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ENVIRONMENTAL SCAN

ENERGY EFFICIENCY OCCUPATIONS

Central Region

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CENTER OF EXCELLENCE

Central Region

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

C·O·E CENTERS OF EXCELLENCE
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Mission: The Centers of Excellence, in partnership with business and industry, deliver regional workforce research customized for community college decision making and resource development.

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

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Centers of Excellence, Economic and Workforce Development Program

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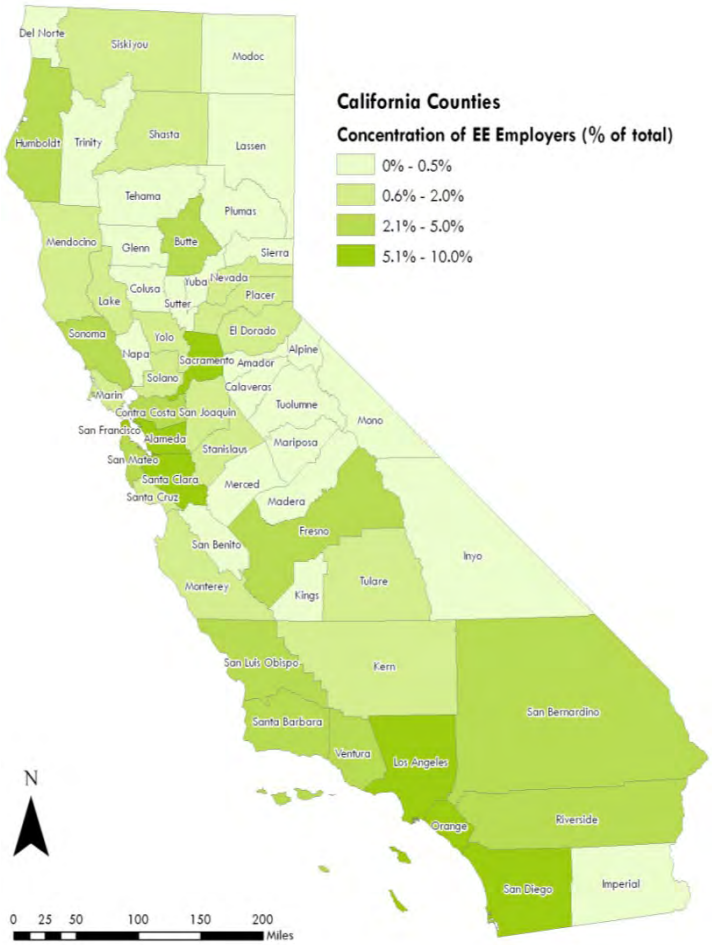
Based on research of Central Region employers, the estimated combined growth of the eight energy efficiency occupations over the next 12 months could result in as many as 1,070 new jobs in the region.



Executive Summary

The Centers of Excellence (COE), in collaboration with research and industry partners, studied the energy efficiency sector in the Central Region and across the State to better understand the projected demand for energy efficiency occupations and the workforce needs of employers. This report focuses on the 14-county Central Region.

The energy efficiency sector contains five major industry segments, including:

- Utilities and energy resource management;
- Design/construction of new structures;
- Energy retrofitting;
- Retro-commissioning;
- Facility operations and maintenance.

The COE collected information from over 200 Central Region employers in these five industry segments, providing a rich set of data that is highlighted in this report. Eight energy efficiency occupations with relevance to community colleges were the focus of the research.

Out of the eight occupations studied, HVAC mechanics, technicians, or installers are expected to grow the fastest adding 820 jobs in the next three years. Collectively, the eight occupations studied are expected to add **3,420 new jobs** in the Central Region in the next three years.

Research indicates that the majority of employers experience difficulty finding qualified candidates in all eight energy efficiency occupations. Employers reported the highest level of difficulty hiring building operators and building controls systems technicians.

Central Region community colleges are well-positioned to build a pipeline of skilled workers, create and expand industry partnerships, and meet regional workforce needs. The following action steps are recommended for community colleges in the Region to promote the development of a skilled energy efficiency workforce:

- Strategically develop energy efficiency training programs to meet industry needs;
- Build energy efficiency training programs using existing programs.

The findings from this study support the creation, adaptation and expansion of energy efficiency courses and programs through Central Region community colleges. These programs will provide meaningful employment opportunities for 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) Program with identifying industries and occupations with unmet employee development needs. The Centers of Excellence (COE) are one initiative within EWD. Appendix A contains further information on the initiative and how to use this report.

Energy Efficiency National 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.[1]

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.[2]

Why study Energy Efficiency occupations? Employees working to make new and existing structures energy efficient provide a valuable service to the economy while earning a decent living. These services help homeowners and businesses save energy and money. Research indicates that money saved is used to buy goods and services, which stimulates the regional economy and creates more jobs across all industry sectors. Furthermore, using less energy reduces green house gas emissions and reduces U.S. dependence on foreign oil. Everything invested in energy efficiency can have a positive impact on society and the economy.

The Centers of Excellence partnered with Pacific Gas and Electric (PG&E) and several industry associations[3] to research firms throughout the state who most likely have employees in eight energy efficiency occupations featured in this study. The data reported in this study is for the Central Region.[4]

This study was designed to identify workforce needs and skill requirements related to energy efficiency occupations so community colleges can develop courses and programs needed by employers. Research conducted for this report focused on the technician level/mid-level occupations closely aligned with community college education programs, as opposed to professional level occupations.

Research was conducted with firms in the energy efficiency sector in the Central Region from December 2008 through May 2009, collecting data from over 200 businesses in the Region.[5] The research focused on gathering the following information using both quantitative and qualitative data:

- The current number and size of firms, as well as geographic concentration;
- Job growth over the next 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 identified occupations;
- Career ladders within the energy efficiency sector;
- Salary ranges for the key occupations;
- Industry interest in accessing community college education and training programs.

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[1]"The Size of the U.S. Energy Efficiency Market: Generating a More Complete Picture," American Council for an Energy-Efficient Economy, 2008.
[2]Ibid.
[3]United States Green Building Council (USGBC), Northern California Chapter; California Association of Building Performance Contractors (CABPC); California Commissioning Collaborative Building Commissioning Association; Building Commissioning Association; North State Building Industry Association.
[4] Counties included in this study are: Alpine, Amador, Calaveras, Fresno, Kern, Kings, Madera, Mariposa, Merced, Mono, San Joaquin, Stanislaus, Tulare, and Tuolumne Counties.
[5]See definition of energy efficiency sector on page 6.

Industry Overview

Defining the Energy Efficiency Sector

A central challenge in researching energy efficiency occupations is identifying employers that hire technical and mid-level energy efficiency workers. Existing research examines different job titles and occupations affected by the new focus on energy efficiency, but there is less discussion about how the occupations are classified and where jobs are located.

Although occupations like resource conservation/energy efficiency manager may exist in a typical large business, this study focused on specific industries with the greatest concentration of energy efficiency occupational opportunities. The following three industries fit these criteria: (1) public or private utilities or agencies; (2) building design and construction; and (3) building or facility operations and maintenance. See Appendix B for more information regarding these industries and the types of firms included in this study.

Public or Private Utilities or Agencies
Compliance, regulation, auditing, program administration, and resource management

Building Design and Construction
Project management, design, building, installation, auditing, and retrofitting.

Building or Facility Operations and Maintenance.
Maintenance, operation, and systems controls.

For the purposes of this study, energy efficiency businesses were defined as those:

- Delivering energy efficiency services as their primary focus,[6] or
- Public or private utilities or agencies who hire energy efficiency workers, or
- Large customers of energy utilities who hire energy efficiency workers.[7]

To calculate energy efficiency workforce projections and determine employer needs, eight specific occupations were selected for this research study. Occupations selected meet the following criteria:

- The occupation is primarily found in at least one of the identified industry sectors;
- The occupation meets the definition of energy efficiency as described above;
- Each occupation can provide a decent wage for employees;
- Community colleges can address the workforce needs through degree or certificate programs.

The following table lists the eight occupations studied in this report for the Central Region. Each of the occupations has projected positive short- and long-term employment growth.

Table 1: Energy Efficiency Occupations

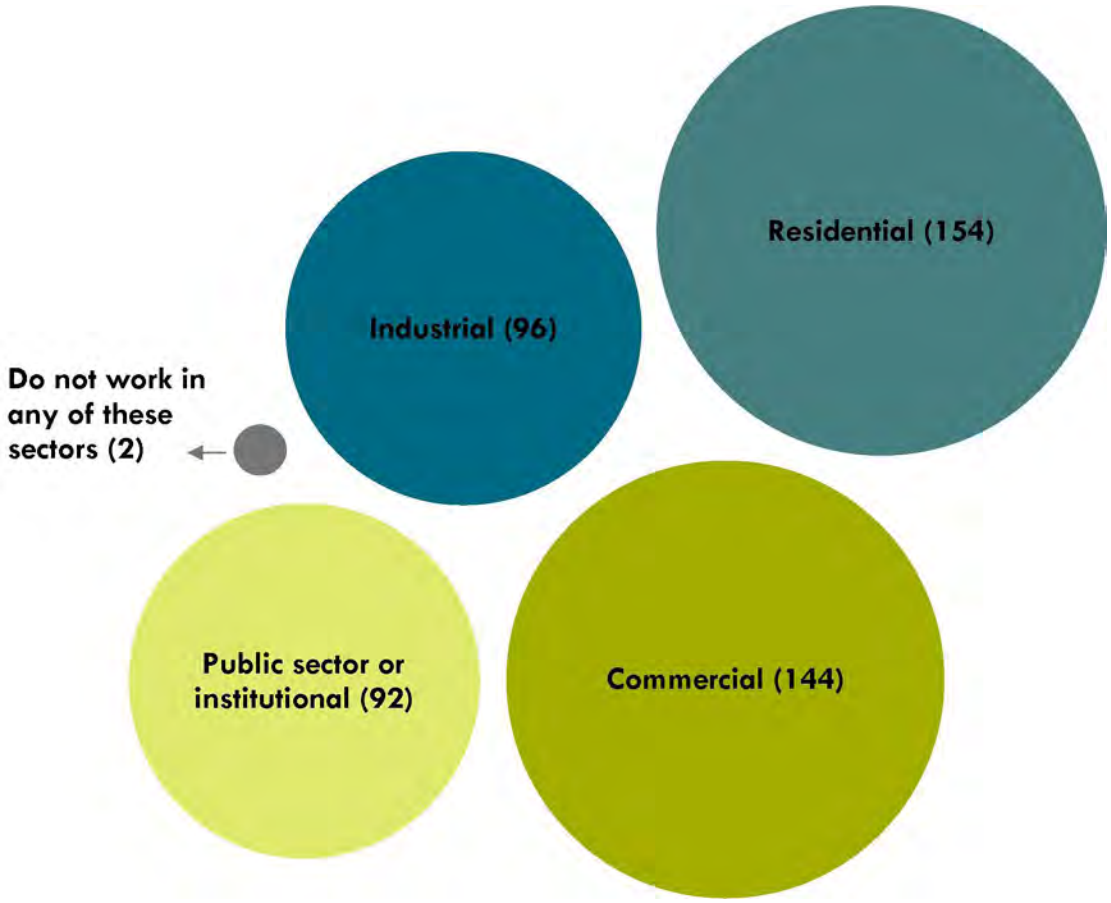
Eight Occupations Studied	
Energy Auditor/Home Energy Rater	Construction/Design Project Manager
Building Performance/Retrofitting Specialist	HVAC Technicians/Installers
Resource Conservation/Energy Efficiency Manager	Building Controls Systems Technicians
Compliance Analyst/Energy Regulation Specialist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

[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.

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

In the Central Region, it is estimated that approximately 1,330 firms employ energy efficiency workers in one or more of the eight occupations studied. Of these, 214 (16% of employers) provided information related to energy efficiency occupations. Seventy-one percent of employers identify themselves as involved directly with energy efficiency work, while 29% said they were indirectly involved. Additionally, the majority of employers provide services in the residential and commercial sectors, as illustrated in Figure 1 below[8]. Appendix C contains information regarding the methodology on estimating the number of firms.

