 |

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.

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

## Occupation: Building Performance or Retrofitting Specialist

Building performance or retrofitting specialist are contractors who improve the energy efficiency of homes or buildings by installing insulation, windows, lighting and other energy efficient products. The following list describes in more detail some of the tasks that may be required of building performance or retrofitting specialist: These workers may also be called weatherization specialists, insulation workers, or other trade specific titles.[30]

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

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

- In the San Diego and Imperial Region, employment in this occupation is projected to increase 3.3 percent over the next 12 months (50 new jobs).
- Over the next three years, employment is projected to increase 19.9 percent or by 310 jobs.
- In addition to increased demand for building performance or retrofitting specialists, 68 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 30 percent of employers responding "great" difficulty.

**Career Pathways:** For most entry-level specialists working in residential applications, learning is mostly done on-the-job but for commercial and industrial settings a formal apprenticeship program or additional training or education is generally required.[31]

- 18 percent of employers surveyed preferred building performance or retrofitting specialists with a specific Associate degree or program certificate, while 27 percent indicated specialists would benefit from a related Bachelor's degree and 25 percent would consider experience in the industry adequate.
- When asked what skills are most important, San Diego and Imperial Region employers working in Improving Energy Efficiency in Homes (Retrofitting Homes) indicated they value the ability to communicate with customers, in writing and in person (100 percent), understanding of local and state energy efficiency requirements and incentives for new and existing buildings (94 percent), building inspection for safety, quality of installation, verification of efficiency (88 percent), ability to conduct home performance diagnostic testing (82 percent), and construction skills related to Energy Efficiency, including installing insulation, windows, and weatherization material (71 percent).

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

**Occupational Wages**: In the San Diego and Imperial Region, the annual wages (based on survey responses) for Building Performance or Retrofitting Specialists are:

| | Entry Level Median Annual Wage | Experienced Level Median Annual Wage |
|---|---|---|
| Building Performance or Retrofitting Specialists | $40,800 | $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: 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 infared cameras, blower door testing equipment, balometers, and other diagnostic instruments to gather energy efficient data and compute energy use analysis and overall building performance.
- May install minor energy saving measures and educate customers about how to reduce energy use through lifestyle changes, building retrofits, and utility programs.

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

- In the San Diego and Imperial Region, employment in this occupation is projected to increase 6.5 percent over the next 12 months (60 new jobs).
- Over the next three years, employment is projected to increase 16.6 percent or by 150 jobs.
- In addition to increased demand for energy auditors or home energy raters, 73 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.

- 19 percent of employers surveyed preferred energy auditors or home energy raters with a specific Associate degree or program, while 27 percent indicated preference for a related Bachelor's degree and 11 percent would consider experience in the industry adequate.
- When asked what skills are most important, San Diego and Imperial Region 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 (100 percent), ability to perform measurement and verification of energy systems (100 percent), understanding of local and state energy efficiency requirements and incentives for existing buildings (93 percent), ability to test and troubleshoot building and process systems, including HVAC, electrical and electronic systems (86 percent), and ability to program a building's energy management system, including control strategies (87 percent).

**Occupational Wages:** In the San Diego and Imperial Region, 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 | $40,000 | $75,000 |

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

### 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 the San Diego and Imperial Region, employment in this occupation is projected to increase 6.3 percent over the next 12 months (70 new jobs).
- Over the next three years, employment is projected to increase 20.9 percent or by 240 jobs.
- In addition to increased demand for resource conservation or energy efficiency managers, 60 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 25 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.

- 51 percent of employers surveyed preferred resource conservation or energy managers with a related Bachelor's degree, while 13 percent indicated preference for a specific Associate degree or program certificate, and 9 percent would consider experience in the industry adequate.
- When asked what skills are most important, San Diego and Imperial Region employers working in Utilities and Resource Management indicated they value the ability to communicate with customers, in writing and in person (87 percent), understanding of local and state energy efficiency requirements and incentives for new and existing buildings (82 percent), and identify and apply regulatory codes when conducting energy assessments and/or site visits (81 percent).

**Occupational Wages**: In the San Diego and Imperial Region, 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 | $56,620 | $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 San Diego and Imperial Region, employment in this occupation is projected to increase 7.1 percent over the next 12 months (100 new jobs).
- Over the next three years, employment is projected to increase 24 percent or by 340 jobs.
- In addition to increased demand for technicians, 58 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 36 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.

- 26.7 percent of employers surveyed preferred building controls systems technicians with a specific Associate degree or certificate, while 15.6 percent indicated technicians would benefit from a related Bachelor's degree and 37.8 percent would consider experience in the industry adequate.
- More than 61 percent of the employers surveyed expressed interest in a two-year Associate degree or certificate program for building controls systems technicians.
- When asked what skills are most important, San Diego and Imperial Region employers working in Facility or Building Operations and Maintenance indicated they value the ability to communicate with customers, in writing and in person (97 percent), understanding of HVAC systems functions, operations, and maintenance (94 percent), understanding of building control and automation systems (90 percent), and understanding of efficient lighting and design, installation, and controls (90 percent).

**Occupational Wages**: In the San Diego and Imperial Region, 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 | $40,800 | $69,680 |

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 the San Diego and Imperial Region, employment in this occupation is projected to increase 3.8 percent over the next 12 months (60 new jobs).
- Over the next three years, employment is projected to increase 17.4 percent or by 260 jobs.
- In addition to increased demand for technicians, 49 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 20 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.

- 31 percent of employers surveyed preferred building operators or building engineers with a specific Associate degree or certificate, while 20 percent indicated preference for a related Bachelor's degree and 23 percent would consider experience in the industry adequate.
- When asked what skills are most important, San Diego and Imperial Region employers working in Facility or Building Operations and Maintenance indicated they value the ability to communicate with customers, in writing and in person (97 percent), understanding of HVAC systems functions, operations, and maintenance (94 percent), understanding of building control and automation systems (90 percent), and understanding of efficient lighting and design, installation, and controls (90 percent).

**Occupational Wages**: In the San Diego and Imperial Region, 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 | $43,300 | $58,240 |

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 the San Diego and Imperial Region, employment in this occupation is projected to increase 16.1 percent over the next 12 months (90 new jobs).
- Over the next three years, employment is projected to increase 53.2 percent or by 290 jobs.
- In addition to increased demand for technicians, 54 percent of employers surveyed experience difficulty finding qualified applicants for these positions, with 42 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.