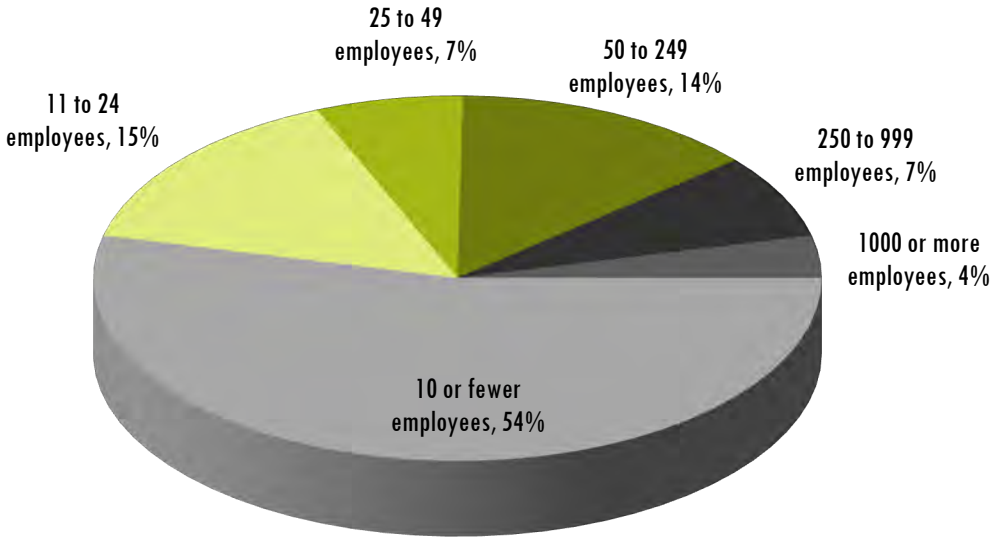
Figure 1: Energy Efficiency Employers by Sector, Central Region



Across all industries, many small businesses do not have the resources to provide internal training to existing employees. This is also true in the energy efficiency industry, where many existing firms are changing services offered to align with evolving energy efficiency practices. Research for this report reveals that most firms in the Central Region are relatively small — 69% employ few than 25 employees — with a significant portion (54%) employing 10 or fewer employees. In executive interviews, multiple employers expressed interest in community colleges providing skills upgrade training for existing employers. Most of the employers interested in this type of training had fewer than 25 employees. More data on the size of firms is shown in the pie chart on the following page.

[8] Employers were able to select more than one sector

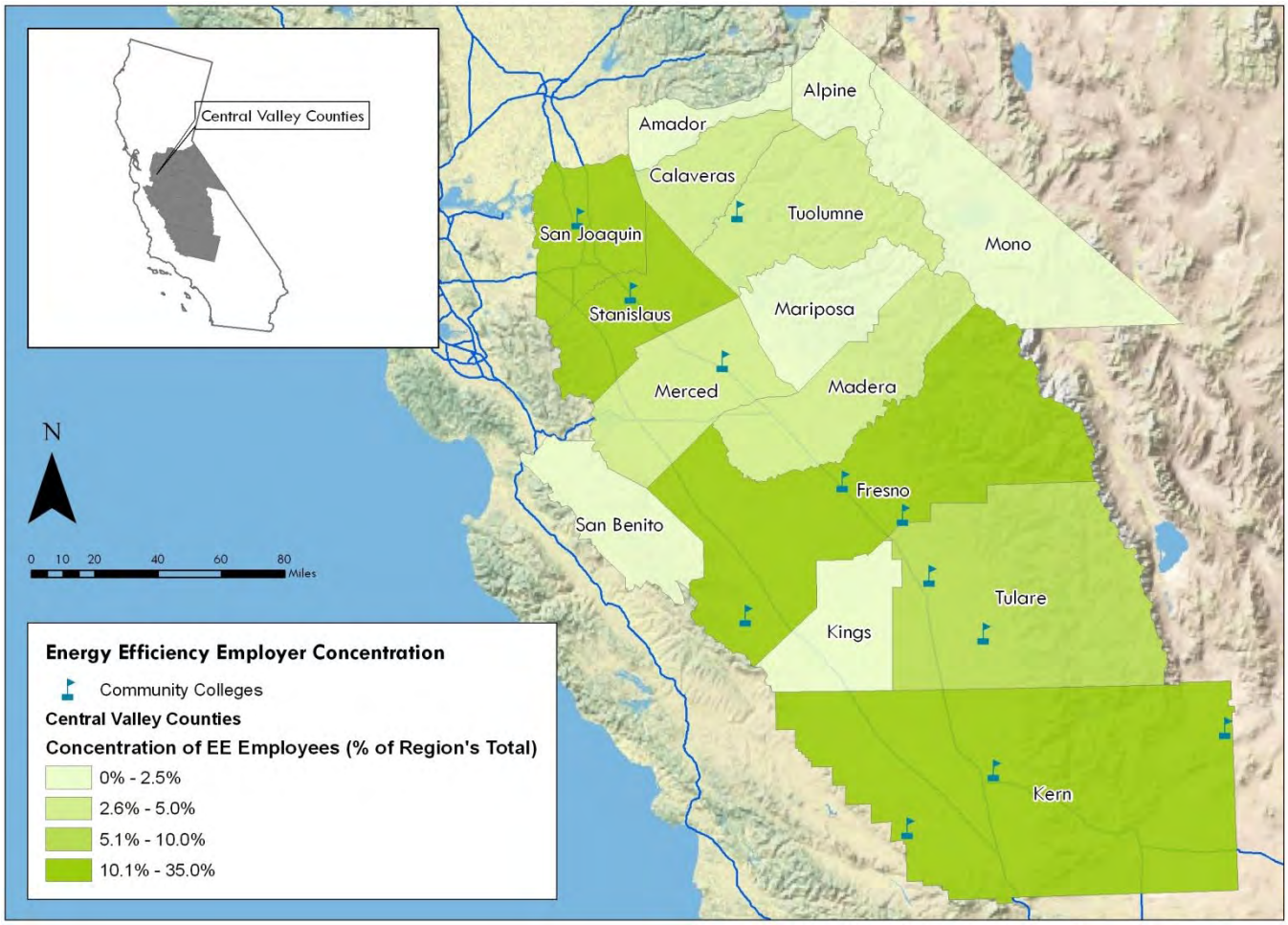
Figure 2: Employment Size for Energy Efficiency Firms, Central Region



While data was collected from employers in 14 Central Region counties, the majority of firms are concentrated in the four larger counties.[9] Nearly one-third (32%) of the energy efficiency employers surveyed were located in Fresno County, 15% each in Kern and San Joaquin Counties, and 14% in Stanislaus County. Research results indicate there are relatively low number of employers in the rural (less populated) counties of the Region – Mono, Alpine, Amador, and Mariposa. Maps of employer concentrations throughout the Region can be found in Appendix D. Figure 3 on the following page displays energy efficiency employer concentrations in the Central Region.

[9] Data for San Benito and Monterey Counties is included in the *Energy Efficiency Occupations: Bay Region* environmental scan, coeccc.net/energy. Survey data was collected from 4 energy efficiency employers in San Benito County and 33 energy efficiency employers in Monterey County.

Figure 3: Concentration of Energy Efficiency Employers, Central Region



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 Central Region. A summary of the energy efficiency related provisions in ARRA can be found in Appendix E.

State Legislation and Policy

California has moved aggressively to establish a legislative and policy framework that puts energy efficiency center stage in the effort to meet the state's increasing energy needs and fight global warming. In 2005, the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC) released their "Energy Action Plan II" which clearly identified energy efficiency as California's top priority. California's Public Utilities Code requires utilities to first meet their "unmet resource needs through all available energy efficiency and demand reduction resources that are cost effective, reliable and feasible."[10] A summary of California's key legislative and policy initiatives related to Energy Efficiency can be found in Appendix F.

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

Utility Energy Efficiency Programs

During 2006-08, California's Investor Owned Utilities (IOUs) embarked on the single-largest energy efficiency campaign in U.S. history, with a $2 billion investment by California's energy ratepayers for energy efficiency programs. The CPUC estimates that the amount of energy saved over the three years eliminated the need to build three large power plants.[11] Pacific Gas and Electric (PG&E), invested over $1 billion between 2006-2008 on energy efficiency programs for customers. Local irrigation districts such as Modesto Irrigation District and Turlock Irrigation District have also invested in energy efficiency programs in their respective communities. These programs include residential energy efficiency incentives, demand response initiatives, and efficiency programs for commercial and industrial customers.

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 11.2% as of May 2009,[12] which is significantly lower than the unemployment rate for the Central Region, which in some areas is greater than 20%. 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 Central 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 state-wide economic development strategy. Some renewable energy industries, such as wind, are only viable where the energy source exists in abundance. In contrast, energy efficiency initiatives can be executed everywhere — in every home, every commercial or public building, and every industrial facility. And energy efficiency jobs can't be outsourced. As Van Jones, former President of Green For All stated, "…you can't take a building you want to weatherize, put it on a ship to China, and then have them do it and send it back."[13]

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

Occupational Overview

Occupations Studied

Occupations included in the research had to be classified in the energy efficiency sector (as defined on page 6 of this report) and aligned with community colleges' education offerings.[14] The eight occupations studied, as well as current and projected employment in the Central Region, are listed in Table 2 on the following page. Occupational profiles for the eight occupations are located in Appendix H.

Qualifying the Employment Estimates

The combined occupational employment in the Central Region for the eight energy efficiency occupations studied could be as high as 10,790 jobs. [15] The figure is a projection of employment, based on employer responses and an estimate of the total number of firms in the energy efficiency sector in the Central Region.

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[11] San Francisco Chronicle, "PG&E gets cash advance to pay backlog of energy-saving rebates", March14, 2009.
[12] California Employment Development Department, Labor Market Information Division, County Unemployment Rates
[13] Van Jones quoted in "Hot, Flat, and Crowded," Thomas L. Friedman, p. 306, 2008.
[14] Occupations were identified through executive interviews with industry leaders, ETC Statewide Director, community college faculty and Deans, and the Energy Services occupational framework developed by ATEEC in 2008.
[15] Employment data from the 214 survey respondents is summarized in Appendix C.

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 in this report assume that the sample of firms who responded to the survey are 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: a) survey respondents may be more engaged in Energy Efficiency work than non-respondents, b) inclusion of firms in the estimate who would not self-identify as a firm that hires energy efficiency workers, c) exclusion of firms who would self-identify as a firm that hires energy efficiency workers, and d) 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 research conducted for this report, the estimated combined growth of these eight occupations over the next three years could result in as many as 3,420 new jobs for the Central Region economy. Employers also expect the anticipated economic recovery to strengthen the demand for energy efficiency occupations, as all eight occupations boast feature employment growth expectations of 19% or higher over the next 3 years.

Table 2: 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
Resource conservation or energy efficiency managers assess current energy and resource consumption and develop strategies to reduce usage.	2,000	90	4%	440	22%
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.	1,890	150	8%	520	28%
HVAC mechanics, technicians or installers install, repair and maintain heating, ventilation, air-conditioning and refrigeration systems.	1,780	330	18%	820	46%
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.	1,290	180	14%	460	36%
Building operators or building engineers troubleshoot, install, replace, and repair building energy systems and controls to optimize energy efficiency.	1,140	10	1%	220	19%
Energy auditors or home energy raters are responsible for collecting, analyzing and validating energy usage in the field and preparing reports on a building or home's total energy profile.	1,000	140	14%	420	42%
Compliance analyst or energy regulation specialists evaluate if projects are meeting regulatory requirements and/or incentives and provide recommendations as needed to meet compliance.	870	70	8%	260	30%
Building controls systems technician combine some of the traditional skill sets of building technicians with advanced skills in controls programming, networking, and systems integration.	820	100	12%	280	33%
Total, All Occupations (totals may not add due to rounding)	**10,790**	**1,070**		**3,420**	

12-month Job Projections

The largest growth occupation during the next year in the Central Region is HVAC mechanics, with as many as 330 new jobs projected. Building performance/retrofitting specialists are also expected to experience a large growth in the next year, with 180 new jobs projected in each occupation over the same period. Collectively, the eight

occupations researched for this report are expected to provide 1,070 new jobs to the Central Region in the next 12 months.

Three Year Job Projections

Over the next three years, the largest growth occupation in the Region is HVAC mechanics, with as many as 820 new jobs projected. Project managers for construction are also projected to experience a large three year growth with 520 new jobs projected. In total, occupations studied for this report are projected to add 3,420 new jobs to the Region in the next three years.

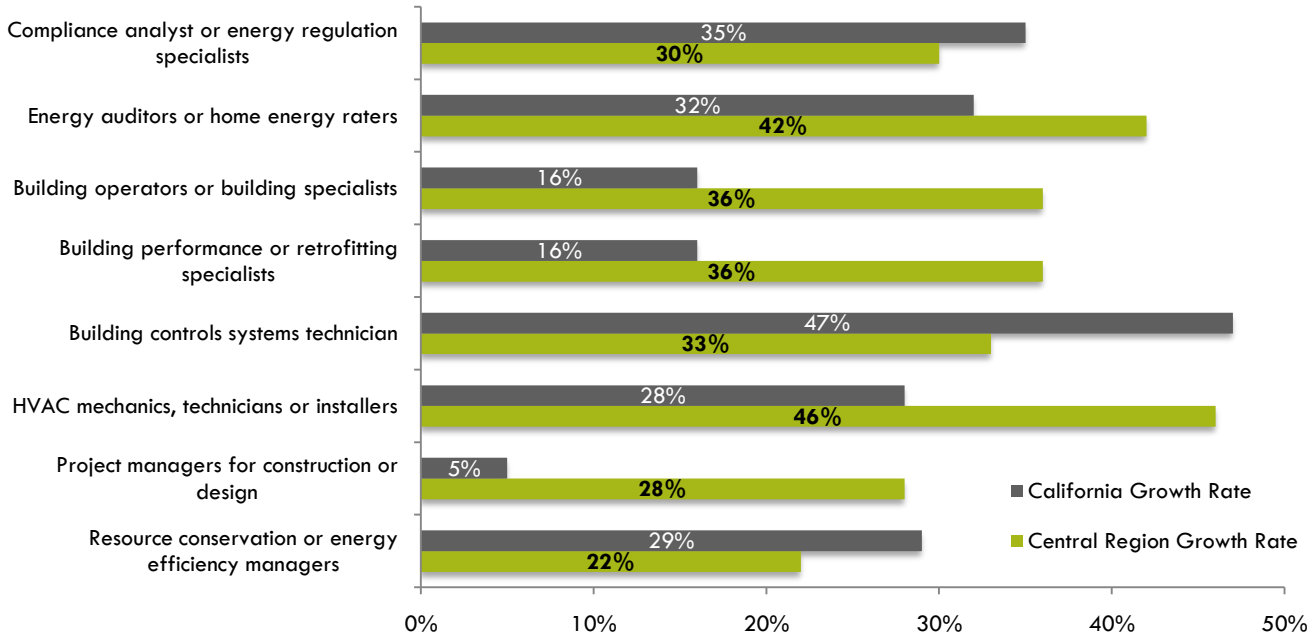
Projection Summary

In the Central Region, each of the eight energy efficiency occupations researched are projected to yield a positive growth in employment opportunities. HVAC mechanics appear to be an occupation with consistent growth, experiencing large overall short- and long-term growth. Project managers and building performance/retrofitting specialists also present promising employment opportunities in the Central Region.

Statewide Occupational Growth

Research conducted for the Central Region indicates a positive increase in energy efficiency jobs over the next three years. Statewide research in energy efficiency yields the same results, with each of the eight energy efficiency occupations projected to grow significantly. When growth rates for the Central Region are compared to statewide growth projections, some occupations are experiencing higher growth rates. In the Central Region, HVAC mechanics and project managers are growing at a much faster rate than statewide. However, other occupations such as building performance or retrofitting specialists or energy efficiency managers are growing at a slower pace than the rest of the state. Figure 4 below compares Central Region three-year growth rates to statewide growth rates.

Figure 4: California and Central Region Energy Efficiency Growth Rate Projections, 2009-2012



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

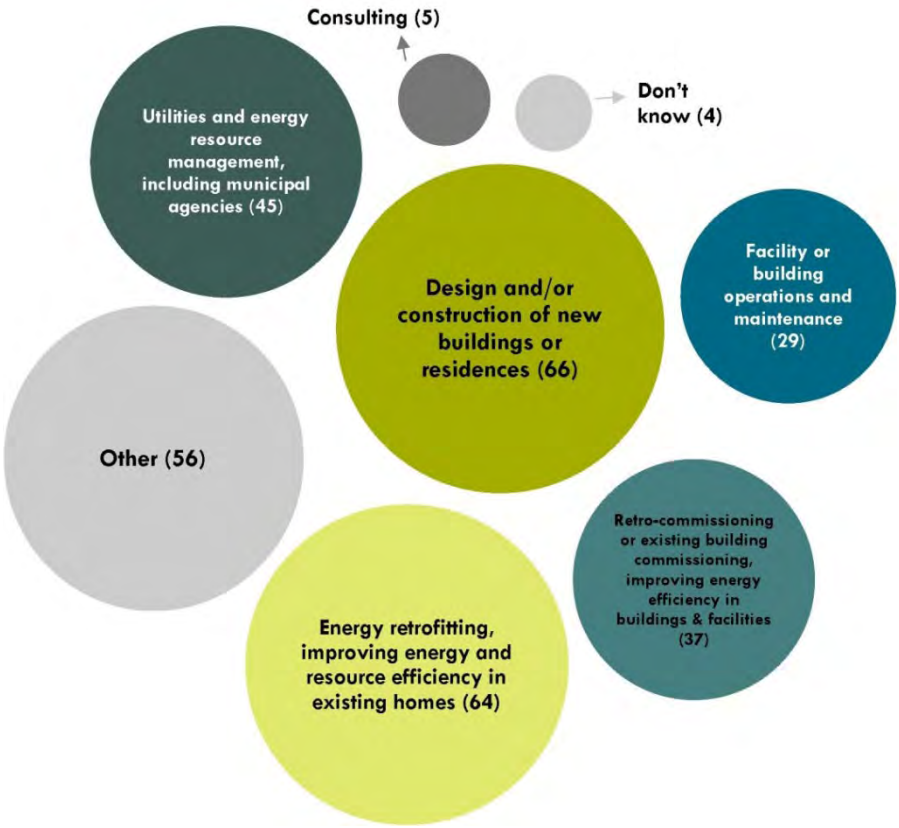
Dividing the building design and construction segment allowed the COE to collect data that is reflective of the energy efficiency workforce in the Central Region. Employers participating in the research provided data and information on energy efficiency in the five industries identified for this report. Figure 5 below details the five industry components of the energy efficiency sector that employers were asked to provide information on.

Figure 5: Energy Efficiency Sector Industry Components

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

The following section, *Occupational Skill and Knowledge Requirements*, summarizes data collected from Central Region energy efficiency employers within the five industry sectors. According to employers, the design and/or construction of new buildings accounts for 22% of energy efficiency services provided in the Central Region. Energy retrofitting accounts for 21% of services and utilities is 15%. Figure 6 represents the distribution of employer services amongst the five industries within the energy efficiency sector in the Central Region.

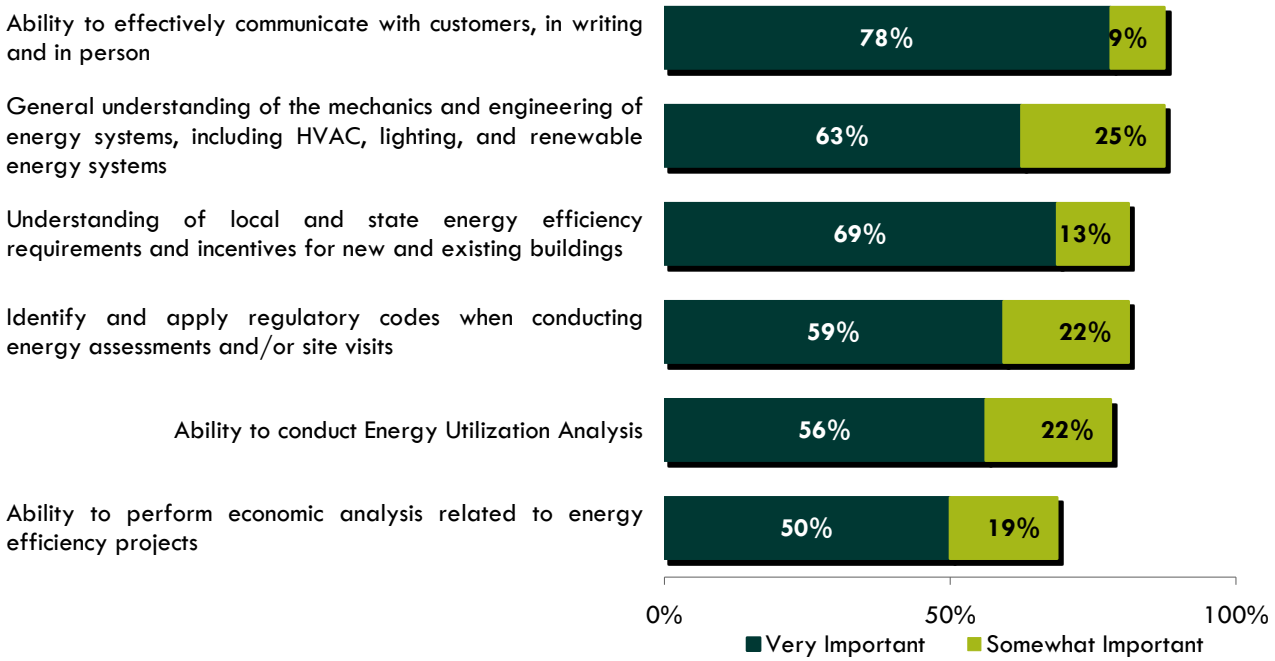
Figure 6: Energy Efficiency Industry Distribution, Central Region



Occupational Skill and Knowledge Requirements

Employers were asked to identify the industry segment that their firm is closely aligned with, as well as skills and areas of knowledge important to them when hiring employees. Figure 7 below illustrates the top skill requirements for occupations in the utilities and resource management industry sector.

Figure 7: Utilities and Resource Management



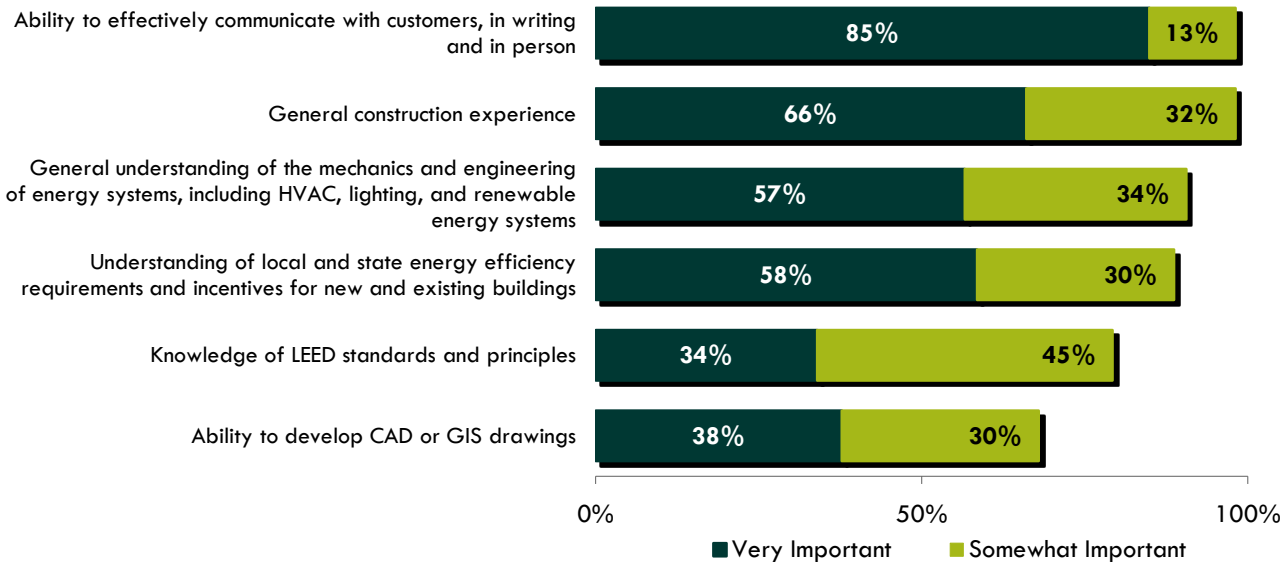
Fifteen percent of energy efficiency employers indicate their respective firms fall into the utilities and resource management sector. Of these employers, 78% expressed the ability to communicate with customers is the most valued skill in their employees. Over 80% of employers also indicated that an understanding of local and state energy efficiency requirements and a general understanding of the mechanics and engineering of energy efficiency systems is important. As colleges develop curriculum to provide training for occupations in utilities and resource management, it would be beneficial to emphasize certain skills (effective communication, general understanding of energy systems) over others (economic analysis of energy efficiency projects, energy utilization analysis).

As a whole, the building design and construction industries comprise the largest number of employers in the Central Region, with 55% of employers indicating their respective firms provide services within this cluster. Figures 8, 9, and 10 represent the building design and construction industries. While each of the industries has a specific focus (new construction, retrofitting, and retro commissioning), there are some common skill requirements for employees. In the Central Region, employers overwhelmingly felt the ability to effectively communicate with customers is an important skill for employees to possess. Employers also indicate employees' understanding of local and state energy efficiency requirements and incentives for new and existing buildings is important.

There are, however, differences in other skill areas amongst the three industries. For example, in the design and/or construction of new buildings, 92% of employers responded that a general understanding of the mechanics and engineering of energy systems, including HVAC, lighting and renewable energy systems is important. This particular skill set was not identified as important for employees in the retrofitting and retro commissioning industries.

Figure 8 contains the highest valued skills for employees working in the design and/or construction of new buildings.