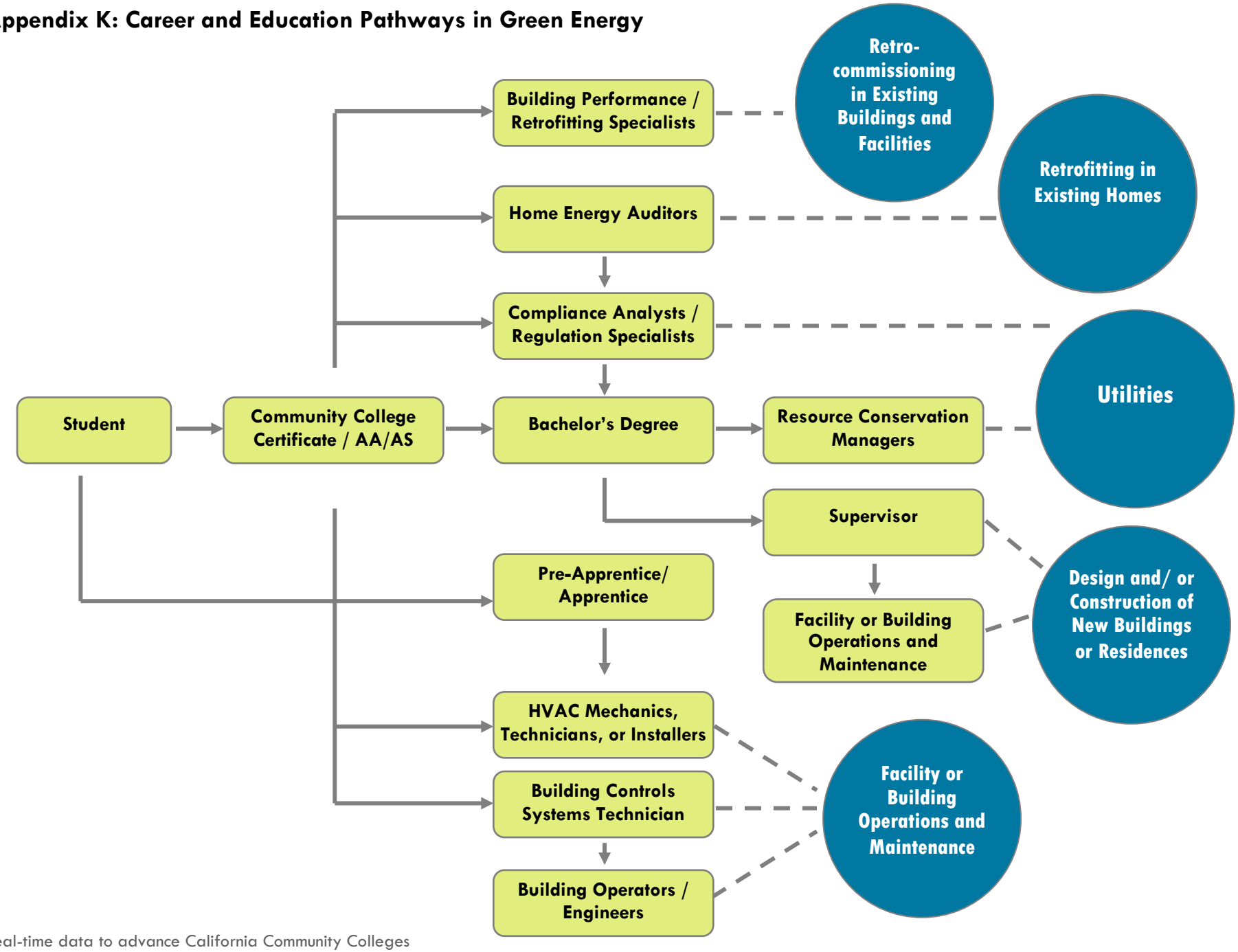
- 62.5 percent of employers surveyed preferred compliance analysts or energy regulation specialists to have a related Bachelor's degree, 8.3 percent indicated preference for a specific Associate degree or program certificate, and 12.5 percent would consider experience in the industry adequate.
- When asked what skills are most important, San Diego and Imperial Region employers working in Utilities and Resource Management indicated they value the ability to communicate with customers, in writing and in person (87 percent), understanding of local and state energy efficiency requirements and incentives for new and existing buildings (82 percent), and identify and apply regulatory codes when conducting energy assessments and/or site visits (81 percent).

**Occupational Wages**: In the San Diego and Imperial Region, 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 | $47,840 | $62,400 |

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

## Appendix K: Career and Education Pathways in Green Energy



## Appendix L: 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

EPA HVAC Certification: http://www.epa.gov/Ozone/title6/608/technicians/608certs.html

Home Builders Institute: http://www.hbi.org/page.cfm?pageID=99

Union Apprenticeship Programs: http://www.ibew569.org/

Building Performance Institute (BPI) (Green for All): http://www.bpi.org/content/contractors/certification.html

## Appendix M: San Diego and Imperial Region College Programs Related to Energy Efficiency Occupations

Six of the eight colleges in the San Diego and Imperial Region 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, Enrollments/Capacity, Future Offerings and College Contacts**

| College | Current Program (s) | Future Program (s) | Contact |
|---|---|---|---|
| Cuyamaca College | None | Energy Auditor | Jennifer Lewis<br>Director, ETC<br>jennifer.lewis@gcccd.edu<br>(619) 660-4619 |
| Imperial Valley College | HVAC<br>Green Building | Energy Auditor | Gonzalo Huerta, Dean of Applied Sciences/Career Technical Education<br>760-355-6419<br>gonzalo.huerta@imperial.edu |
| Palomar College | HERS Rater | | Wilma Owens, Dean<br>760-744-1150 x2276<br>wowens@palomar.edu |
| San Diego City College | HVAC | Green Building/Retrofitting | Trudi Gerald, CACT Director<br>619-388-3730<br>Tgerald@sdccd.edu |
| San Diego Continuing Education | Building Retrofitting | | Jane Signalio-Cox, Dean, Continuing Education<br>619-388-4819<br>jsignaig@sdccd.edu |
| San Diego Mesa College | Construction Program | | Michael Reese |
| Southwestern College | Green Project Management | Energy Auditor | Trish Axiom |