Figure 8: Design and/or Construction of New Buildings

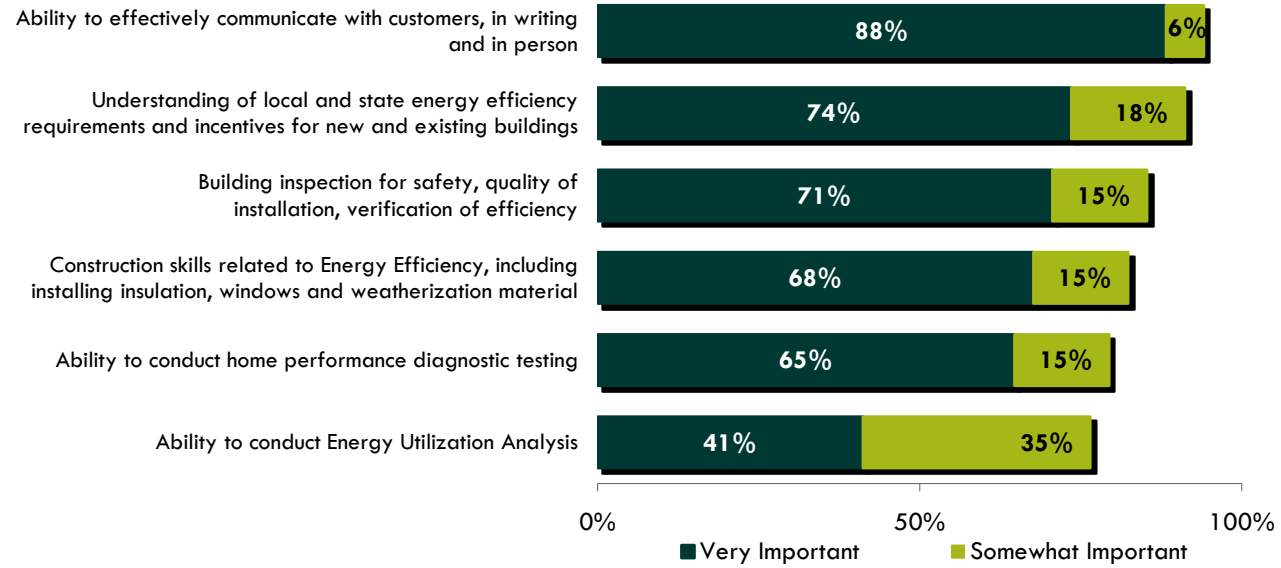


Design and/or construction of new buildings is the energy efficiency industry with the largest number of employers in the Central Region. Twenty-two percent of Regional energy efficiency employers indicate their firms provide services within the design and/or construction of new buildings industry. Of these employers, at least 90% expressed that each of the following skills are important for employees:

- Ability to effectively communicate with customers, in writing and in person
- General construction experience
- General understanding of the mechanics and engineering of energy systems, including HVAC, lighting and renewable energy systems

Twenty one percent of energy efficiency employers in the Central Region reported providing services in the retrofitting sector, the second largest segment of the energy efficiency sector in the Region. Figure 9 highlights important skills for employees providing retrofitting services.

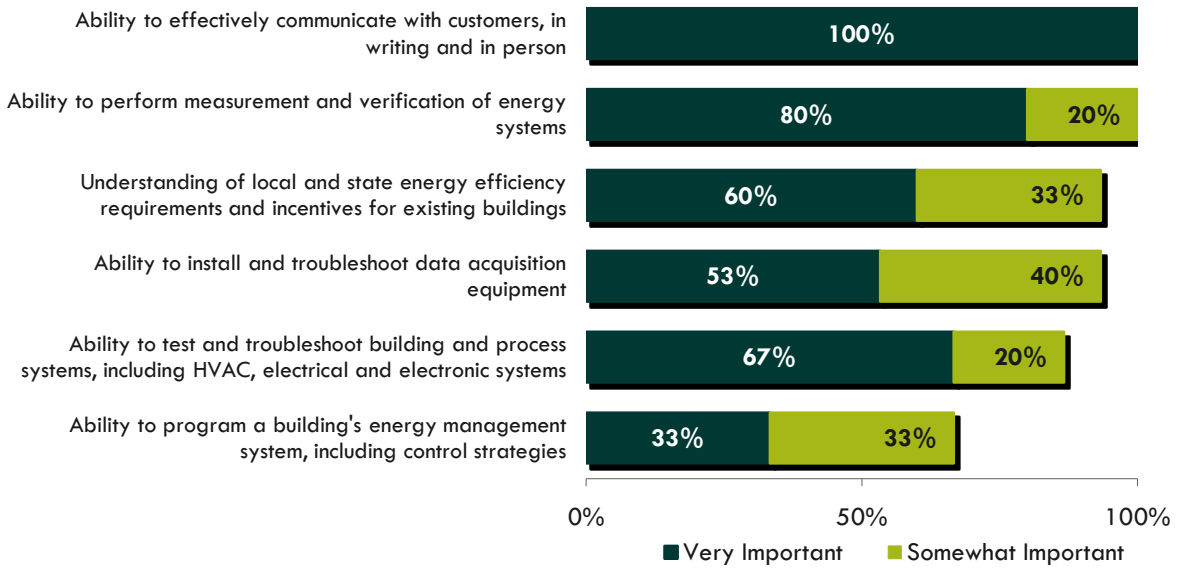
Figure 9: Improving Energy Efficiency in Homes (Retrofitting Homes)



Employers providing services in retrofitting homes responded that employees' ability to communicate with customers, in writing and in person, is the most valued skill. Employers also indicate that understanding of local and state energy efficiency requirements and incentives for new and existing buildings is an important skill (74%). However, employers feel the ability to conduct energy utilization analysis is less important than other skills listed above.

Twelve percent of regional energy efficiency employers reported providing services in the retro commissioning sector. Figure 10 illustrates important skills for employees working in retro commissioning occupations.

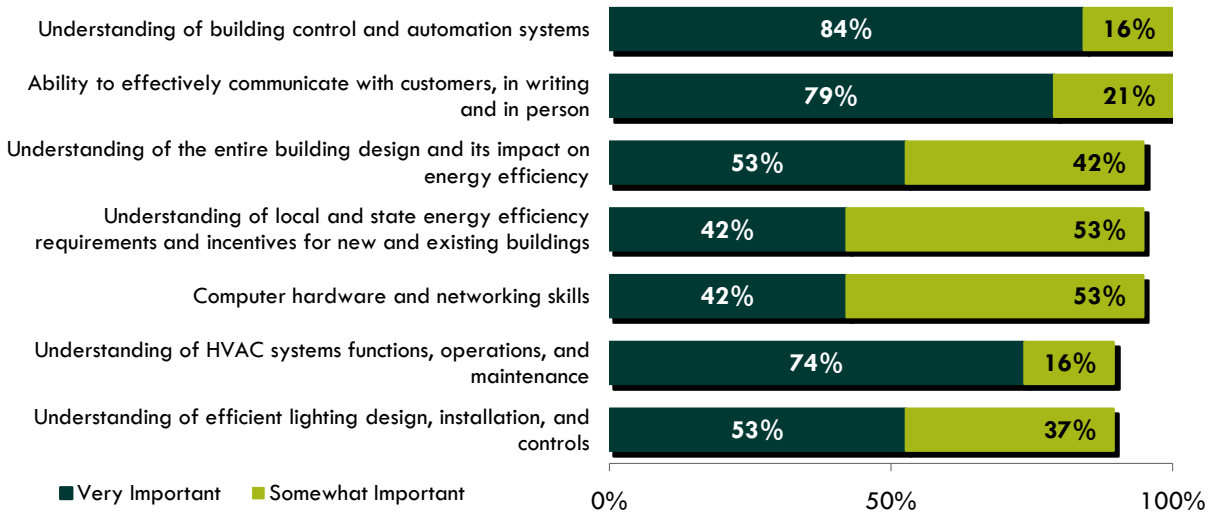
Figure 10: Improving Energy Efficiency in Existing Buildings (Retro-Commissioning)



One hundred percent of retrofitting employers indicated that employees' ability to perform measurement and verification of energy systems is an important skill. An interesting finding is that one hundred percent of employers felt the ability to effectively communicate with customers is a very important skill.

Nine percent of employers in the Central Region reported providing services in facility or building operations and maintenance. Of those employers, 100% indicated that employees' understanding of building control and automation systems. As a whole, employers indicated that each skill listed in Figure 11 is important for employees to have.

Figure 11: Facility or Building Operations and Maintenance



Career Pathways

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

Energy efficiency jobs pay well and provide opportunities for advancement along a career pathway of increasing skills and wages. Most energy efficiency jobs are middle-skill jobs requiring more education than high school, but less than a four-year degree and are well within reach for lower-skilled and low-income workers, as long as they have access to effective training programs and appropriate supports. Most of the eight energy efficiency occupations studied for this report are existing jobs that are changing as industries transition to a clean energy economy.[16]

Lawrence Berkeley National Lab (LBNL) is currently conducting a needs assessment of the energy efficiency services workforce in the U.S. and in eleven states, including California. One component of the research is estimating the size of the energy efficiency services industry (EESI) nationally and in the selected states. Early results indicate that there are over 5,500 jobs in California for Program Administrator Staff, Program Management Contractor Staff and Program Support Contractors. These positions represent the professional and management jobs in the EESI. Significant growth is projected for program management contractor staff and program support contractors in the range of 65% from 2007-2010.[17] Technical workers who begin in the occupations studied for this report could pursue career advancement opportunities into these management and professional jobs with additional education and experience.

Appendix I contains an example of a career and education pathway graphic for energy efficiency occupations. The Appendix also contains some examples of industry certifications that if attained, can help workers advance into more skilled positions with higher pay.

Employer Needs and Challenges

Utilities and energy efficiency service providers in California report a serious problem in attracting trained and experienced professionals and technician personnel with expertise to perform energy efficiency work. The shortage of available and experienced personnel may be a key bottleneck constraining the ability of energy efficiency program administrators, service providers and facility owners to effectively ramp up their energy efficiency activities and efforts to meet growing demand.[18]

> **"There is a huge pressure to stay ahead of the constant changes in energy efficiency. Community colleges can provide trained employees that allow us to keep pace with the needs of the customers."**
>
> *– Don Freeze*
> *Green Energy USA*

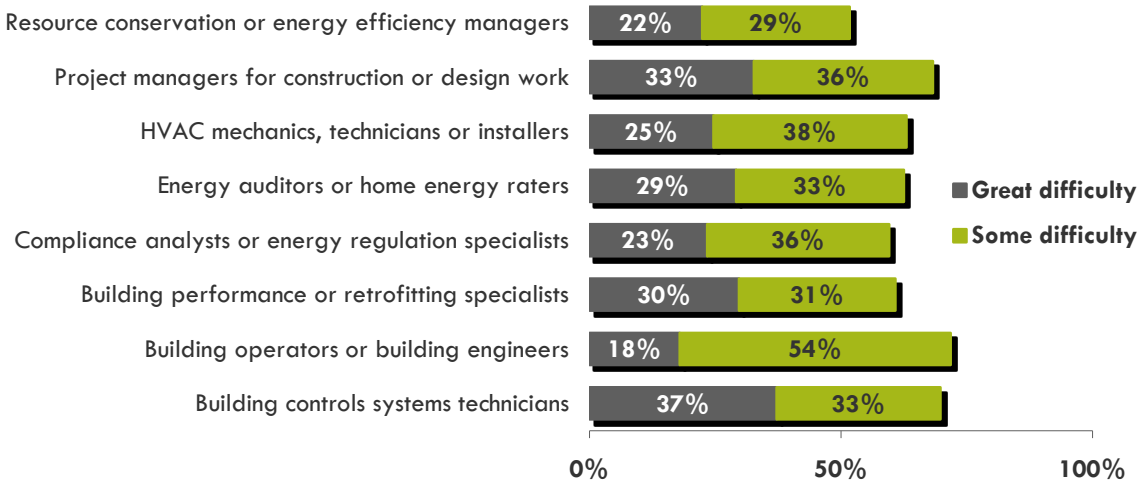
Hiring Difficulties

The majority of employers report difficulty hiring qualified applicants for all eight occupations as shown in Figure 12. The level of difficulty finding qualified applicants for the energy efficiency occupations only strengthens the overall demand for these positions and need for quality training programs. In particular:

- 7 out of 10 employers experience difficulty finding building operators or engineers.
- Over 30% of employers experience great difficulty finding qualified building controls systems technicians and project managers for construction or design work.
- 69% of employers reported difficulty in finding qualified project managers for construction or design work.

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

Figure 12: Difficulty in Hiring for Each Occupation



Relationship between difficulty hiring and projected growth

In the energy efficiency sector, the relationship between difficulty in hiring and expected growth for each of the eight occupations is noteworthy. This relationship is indicative of the need for quality training programs in the Central Region. For example, HVAC mechanics, technicians, and installers are the occupation with the highest 3-year growth projection in the Central Region (46% growth), with 65% of employers also reporting difficulty in hiring a qualified employee. Project managers are also one of the largest energy efficiency occupations studied (1,890 jobs) in the region, with 68% of employers reporting difficulty hiring for the occupation. Additionally, building operators or building engineers represent the most difficult occupation to hire for (72% difficulty); however it is also the occupation with the slowest 3-year growth projection (19% growth).

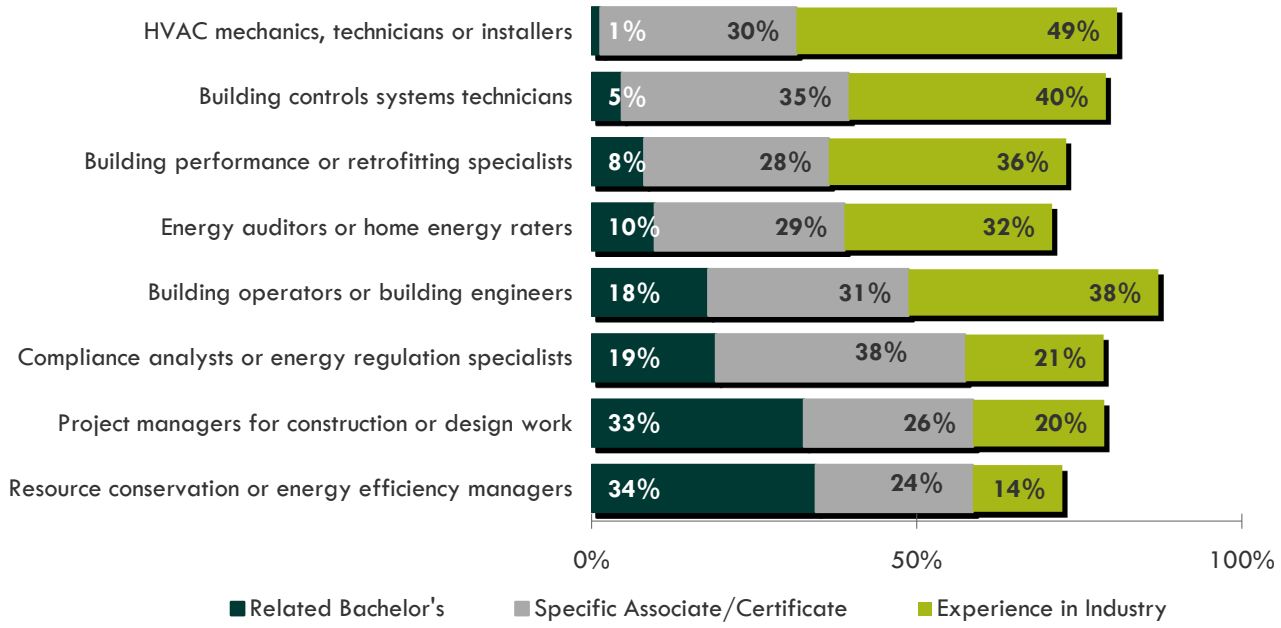
Education and Experience Preferences

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

> **"We would like community colleges to develop and offer classes in geographic proximity to (business) locations that provide career ladder opportunities."**
>
> *—Diane Vessels, California Energy Consultants*

- Between 24% and 38% of employers prefer an associate degree or program certificate specific to the position for each occupation.
- One in three employers prefer resource conservation or energy efficiency managers (35%) and project managers for construction or design work (33%) to have a bachelor's degree in a related field, but not necessarily specific to the occupation.
- Close to the majority of employers prefer hands on experience in the industry for HVAC mechanics, technicians or installers (49%).
- Employers generally preferred a bachelor's degree for Resource Conservation or Energy Efficiency Managers and Project Managers for Construction or Design Work.

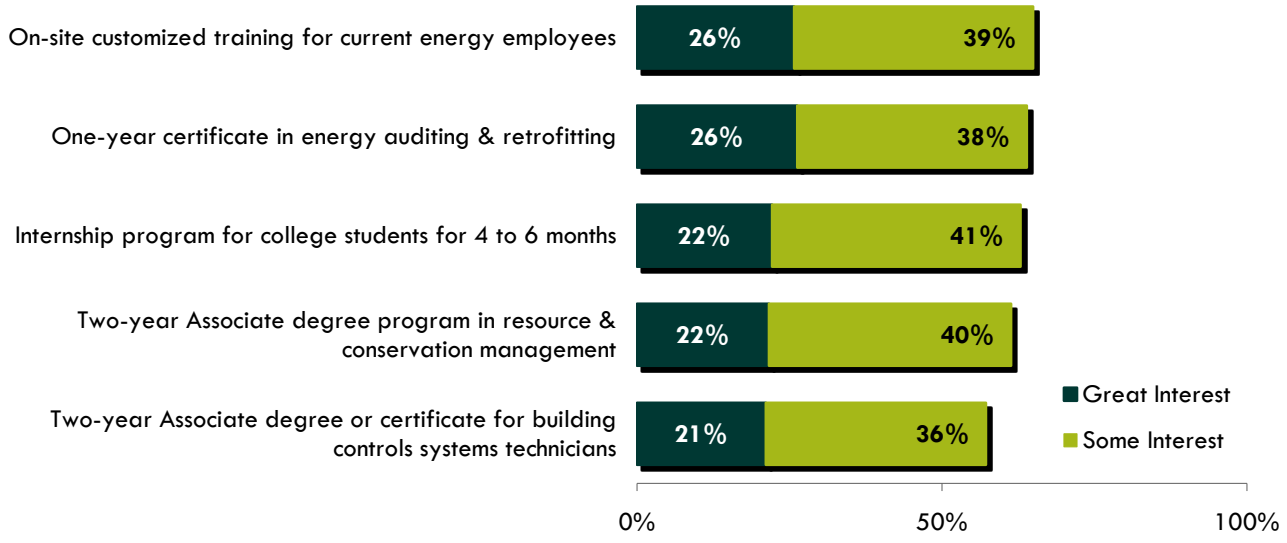
Figure 13: Education and Experience preferences for each of the eight occupations



Workforce Development Opportunities

Central Region employers expressed great interest in education and training programs that can be developed by community colleges. Employer interest in specific community college programs is summarized in Figure 14 below.

Figure 14: Employer Interest in Community College Programs



College Response and Issues

The following section details education and training programs offered by community colleges in the Central Region, which could prepare energy efficiency workers. Challenges and issues related to energy efficiency program development 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), social science or earth science, and renewable energy (solar, wind, etc).

The task of identifying energy efficiency-related programs offered through Central Region Community Colleges was not easy, since potential courses, certificates and degrees are buried within a host of programs with differing titles. In order to obtain an accurate picture of programs which may provide training for energy efficiency occupations, information was collected via survey of regional colleges and a review of the California Community College Chancellor's Office (CCCCO) Inventory of Approved Programs.[19] However, the response rate for the college survey was low (2 out of 13 colleges responding) and did not reveal much information about energy efficiency program development. The CCCCO's Inventory of Approved Programs contained information on several existing programs in the Region related to energy efficiency. The nine programs shown in Table 3 below are the most likely candidates related to the eight occupations studied, based on the Taxonomy of Programs (TOP) and their related codes, and could serve a core program of study for an energy efficiency training program[20].

Table 3: Potential Community College Programs Related to Energy Efficiency Occupations with TOP Code

Top Code	Program Title	Program Description
0301.00	Environmental Science	Study of the biological, chemical, and physical aspects of the environment, including methods of preventing environmental pollution and damage, and preventing animal and plant extinction.
0302.00	Environmental Studies	Study of environment-related issues, including policy and legislation, social, legal, and economic aspects, and scientific principles of the ecosystem and environmental conservation.
0303.00	Environmental Technology	Environmental management, monitoring, assessment, and restoration, including environmental pollution control systems and the management of hazardous materials and hazardous waste, and related government regulations.
0945.00	Industrial Systems Technology and Maintenance	Design, construction, maintenance, and operation of mechanical, hydraulic, pneumatic, and electrical equipment and related systems, such as production machinery. Includes building and plant maintenance.
0946.00	Environmental Controls Technology (HVAC)	Assembly, installation, operation, maintenance, and repair of air conditioning, heating, and refrigeration systems.
0946.10	Energy Systems Technology	Theory and methods of energy conservation applied to heating, cooling, and related systems, including the measurement and assessment of energy consumption, diagnosis and prescription. Includes alternative energy systems.
0952.00	Construction Crafts Technology	Lay out, fabrication, erection, installation, and repair of buildings, highways, airports, and other structures and fixtures, including framing, construction materials, estimating, blueprint reading, and use of tools.
0957.00	Civil and Construction Management Technology	Application of procedures and techniques related to civil and construction management including estimating and bidding, scheduling and control, inspection, building systems, construction practices, quality control, labor and safety practices. Includes public works mgmt.
0957.20	Construction Inspection	Inspection of new or remodeled structures to determine their soundness and compliance to specifications, building codes, and other regulations.

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

[20] To further identify college programs, an online survey was disseminated to colleges. Follow up phone interviews were also conducted.

Central Region College Programs Related to Energy Efficiency Occupations

Example of an Energy Efficiency Program in the Central Region[21]

San Joaquin Delta College in Stockton is participating in the national movement to endorse the American College and University and Presidents Climate Commitment. Over the past year the college has implemented two key policies: 1) a sustainable building policy that ensures major construction projects meet LEED certification or equivalent standards, and 2) an energy star purchasing policy to ensure that new appliances and equipment meet energy conservation standards. Additionally, operational changes sparked the introduction of biodegradable utensils in the cafeteria and new cleaning operations that promise to reduce water and chemical use. Energy efficiency training programs offered at San Joaquin Delta include: facilities/maintenance, recycling/waste management EPP (Environmentally Preferable Purchasing)[22].

Current College Programs, Certificates, or Courses Related to Energy Efficiency Occupations

Table 4 on the following page illustrates colleges in the Central Region offering courses, certificates and degree programs relating to the eight occupations studied.

Table 4: Current College Programs, Certificates, or Courses

COLLEGE	Potential Energy Efficiency Occupational Training Programs[23]							
	Environ-mental Science	Environmental Studies	Environ-mental Technology	Industrial Systems Technology & Maintenance	Environmental Control Technology (HVAC)	Energy Systems Technology	Construction Crafts Technology	Civil and Construction Management Technology
Bakersfield College		Currently no approved programs in Central Region	A.S. Degree, Certificate			Currently no approved programs in the Central Region	A.S. Degree, Certificate	
Columbia College	A.S. Degree							
Fresno City College			A.S. Degree				A.S. Degree, Certificate	A.S. Degree
Hartnell College				A.S. Degree, Certificate	A.S. Degree, Certificate		Certificate	A.S. Degree, Certificate
Merced College			A.S. Degree, Certificate	A.A. Degree, Certificate	A.A. Degree, Certificate			
Modesto Junior College				A.S. Degree, Certificate			A.S. Degree, Certificate	A.S. Degree
San Joaquin Delta College				A.S. Degree, Certificate	A.S. Degree, Certificate			Certificate
College of the Sequoias				A.S. Degree, Certificate	A.S. Degree, Certificate		A.S. Degree, Certificate	

[21] Directory of Sustainability Programs at California Community Colleges, http://www.green-technology.org/ccsummit/directory.html
[22] For information regarding this program, contact: Dr. Matt Wetstein, mwetstein@deltacollege.edu
[23] Only colleges with approved programs were included in this table.

Community Support and Resources

There are excellent opportunities for regional colleges 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 research results. The following table summarizes existing and potential partnerships that can be leveraged if colleges in the Central Region are planning to develop an energy efficiency training program.

Table 5: Central Region Partnership Resources

Organization	Service Area (Type of Organization)	Contribution to Partnership
American Society of Heating, Refrigerating & Air Conditioning Engineers (ASHRAE) www.ashrae.org	Central Valley 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
Building Owners & Managers Association (BOMA) www.bomasacramento.org	Sacramento Chapter[24] (Industry Association)	Access to Employers, Industry Standards, Job Descriptions
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.
Pacific Gas & Electric (PG&E)* www.pge.com	Statewide (Employer)	Industry Standards, Job Descriptions, Access to Employees for Training, Training Centers (San Francisco, Stockton)
UC Davis, Energy Efficiency Center http://eec.ucdavis.edu/	Statewide (Research & Development, Education Institution)	Access to internships, fellowships and job postings and forums, workshops, guest lectures, and events
US Green Building Council (USGBC)* www.usgbc-ncc.org	Central California Chapter (Industry Association)	Access to Employers, Industry Standards, Job Descriptions, LEED Certification Training
Workforce Investment Boards www.cwib.ca.gov	Central California (Workforce Development)	Access to Job Seekers, Training Funds, Employment Resources
Advanced Transportation Technology and Energy Initiative (ATTE), California Community Colleges www.attecolleges.org	Statewide (Economic and Workforce Development Program)	Provide students, technicians, faculty, public and other initiative centers with the education, training and resources they need to effectively learn, teach and work with advanced transportation and energy technologies.

* Existing Partnership

[24] There is not a BOMA chapter for the Central Region. The Sacramento chapter is the nearest field office.

Conclusion

Research conducted for this report indicates that employers in the energy efficiency sector are projected to increase employment substantially over the next three years in the Central Region and across the state. Furthermore, the majority of employers in the Region report difficulty hiring qualified candidates in all eight energy efficiency occupations studied.

This study also reveals that in the Central Region, there is a shortage in training programs designed to train workers in the eight occupations studied. However, there is an adequate base of existing approved programs (e.g., industrial technology, HVAC, or environmental technology) throughout the Region with the potential to develop energy efficiency training programs. The programs can update or change existing curriculum to meet industry training standards.

According to research results, employers indicate they were most comfortable with community college training for three occupations: (1) compliance analysts or energy regulation specialists, (2) building controls system technician, and (3) building operators or building engineers. Collectively, these three occupations will account for as many as 760 new jobs in the next three years for the Central Region (approximately 250 jobs a year). At the present time, Community Colleges in the Region are not training enough workers for these occupations. Furthermore, 93% of employers report difficulty hiring employees in these three occupations. As such, these three occupations should be the top priority when considering where to allocate limited resources.

The good news is that colleges have already begun to anticipate employer needs for energy efficiency workers. As colleges begin to implement new energy efficiency training programs, the new certificate programs will add students to the workforce and work towards meeting employer needs.

Recommendations

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

1. **Strategically develop energy efficiency training programs throughout the Region to meet industry needs while leveraging resources.**

Research conducted for this report demonstrates a clear need for community colleges to train workers in the energy efficiency sector. However, community colleges are faced with the challenge of balancing programs in the region to avoid over-saturation of the workforce in any one particular sector while focusing on cost-effectiveness. As community colleges in the region begin to create, adapt or expand energy efficiency courses and programs to meet the projected demand for the eight occupations studies, degree and certificate programs that are appropriately dispersed throughout the region will provide economies of scale for colleges. This approach will be particularly useful when using ARRA funds to develop training programs.

2. **Build energy efficiency training programs using existing programs.**

Colleges in the Central Region can build successful training programs for energy efficiency occupations by tapping existing program structures, in both curriculum and technology, to reduce start-up expenses and the time to delivery. Colleges that already have in place courses and/or programs such as environmental technology, industrial systems technology, HVAC, or construction inspection[25] are prime candidates to expand offerings to include energy efficiency training.

[25] Complete list of programs is located on page 19.

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U.S. Green Building Council, www.usgbc.org

Appendix A: How to Use 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 represents funding for multiple projects and written reports through the Central Region 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 of gathering information from employers regarding emerging occupations is to understand 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 existing 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 industries with the greatest concentration of energy efficiency employment opportunities. The following three industries were selected using these criteria in identification of energy efficiency employers in the Central Region:

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 industry includes 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.

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

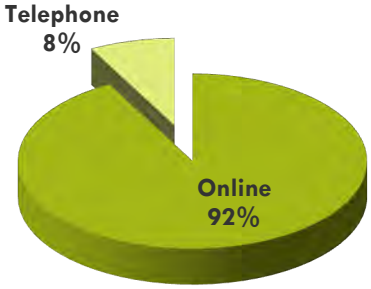
Facility/Building Operations and Maintenance (NAICS definition: 8113 Commercial & Industrial Equipment Repair and Maintenance, 53131 Real Estate Property Managers & Large Employers with Large Facilities) This includes those businesses that hire individuals to can repair and maintain the new energy efficiency 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 often consist of a shift from standard practice to a more energy efficient approach to design, building construction, and building operation (Goldman, 2008). At the same time, over the past 25 years, there have emerged new occupations, with new skill sets that are not addressed within the traditional design, construction, and building operations professions and trades. Examples are energy auditing, resource conservation/energy efficiency manager, and building controls systems technician.

Appendix C: Study Methodology and Sample Data

About the Survey

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



For the Central Region, 92% of the survey responses were submitted online; 8% were conducted by telephone.

About the Respondents

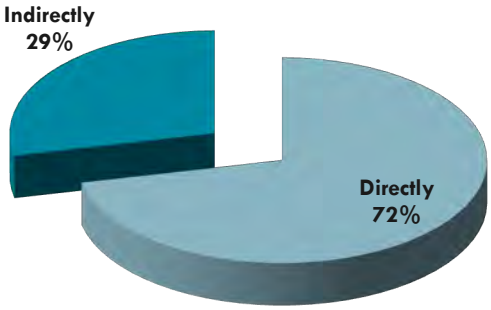
Two hundred and fourteen (214) employers in the Region responded to the survey. The respondent's industry, size of firm, and regional location were recorded where possible. Caution should be used in generalizing results to the entire population of employers to the degree that the sample may differ from the universe.

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

NAICS	Title
221	Utilities
236	Construction of Buildings
238160	Roofing Contractors
238210	Electrical Contractors
238220	Plumbing, Heating, and Air Conditioning Contractors
238310	Building Finishing Contractors
238350	Finish Carpentry Contractors
238990	All Other Specialty Trade Contractors
531311	Residential Property Managers
531312	Nonresidential Property Managers
541310	Architectural Services
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.

Seventy-two percent of respondents identified their work as directly involved in energy efficiency, as a primary part of their business, while 29% responded that their firm was indirectly involved in energy efficiency work.



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

Table 5: 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
Resource conservation or energy efficiency managers	801	35	4%	178	22%
Project managers for construction or design	782	61	8%	215	28%
HVAC mechanics, technicians or installers	551	101	18%	253	46%
Building controls systems technician	418	50	12%	140	33%
Building performance or retrofitting specialists	223	31	14%	80	36%
Building operators or building engineers	204	2	1%	40	19%
Energy auditors or home energy raters	178	26	14%	74	42%
Compliance analyst or energy regulation specialists	87	7	8%	27	30%
Total, All Occupations	**3,243**	**313**		**1,006**	

Study Methodology: Universe of Firms
To estimate the total number of energy efficiency firms in the 14-county Central Region, the following inputs were considered.

- Using the NAICS codes already identified for the study as having the most relevance for energy efficiency work, business listings were acquired from InfoUSA.
- A database of businesses was also developed by the Centers of Excellence using more conventional research methods, including online searches and industry contacts.
- Additional groups of energy efficiency firms were identified through partnerships with industry associations (see below for list) that provided invaluable information about their organizations and members.
    - Pacific Gas and Electric Company (PG&E)
    - United States Green Building Council (USGBC) - Northern California Chapter
    - California Association of Building Performance Contractors (CABPC)
    - California Commissioning Collaborative
    - Building Commissioning Association

These inputs were analyzed and adjusted for relevance to the energy efficiency field, duplication of records, and firms that may not be located in the Central Region or are no longer doing business. The total number for each database was then combined into the universe of firms estimate (1,330 firms).

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 Central Region for the eight occupations totals at least 3,243 jobs (known employment from survey respondents) and could be as high as 10,790 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 Central Region. Margin of error for the 214 survey respondents (out of the universe of 1,330) is ± 5.96%.

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.

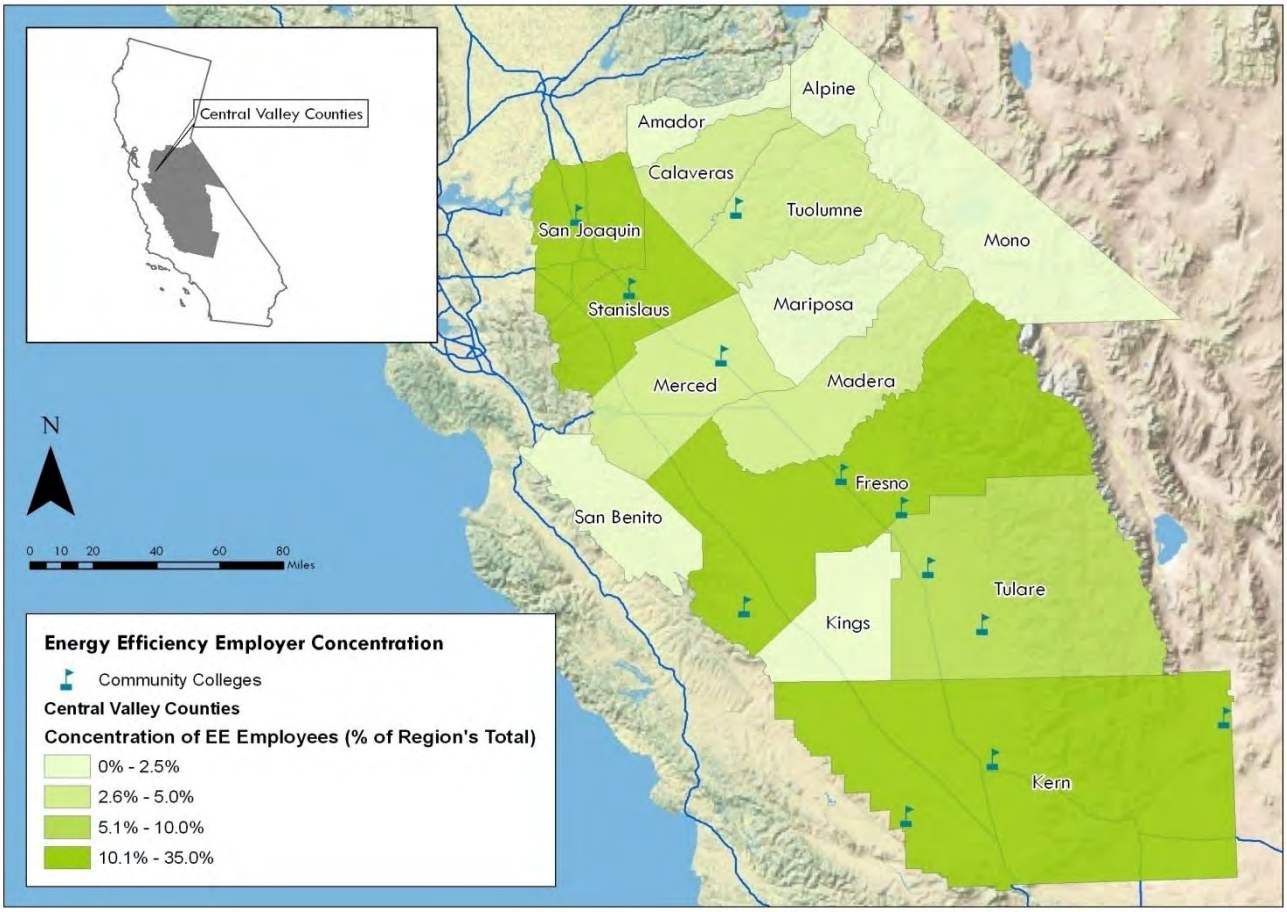
- In the survey, respondents were asked how many individuals in each occupation were currently employed in permanent positions, full or part-time. This resulted in estimates for the distribution of employment across the sample, mean employment, and sample total employment.

- 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).

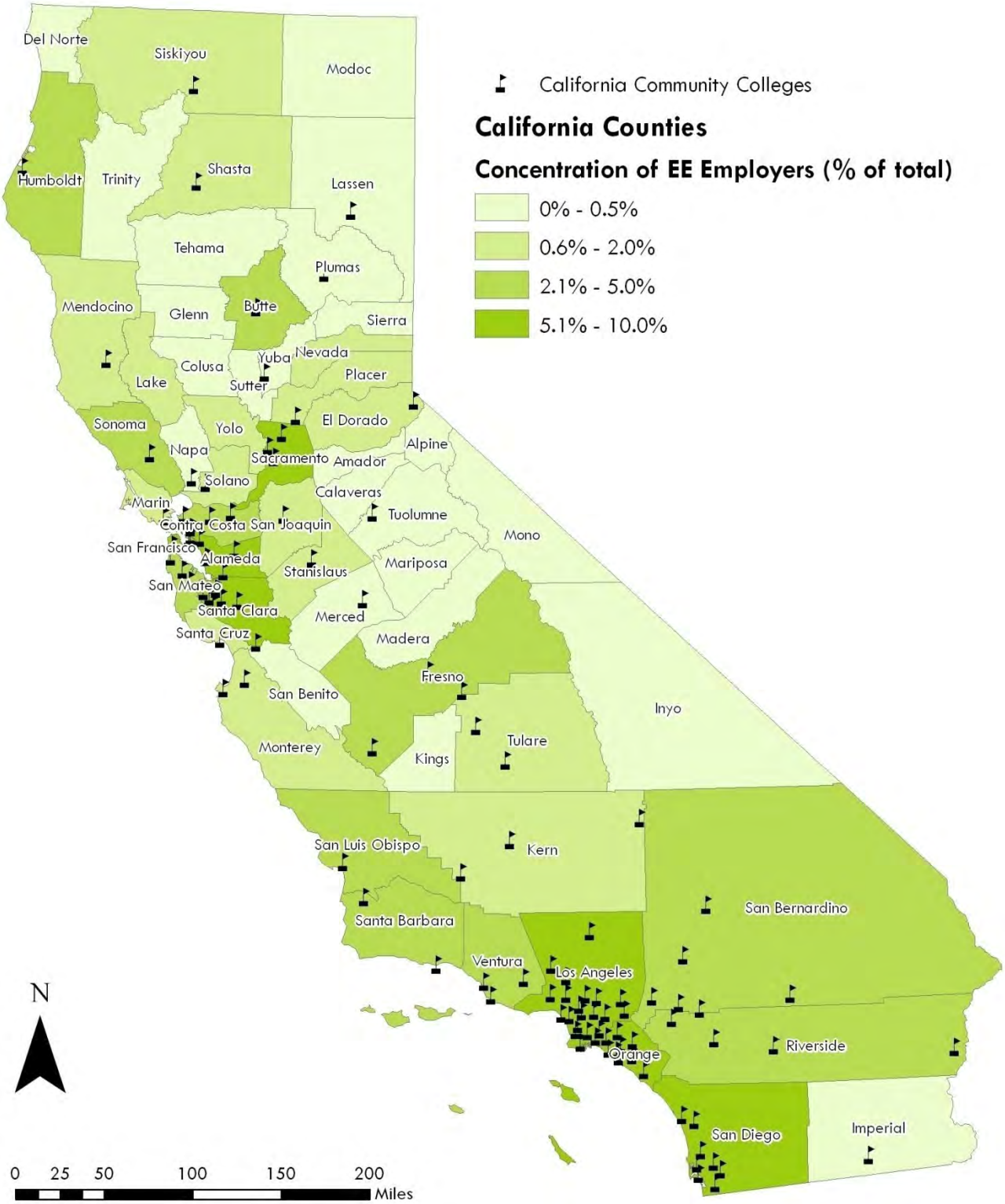
Appendix D: Concentration of Energy Efficiency Employers

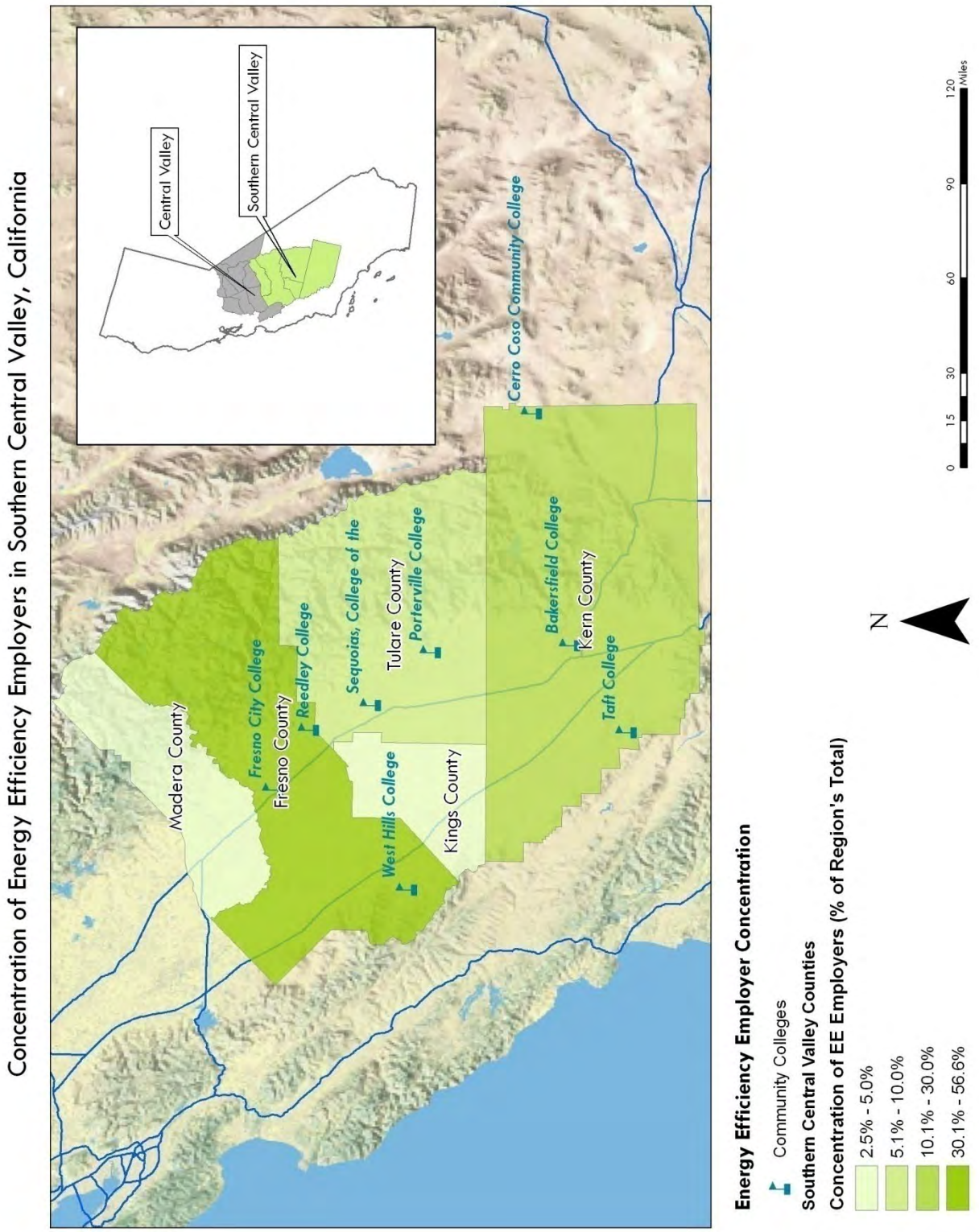
Concentration of Energy Efficiency Employers in Central Valley, California

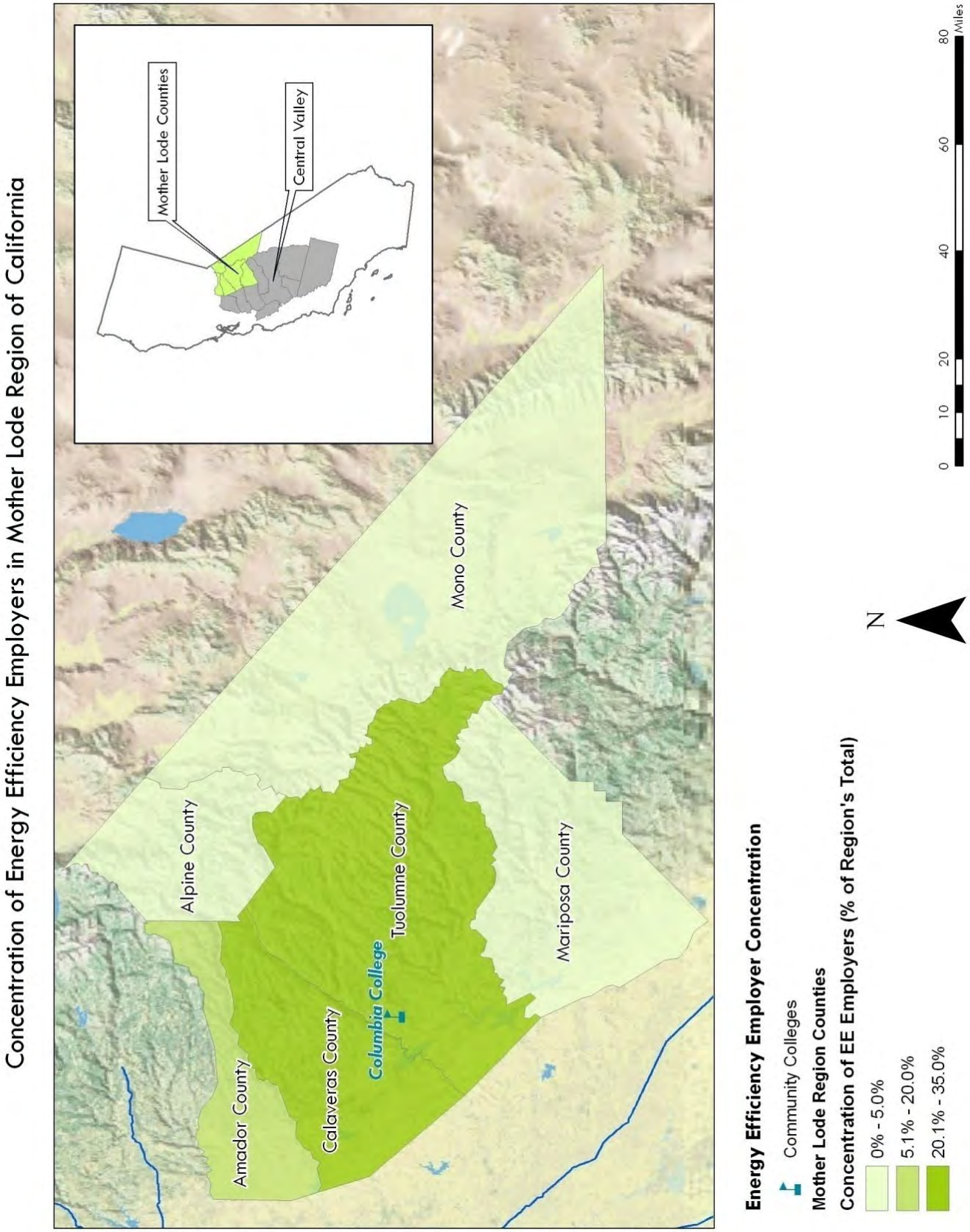


Location of Survey Respondents (County)	Percent of Sample
Alpine	0.5%
Mariposa	0.5%
Mono	0.5%
Kings	1.4%
Amador	1.9%
Tuolumne	2.7%
Madera	2.8%
Calaveras	3.3%
Merced	4.2%
Tulare	10.0%
Stanislaus	14.0%
Kern	15.0%
San Joaquin	15.4%
Fresno	32.2%
TOTAL	**100%**

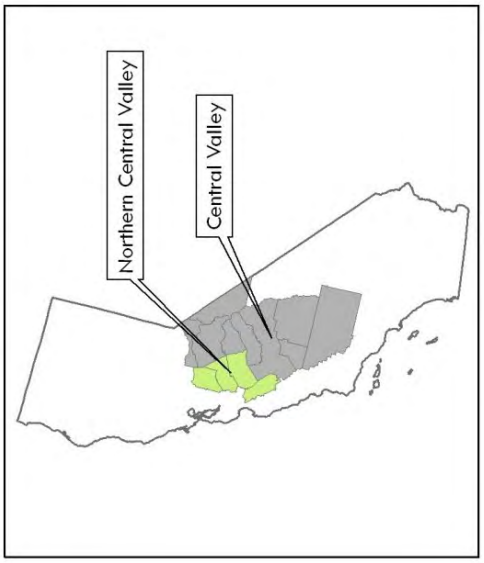
Concentration of Energy Efficiency Employers in California

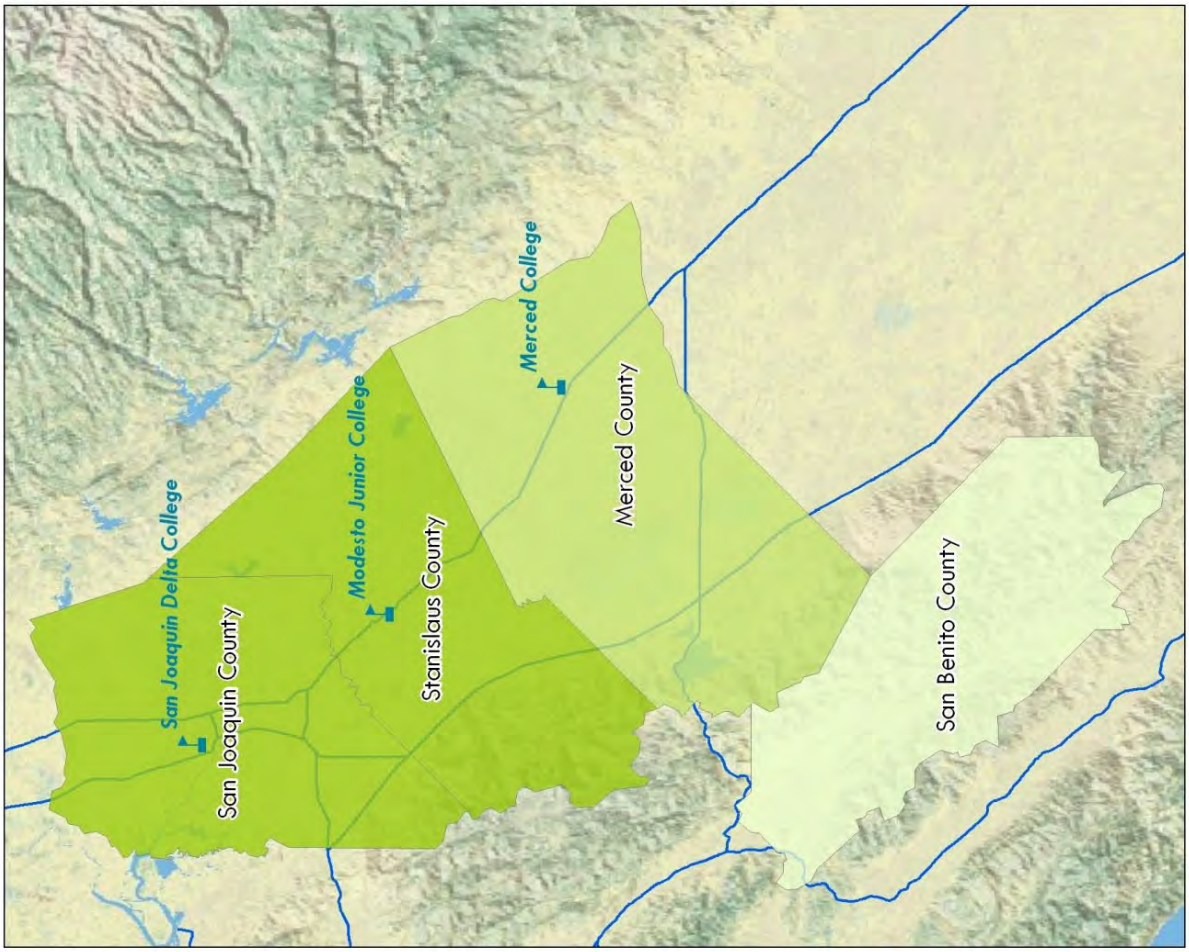



Concentration of Energy Efficiency Employers in Southern Central Valley, California
Central Valley
Southern Central Valley
Madera County
Fresno City College
Fresno County
Reedley College
Sequoias, College of the
Tulare County
Porterville College
West Hills College
Kings County
Bakersfield College
Kern County
Taft College
Cerro Coso Community College
Energy Efficiency Employer Concentration
Community Colleges
Southern Central Valley Counties
Concentration of EE Employers (% of Region's Total)
2.5% - 5.0%
5.1% - 10.0%
10.1% - 30.0%
30.1% - 56.6%
N
0
15
30
60
90
120
Miles


Concentration of Energy Efficiency Employers in Mother Lode Region of California
Mother Lode Counties
Central Valley
Alpine County
Amador County
Calaveras County
Columbia College
Tuolumne County
Mono County
Mariposa County
Energy Efficiency Employer Concentration
Community Colleges
Mother Lode Region Counties
Concentration of EE Employers (% of Region's Total)
0% - 5.0%
5.1% - 20.0%
20.1% - 35.0%
N
0
10
20
40
60
80
Miles

Concentration of Energy Efficiency Employers in Northern Central Valley, California





Energy Efficiency Employer Concentration

Community Colleges

Northern Central Valley Counties

Concentration of EE Employers (% of Region's Total)

- 5.3% - 5.5%
- 5.6% - 15.0%
- 15.1% - 45.0%

N

0 5 10 20 30 40 Miles

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)[26]	$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% 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,

Green Jobs Act: $500 million for training programs to build the green workforce is being funded by the Act.

[26] 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

Assembly Bill 32 (AB32): The California Global Warming Solutions Act of 2006 mandates that California reduce its green house emissions to 1990 levels by 2020. The bill sets a goal of an approximately 11% reduction from current emissions levels and a nearly 30% reduction from 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): Enacted in 2008, this law 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, 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 H: 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:[27]

- 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 Central Region, employment in this occupation is projected to increase 18% over the next 12 months (330 new jobs).
- Over the next three years, employment is projected to increase 46% or by 820 jobs.
- In addition to increased demand for HVAC technicians, 63% of employers experience difficulty finding qualified applicants for these positions, with 25% 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.[28]

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.

- 49% of employers surveyed preferred HVAC technicians with experience in the industry, while 30% indicated preference for a specific Associate degree or program certificate, and 1% percent would consider a related Bachelor's degree adequate.

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

[28] Occupational Outlook Handbook, 2008-2009, "Sheet Metal Workers," www.bls.gov/oco

- When asked what skills are most important, Central Region employers working in Facility or Building Operations and Maintenance indicated they value the understanding of building control and automation systems (84%), and the ability to communicate effectively with customers (79%).

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

	Entry Level Median Annual Wage	Experienced Level Median Annual Wage
HVAC Technicians	$26,520	$52,000

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

Occupation: Project Managers for Construction or Design Work

Project Managers for Construction or Design Work are responsible for communicating with project partners and ensuring that the project is completed in a timely manner and within budget. The following list describes in more detail some of the tasks that may be required of Project Managers:[29]

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

Occupational Outlook: Concern for the environment has prompted the development of new energy-saving heating and air conditioning systems. An emphasis on better energy management should lead to the replacement of older systems and the installation of newer more efficient systems in existing homes and buildings. Installation of new air conditioning and 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, 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 Central Region, employment in this occupation is projected to increase 8% over the next 12 months (150 new jobs).
- Over the next three years, employment is projected to increase 28% or by 520 jobs.
- In addition to increased demand for Project Managers, 69% of employers experience difficulty finding qualified applicants for these positions, with 33% of employers responding "great" difficulty.

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

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.[30]

- 33% of employers surveyed preferred project managers with a related Bachelor's degree, while 26% indicated preference for a specific Associate degree or program certificate, and 20% preferred industry experience.
- When asked what skills are most important Central 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 (85%), and understanding of local and state energy efficiency requirements and incentives for new and existing buildings (58%).

Occupational Wages: In the Central 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	$41,600	$66,380

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

Occupation: Building Performance or Retrofitting Specialist

Building performance or retrofitting specialist are contractors who improve the energy efficiency of homes or buildings by installing insulation, windows, lighting and other energy efficient products. The following list describes in more detail some of the tasks that may be required of building performance or retrofitting specialist: These workers may also be called weatherization specialists, insulation workers, or other trade specific titles.[31]

- 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 Central Region, employment in this occupation is projected to increase 14% over the next 12 months (180 new jobs).
- Over the next three years, employment is projected to increase 36% or by 460 jobs.

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

- In addition to increased demand for building performance or retrofitting specialists, 61% of employers surveyed experience difficulty finding qualified applicants for these positions, with 30% 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.[32]

- 28% of employers surveyed preferred building performance or retrofitting specialists with a specific Associate degree or program certificate, while 8% indicated specialists would benefit from a related Bachelor's degree and 37% would consider experience in the industry adequate.
- When asked what skills are most important, Central 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 (88%), understanding of local and state energy efficiency requirements and incentives for new and existing buildings (74%), and building inspection for safety, quality of installation, verification of efficiency (71%).

Occupational Wages: In the Central 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	$33,280	$52,000

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 Central Region, employment in this occupation is projected to increase 14% over the next 12 months (140 new jobs).
- Over the next three years, employment is projected to increase 42% or by 420 jobs.

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

- In addition to increased demand for energy auditors or home energy raters, 62% of employers surveyed experience difficulty finding qualified applicants for these positions, with 29% 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.

- 29% of employers surveyed preferred energy auditors or home energy raters with a specific Associate degree or program, while 10% indicated preference for a related Bachelor's degree and 32% would consider experience in the industry adequate.
- When asked what skills are most important, Central Region employers working in Improving Energy Efficiency in Existing Buildings (Retro-Commissioning) indicated they value ability to perform measurement and verification of energy systems (80%), ability to test and troubleshoot building and process systems, including HVAC, electrical and electronic systems (67%), and an understanding of local and state energy efficiency requirements and incentives for existing buildings (60 percent).

Occupational Wages: In the Central 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	$31,200	$52,000

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 Central Region, employment in this occupation is projected to increase 4% percent over the next 12 months (90 new jobs).
- Over the next three years, employment is projected to increase 22% or by 440 jobs.

- In addition to increased demand for resource conservation or energy efficiency managers, 51% of employers surveyed experience difficulty finding qualified applicants for these positions, with 22% 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.

- 35% of employers surveyed preferred resource conservation or energy managers with a related Bachelor's degree, while 24% indicated preference for a specific Associate degree or program certificate, and 14% would consider experience in the industry adequate.
- When asked what skills are most important, Central Region employers working in Utilities and Resource Management indicated they value the ability to communicate with customers, in writing and in person (78%), understanding of local and state energy efficiency requirements and incentives for new and existing buildings (69%), and general understanding of the mechanics and engineering of energy systems (63%).

Occupational Wages: In the Central 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	$51,000	$77,500

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 Central Region, employment in this occupation is projected to increase 12% over the next 12 months (100 new jobs).
- Over the next three years, employment is projected to increase 33% or by 280 jobs.
- In addition to increased demand for technicians, 70% of employers surveyed experience difficulty finding qualified applicants for these positions, with 37% 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.

- 35% of employers surveyed preferred building controls systems technicians with a specific Associate degree or certificate, while only 5% indicated technicians would benefit from a related Bachelor's degree and 40% would consider experience in the industry adequate.
- When asked what skills are important, Central Region employers working in Facility or Building Operations and Maintenance indicated they value understanding of building control and automation systems (84%), and the ability to effectively communicate with customers (79%).

Occupational Wages: In the Central 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	$37,440	$61,200

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 Central Region, employment in this occupation is projected to grow 1% over the next 12 months (10 new jobs).
- Over the next three years, employment is projected to increase 19% or by 220 jobs.
- In addition to increased demand for technicians, 72% of employers surveyed experience difficulty finding qualified applicants for these positions, with 18% 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% of employers surveyed preferred building operators or building engineers with a specific Associate degree or certificate, while 18% indicated preference for a related Bachelor's degree and 39% would consider experience in the industry adequate.
- When asked what skills are most important, Central Region employers working in Facility or Building Operations and Maintenance indicated they value understanding of building control and automation systems (84%), and the ability to effectively communicate with customers, in writing and in person (79%).

Occupational Wages: In the Central 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	$40,000	$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 Central Region, employment in this occupation is projected to increase 8% over the next 12 months (70 new jobs).
- Over the next three years, employment is projected to increase 30% or by 260 jobs.
- In addition to increased demand for technicians, 59% of employers surveyed experience difficulty finding qualified applicants for these positions, with 23% 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, and energy analyst or energy auditor.

- 19% of employers surveyed preferred compliance analysts or energy regulation specialists to have a related Bachelor's degree, 38% indicated preference for a specific Associate degree or program certificate, and 21% would consider experience in the industry adequate.
- When asked what skills are most important, Central Region employers working in Utilities and Resource Management indicated they value the ability to communicate with customers, in writing and in person (78%), understanding of local and state energy efficiency requirements and incentives for new and

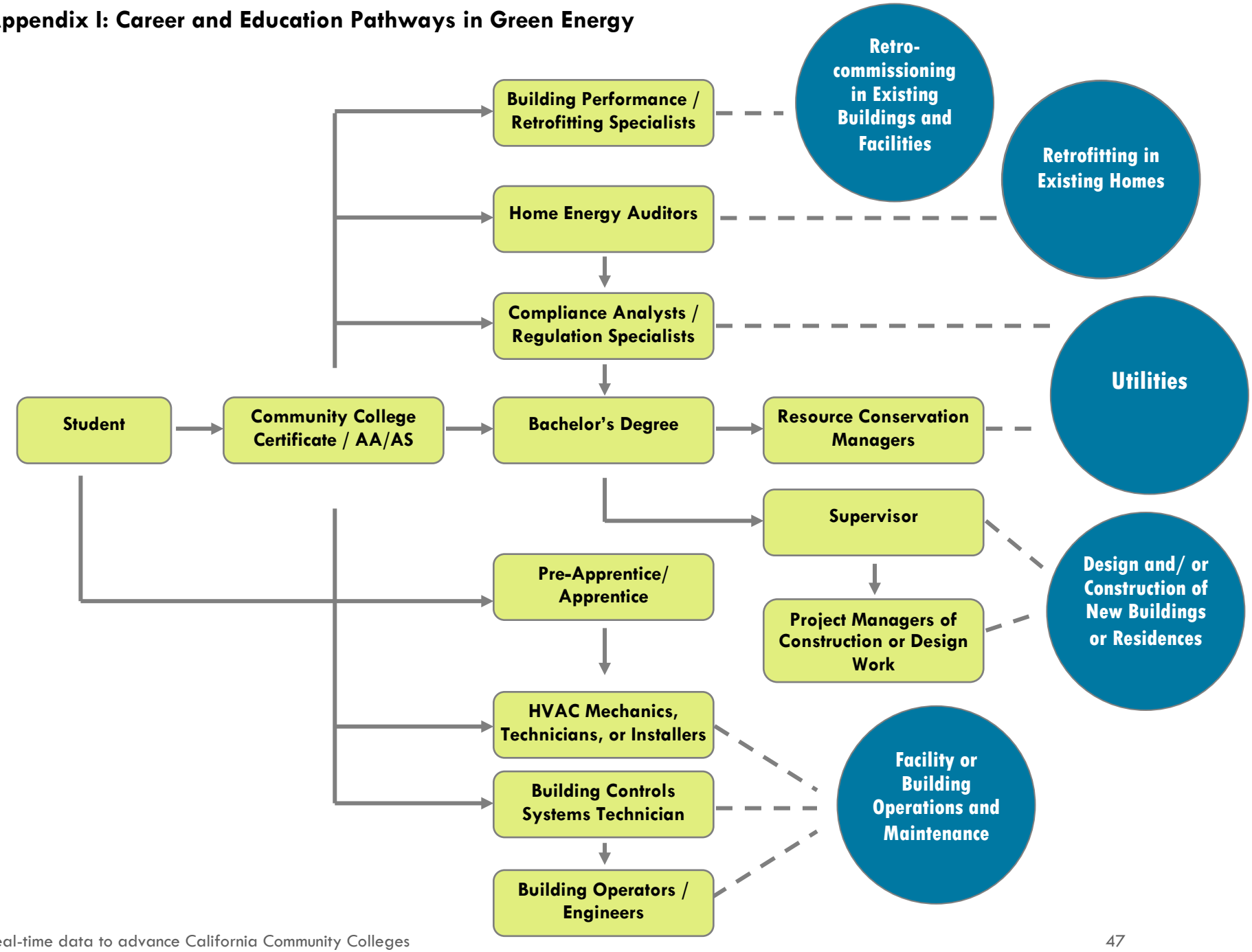
existing buildings (69%), and identify and apply regulatory codes when conducting energy assessments and/or site visits (59%).

Occupational Wages: In the Central 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	$36,000	$56,160

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.

Appendix I: Career and Education Pathways in Green Energy



Appendix J: 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.